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## Internal Control System in Enterprise Management: Analysis and Interaction Matrices

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**Abstract:**

*This study is aimed at the development of a guideline for analysis of the economic activity of an enterprise to control and ensure the interaction of tasks and functions of management in the current and strategic aspects in the conditions of innovative development. The proprietary methodology for enterprise management control system formation is developed.*

*The concept of matrices of analysis and interaction between the functions of the enterprise management is introduced. The matrix of operational control and management, the matrix of strategic control and management, the matrix of integrated control and management are considered by the authors. The concept of enterprise management control is considered herein.*

*The objectives of the management control system in the modern economy are also described. The key role of control in the implementation of the current and strategic objectives of the enterprise management is substantiated.*

*The proposals are formulated to improve the control function at the enterprise with the help of new information technologies. Based on the proprietary methodology of matrix analysis and interaction of objectives and functions of the enterprise management system, the algorithm for the formation of a system of integrated flexible internal control is developed.*

**Keywords:** Management, control, internal control system, strategic control, strategic control matrix, integrated flexible internal control.

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## **1. Introduction**

Currently, control as a function of management is recognized as determining in achieving the high quality of work of the enterprises and organizations. There is a generally accepted logic: no control, no exact implementation of the plan, no high result of the activity of the enterprise. In more detail, the advantages and disadvantages of the enterprise internal control systems are studied and published in the scientific works of Wu (2016), Martysenko (2016), Rahim *et al.* (2017), Prodanova *et al.* (2017), Goloshchapova *et al.* (2017), Mullakhmetov *et al.* (2018) and others.

However, some modern problems of organization of the efficient control in the framework of enterprise management system are observed. One of them is the difficulty of integration of the control functions in the current and strategic objectives of the enterprise management system. The proprietary approach to the solution of this problem consists in the formation of a special methodology for the analysis and interaction of the control system with the overall management system of the enterprise. In the opinion of the authors, this analysis and interaction methodology can be implemented based on matrix models.

The problems of the internal control system of the enterprise are the relevant research issue. According to the scientists, the problem of internal control is the key of success to any company (Rahim *et al.*, 2017). The mistakes made in the current financial statements, in daily production objectives, in the relationships with the suppliers and consumers, can result in bankruptcy. The success of internal control depends entirely on the quality of the labor resources of the company. To solve these problems, the COSO IC-IF internal control standard was updated. This standard enables the control risks assessment, the development of control procedures, the improvement of the information and data management (Montaño-Ardila *et al.*, 2017). As noted in the studies, the internal control system is in constant motion and transformation (Wu, 2016). In this regard, it becomes very important to consider new methods of analysis to improve the internal control system (Ivanova *et al.*, 2017).

Some attempts have been made to use the matrix method in the analysis of the enterprise management system (Iorga and Scarlat, 2014). The scientists proposed to use the matrix principle to analyze business processes and improve the indicators of the strategy. To this end, the key performance indicators were formed into a matrix for analysis of the market and functional areas of the company. The positive result was the increase in the efficiency of control over the economic indicators and the increase in the manageability of the company's business processes while fulfilling a common goal (Bondarenko *et al.*, 2017).

The application of the matrix approach in risk analysis is the accomplishment of the logistics tasks as: the selection of the optimal supplier, the selection of the cost and the quality of supplies (Jawab and Arif, 2015). A positive result is the confirmation of the possibility of use of the matrix approach for risk assessment and for one of the management system functions. This study does not involve the use of a matrix approach for the management system. It is proposed to solve this problem.

The use of the matrix approach in the strategic aspect for the company has also been studied by Kokodey (2013). The presented matrix model uses three indicators: the level of the company's competitive advantage, the popularity in business environment and time. These indicators have a market orientation and do not sufficiently consider the internal potential of the management system and the internal control system. It seems important to examine the internal control system as an important factor in the implementation of the strategy. It is proposed to apply the matrix approach to solve this problem.

The procedure for control over the current economic activity indicators and the innovative development indicators of the company remains insufficiently studied. The application of the matrix method will make it possible to formulate a general strategy for the innovative development of the enterprise while maintaining the current market positions.

