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## Inland Transport Enterprises Process Maturity Assessment – Theoretical Aspects

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**Abstract:**

**Purpose:** Inland transport companies play a pivotal role in the broader context of the global maritime container supply chain. Their role in managing the land-based links of the supply chain, coupled with the diverse entities influencing the maritime link, adds complexity to the integration and coordination of the entire supply chain. The quality of processes involved in performing various activities within the supply chain determines the attractiveness and competitiveness of particular supply chain participants and the supply chain as a whole. Given the extensive tasks and responsibilities assigned to inland transport companies, the adoption of a well-suited process-oriented management system becomes a necessity. Process maturity is delineated by a framework wherein individual processes undergo formalization concerning their definition, identification, measurement, flexibility, and efficiency. Unfortunately in the literature, there is a lack of process maturity models, which could be implemented in the inland transport companies. Hence, purpose of this paper is to present a theoretical model of process maturity assessment for inland transport enterprises.

**Design/Methodology/Approach:** A few research methods were applied: literature review, questionnaire method, and process maturity evaluation model.

**Findings:** Developed model of process maturity assessment dedicated for the inland transport companies is divided into levels and dimensions, which gives a better understanding of how to improve process maturity within the company.

**Practical implications:** The model of process maturity for inland transport companies can be utilised in practice as a kind of reference model, that managers can apply for benchmarking purposes, and also as a set of recommendations as well.

**Originality value:** This research is the first attempt to develop the process maturity model for inland transport enterprises.

**Keywords:** Process maturity model, inland transport, process management.

**JEL classification:** L15, M10, M16, R49.

**Paper type:** Research paper.

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## **1. Introduction**

The transport sector has been always very susceptible to market changes and disruptions. However, the current volatile market environment highly influences on decreasing performance and efficiency of many transport entities.

The COVID crisis resulted in a major decrease in global trade (WTO, 2020). Relatively fast recovery, which was also one of the reasons for congestion in US ports, confirmed that transport-related companies are resilient (Notteboom *et al.*, 2021).

In the intricate web of the global maritime supply chain, the maritime container terminal assumes a pivotal role as an integrator, highly sensitive to disruptions in adjacent segments of the chain (Charłampowicz and Grzelakowski, 2022). This critical nexus sees shipping lines, transporting an extensive array of containers, interfacing with a diverse array of land-based entities including land carriers and freight forwarders (Kotowska *et al.*, 2020). Given the operational dependence of land carriers on the mandates of freight forwarders, this study amalgamates these entities under the umbrella of inland transport companies.

The dispersion of these stakeholders in the terrestrial component of the supply chain presents challenges in harmonizing integration and coordination efforts. Inland transport companies, in this respect, are not just vital cogs in the transport mechanism but also play a substantial role in the broader economic context. They act as essential links in ensuring the seamless movement of goods, impacting the efficiency of the entire supply chain.

All activities and services are the results of performed processes. The ability to repeat the achieved process results can be described as the application of a process-based management system. The level of implementation for this system can be defined as a process maturity (Charłampowicz and Grzelakowski, 2022). Disruptions in inland transport can ripple through the entire system, affecting not only the logistical flow but also the economic throughput and stability.

An increase in the share of road transport, recorded as the highest in the past decade, was observed, while rail transport's share also saw a marginal rise in 2021 compared to 2020, yet not reaching its highest point of the last decade (Eurostat, 2023). This shift in the modal split offers valuable insights into the evolving dynamics of freight transport, signalling changes in preferences and utilization of different transportation modes.

The growing predominance of road transport exemplifies a significant alteration in freight transport tendencies. These variations are not merely indicative of shifts in transport preferences but also have substantial implications for the process maturity

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of inland transport companies. Moreover, road transport is the second largest mode of freight transport in EU (Eurostat, 2023; Thalassinos *et al.*, 2013).

Inland transport companies, in adapting to these shifts, face the challenge of evolving their process maturity to align with changing dynamics in freight transport. This involves revisiting their operational strategies, infrastructure development plans, and environmental policies. The increase in road transport's share, for example, necessitates a review of logistical efficiencies, route planning, and fleet management for these companies. Moreover, the rise in road transport underscores the need for these companies to enhance their process maturity to manage increased demand and to optimize their operations within this changing landscape.

Consequently, for inland transport companies, these shifts in the modal split and freight transport patterns necessitate a strategic re-evaluation. This re-evaluation should focus on improving process efficiencies, aligning with new transport policies, and adapting to environmental considerations, which are crucial for the logistics industry's strategic decision-making.

The efficacy of these inland transport entities, therefore, is crucial not only for the supply chain's performance but also for the larger economic ecosystem, highlighting their indispensable role in maintaining both supply chain integrity and economic vitality. Hence, the ability for capturing the process maturity level of transport inland companies can be perceived as an essential aspect of an efficiency of the global supply chain management.

Even though, the process maturity assessment has been widely studied in the literature (Becker *et