## **2. Methodology**

In this article, general scientific methods of study are used: analysis and synthesis, deduction and induction, the interrelationship between logical and historical processes, the search for cause-effect relations, the laws of dialectics. The matrix approach is used as a special method. This method is widely described in the literature and it is applied for solving various economics and management problems.

The proprietary vision of the application of the matrix approach is as follows. The system of internal control is represented by the authors as a set of organizational structures, control measures, responsible executives, program activities, control indicators and costs required for effective control. The internal control system operates in the enterprise management system. The authors present the system of internal control as a complex system. On the one hand, it is subject to the enterprise management system, and on the other hand, it provides and determines the improvement of the enterprise management system.

Thus, a linear representation of the internal control system is insufficient, and a matrix approach is required. The matrix approach makes it possible to represent the contradictory sides of one phenomenon for a common goal achievement. In this case, the common goal is to maintain a highly competitive market position of the enterprise in its innovation development (Korableva *et al.*, 2018). At the same time, the contradictory factors that make up the research matrix are the stages of

traditional and innovative projects, the indicators of the current and forecasted market strategy, the objectives of operational and strategic management.

Thus, using the matrix approach, the authors attempted to build a logical system of internal control for the effective solution of diverse, contradictory but mutually complementary and mutually reinforcing economic functions and entrepreneurial objectives.

### 3. Results

The following matrices are used to analyze the control procedure and to make the appropriate decisions in the field of enterprise management.

#### 3.1 The operational control and management matrix

The improvement of the internal control system of a modern enterprise should be associated with the attribution of the flexibility (adaptability) properties to the internal control system. This study implies an analysis of the organizational management and control structure of the enterprise, identifying those responsible for the functional fields of activity and ensuring their close relationship in the process of the external and internal changes control. In other words, a flexible internal control system should be "embedded" into the existing management system of the enterprise in such a way that the period between the violations (discrepancies) revealed in the course of control and the response of the management system to them would be minimal (Table 1).

*Table 1. Operational control and management matrix*

<b>Directions of analysis</b> <b>Objects of analysis</b>	<b>Cost and profit centers</b>	<b>Map of internal control processes</b>	<b>Business process efficiency indicators</b>
Stages of ongoing production projects	Example: composition, structure and dynamics of project budgets	Example: persons in charge for control and control procedures for projects	Example: labor productivity and cost-effectiveness of projects
Stages of innovation projects	Example: monitoring of resources and motivations at the current stage of projects	Example: persons in charge for development and implementation of project stages	Example: effectiveness of activities and costs by stages in projects

Fields of an effective management model of a flexible internal control system includes:

- 1) Identification of the main parameters for the cost and profit centers in the time prospect and in comparison.
- 2) Analysis of each process of the model with the construction of a model of such a process.
- 3) Creation of business processes and financial flows map.
- 4) Reorganization, if necessary, of a system of interaction between various organizational units within the framework of adjustment of the models of the processes of the enterprise.

In addition to control over the current indicators of economic activity in modern conditions, it is important to control the innovation development of the enterprise (Lenkova *et al.*, 2017). The innovation activity is an activity with a high level of uncertainty (Korableva, *et al.*, 2017b). When we consider the stages of the innovation process and try to control the achievement of the target indicators, first, the objective is to control the uncertainty, the level of risk of the innovation project. In this regard, the new an autonomous objective is the formation of a system of internal control of the risks of the company's innovation activity. For this, the stages of the innovation project must be combined with the risk management rules in accordance with the international standards for internal control. Risk management should include the following elements of the internal control standard: internal environment, goal setting, event identification, risk assessment, risk response, means of control, information and communication, monitoring (Korableva, *et al.*, 2017a).

When improving the internal control system of an enterprise, it is required to link flexibly the parameters of the tactics and strategy of the enterprise in conditions of innovative development and current standards for internal control. This process involves the assessment of the parameters for the cost and profit centers, necessary resources and technologies for their use in the context of their linking with the persons responsible for control in accordance with the organizational management structure to ensure the ability to improve the performance indicators of the enterprise and considering the sections of the quality management system of the enterprise:

- ✓ management responsibility;
- ✓ product life cycles;
- ✓ resource management;
- ✓ analysis;
- ✓ change;
- ✓ improvement.

In this case, the internal control system becomes flexible, the process of managerial decision making after the control actions is reduced, the control function becomes dominant in the aggregate of management functions, integrating the planning, organization, motivation, analysis and accounting functions under its own control.

### **3.2 Strategic control and management matrix**

From the point of view of strategic management, effectiveness, efficiency, economy and dynamism are the indicators of the internal control system efficiency. These indicators should be set primarily to monitor the strategic indicators grouped into such areas as finance, market and customers, business processes, development and human resources. This will allow ensuring the successful strategic (innovation) development of the enterprise through systematic control and adoption of tactical managerial decisions (Table 2).

The specificity of managerial information requires the provision of data according to the current requirement – it can be both the information about the workload of an individual object, and the progress of a certain production (innovation) process. This is the most appropriate for a multi-administrative project structure, including the control of both traditional and innovation projects (Grynko and Gviniashvili, 2017).

**Table 2.** *Strategic control and management matrix*

<b>Directions of analysis</b> <b>Objects of analysis</b>	<b>Finance</b>	<b>Market and customers</b>	<b>Business processes</b>	<b>Development and Human Resources</b>
Stages of ongoing production projects	Example: composition, structure and dynamics of working capital and receivables of projects	Example: rates of sales growth and market share in projects	Example: benchmarks and indicators for functional areas in projects	Example: composition, structure and dynamics of the wage fund of projects
Stages of innovation projects	Example: composition, structure and dynamics of own and borrowed capital in projects	Example: quantity and quality of contracts with potential consumers of projects' products	Example: implementation of control measures for project stages according to the development strategy	Example: indicators of movement, rotation and training of personnel in projects

When constructing an optimal management model of a flexible internal control system, the degree of its complexity should correspond to the organizational structure of the enterprise, the number of employees, the number of branches and the level of their territorial branching, the degree of centralization of accounting, and other characteristics of the enterprise. The management model of a system of flexible internal control should use the advanced capabilities of the information technology to organize the work of distributed groups and units in the enterprise.

One of the communication tools of the organizational structure and control processes is the scheme of responsibility of the top managers for the functional areas of the enterprise. When changing the organizational structure, the scheme and description

of the processes should be changed also. As the organizational structure can change often enough, the description of processes should be convenient for making necessary changes.

To improve the internal control system, to increase its flexibility and adaptability, the principle of the conformity of organizational and managerial structures to the objectives of monitoring market (internal) changes should be used. It is also advisable to use the concept of "frame" – the event with certain parameters, subject to the occurrence of which the information is submitted to the necessary functional units responsible for the control of the event and authorized to make the necessary managerial decisions. This will ensure a rapid response to the market (internal) changes, adoption of the measures necessary to solve the problem and, based on the results of the actions undertaken, change flexibly the benchmarks of the strategic (innovation) development of the enterprise. The complex automated management and control system based on the frame implementation of the matrix representation of the structure and modern methods of information processing and analysis will allow the enterprise to switch over to a fundamentally new level of internal control, monitoring operatively the current state of innovation processes and the production system as a whole, providing the reporting and analytical data in various reviews, thereby making flexible the internal control.

### **3.3 Integrated control and management matrix**

To implement the matrix of the third type (Table 3), which makes it possible to combine the operational and strategic objectives of the economic activity, it is required to develop a management model of integrated flexible internal control.

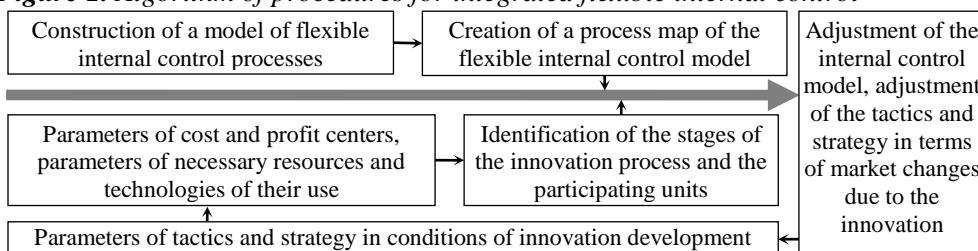
*Table 3. Integrated control and management matrix*

<b>Directions of analysis</b> <b>Objects of analysis</b>	<b>Operational objectives of economic activity</b>	<b>Strategic objectives of economic activity</b>
Stages of ongoing production projects	Example: ensure the placement of personnel and the implementation of the production plan	Example: ensure profitability of sales above the market average
Stages of innovation projects	Example: conduct a new product certification	Example: ensure a monopoly position in the market

The integrated flexible internal control (IFIC) can be defined as a permanent element of the enterprise activity in all fields, including various forms of cost optimization on key elements of the business model using various information technologies and management technologies, where the cost optimization is a prerequisite for the further innovative development of the enterprise. The algorithm of the basic IFIC procedures is shown in Figure 1.

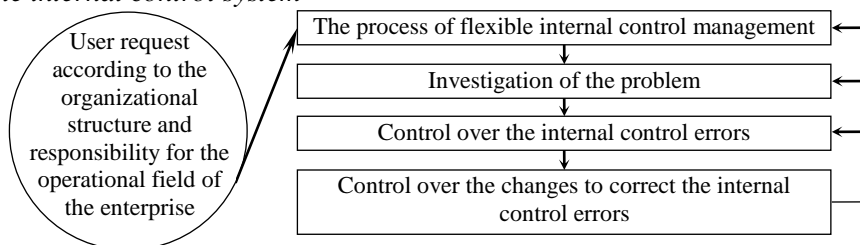
The integrated flexible internal control (IFIC) is a whole complex of activities organized and carried out in the company (organization) to achieve the best efficiency from the professional duties execution by the personnel. The management model of an integrated, flexible internal control system acts as a single point of contact for the user request to choose the responses to market or internal changes. The enterprise must respond immediately in the form of control to daily market or internal changes to carry out its work. Moreover, it is required to identify, analyze and eliminate the problems in the infrastructure of the information model of the flexible internal control system.

**Figure 1.** Algorithm of procedures for integrated flexible internal control



The proposed management model of the integrated, flexible system of internal control automates the ongoing market (internal) changes and objectives of process management, so that they are quickly reacted and effectively managed in the event of violation of the vital control functions of the enterprise. Figure 2 shows the operation of the integrated, flexible internal control system. The management process is focused on identifying the root cause of the problem and on using the change management process to eliminate the root cause.

**Figure 2.** Relationship between the market (internal) changes and the integrated flexible internal control system



The integrated flexible internal control (IFIC) system management process is designed to solve the problems at the requests of the users (the individuals, responsible for management and control) as soon as possible.

The following can be the stages of IFIC system designing:



- 1) Identification of subjects responsible for the implementation of the internal control. This responsibility division can be based both on the fulfillment of the traditional functional duties and on the implementation of the innovative development projects of the enterprise. In modern conditions, matrix organizational and managerial structures begin to play a dominant role.
- 2) The system of internal control acquires the principles, objectives, requirements necessary for combining traditional economic and innovation development functions. The guidelines for the internal control system are both current analytical notes on the state of the market, and the charter, strategy and accounting policy of the enterprise.
- 3) For the purposes of efficiency, the internal control system uses modern technologies, tools and management methods. Personnel job descriptions specify the boundaries of responsibility and the control parameters (Gapsalamov, et al., 2017; Ling and Yumashev, 2018). An approach is applied to the organization of the internal control system based on three levels of protection.
- 4) According to the chosen tactics and control strategy, considering traditional and innovative development objectives, the necessary economic resources are determined. In job descriptions, the authorities and the necessary economic resources are in line. It is important to allocate human, information, financial and time resources required for the effective operation of the internal control system.
- 5) Based on successfully developed functions of the internal control system, the standards are compiled. In terms of constant market changes and innovative development objectives, the internal control system standards should be able to change and acquire the flexibility.
- 6) The final stage is the functional and structural integration of the internal control system into the enterprise management system. This considers the requirements of flexible changes in internal control standards. The establishment of the internal control department, the procedure for internal and external audits, the distribution of control functions between the structural divisions of the enterprise occurs in conditions of combining (integrating) the traditional and innovative objectives of the enterprise. Thus, the integrated flexible internal control system is being formed.
- 7) The next stage in the establishment of the integrated flexible internal control system of an enterprise is the selection of personnel.

#### **4. Discussion**

The comparison of the results of the matrix approach application to the solution of the economic and management problems revealed the following. The choice of the opposite criteria or indicators to find the optimal solution is effectively realized using the matrix approach (Kryvoviaziuk, 2013). In our case, these opposite criteria or indicators are the operational and strategic objectives of the enterprise, as well as the stages of ongoing production and innovation projects (Vasilev, *et al.*, 2017). When combining the operational and strategic objectives and ongoing production and innovation projects, the control measures and installations are controversial.

While the current (operational) activity requires controlling the cost reduction and quality improvement, the innovation (strategic) activity requires controlling the increase in costs and obtain the uncertain quality with the likelihood of high demand in the market. In these terms, the problem of effective control integration should be solved.

Other well-known economic methods and management tools are used by the authors apart from the matrix approach to the solution of this problem. The approach to the organization and control of the operational activities, based on the identification of cost and profit centers, internal control process maps and business process performance indicators is used (Kurbanova *et al.*, 2018). In this case, this approach is applied to the formation of the operational control and management matrix. This allows the authors to develop the recommendations to improve the internal control system at the operational level.

The approach to the enterprise management based on the balanced indicators is also used (Vasilev *et al.*, 2013). This approach includes such analytical fields as finance, market and customers, business processes, development and human resources. Herewith, the studies are known where the matrix approach has been successfully applied to improve the system of balanced indicators (Korableva and Kalimullina, 2016). In this case, the system of balanced indicators is used to form the strategic control and management matrix. This makes it possible to develop the recommendations for improvement of the internal control system at the strategic level.

One of the complex modern problems of any enterprise is to ensure the integration of the implementation of strategic and operational economic objectives in selecting the current market positions or risky innovative projects. In this case, the objective is to increase the internal control flexibility in solving the problems of the enterprise innovative development. To solve this problem, the results obtained by the authors in previous studies are used (Akhmetshin *et al.*, 2018). Ultimately, the use of the proprietary experience and the principles of innovative management make it possible to form the integrated control and management matrix in the enterprise management system.

Thus, the most successful economic methods and management tools (matrix approach, balanced indicators system, innovative management) are used based on topical research and development of the world level in the field of improving the internal control system, and the proprietary model of integrated flexible internal control of the enterprise is proposed.

## **5. Inferences**

Currently, the problems of improvement of the internal control system are relevant for any enterprise. The complexity of solution to this problem is due to the non-linear nature of the control activity. The internal control system performs both a subordinate and a leading role in the overall management system. The effect of the internal control system improvement is synergistic.

Herein, an attempt is made to improve the internal control system using the matrix approach. Three matrixes of analysis and interaction are developed: the operational control and management matrix, the strategic control and management matrix, the integrated control and management matrix.

First, with the help of a matrix approach, it is possible to control and manage the operating activities of the company during implementation of current production and innovation projects. Wherein, the cost and profit centers, the internal control processes maps and business process efficiency indicators will serve as the management factors.

Second, with the help of the matrix approach, it is possible to control and manage the strategic activity of the enterprise during the implementation of current production and innovation projects. Wherein, the management factors will be finance, market and customers, business processes, development and human resources.

Third, using the matrix approach, it is possible to integrate the control and management of the operational and strategic objectives of economic activity in resolving the contradictions of support or current production or innovative projects. In this case, a management model of the enterprise integrated flexible internal control is proposed by the authors. When working with the user requests to solve the problems related to the improvement of the integrated, flexible internal control system, the following recommendations should be implemented:

- 1) *Priority setting*, so that the external (market) and internal changes, which cause a significant risk for the organization, for example, a fall in sales or a stoppage in production activities, are first recorded; this approach makes it possible to save the resources and to use them where they are most needed.
- 2) *Consecutive recording of user request details*. This information is then made available to other units. This means that the records can be found, analyzed and submitted to work throughout the enterprise.
- 3) *Integration with the management system of the enterprise*. The information obtained on the basis of the results of the integrated flexible internal control system can be used to solve the immediate production objectives and the objectives of the innovative development of the company.

## **6. Conclusions**

In conclusion, it should be noted that the complex automated system of integrated flexible internal control of the enterprise, based on the frame implementation of the matrix representation of the structure and modern methods of data processing and analysis, will allow the enterprise to switch over to a principally new level and improve the efficiency of control activities by monitoring the current state of the innovative processes and the production system as a whole, providing the reporting and analysis data in various reviews, thereby making the internal control flexible and integrated.

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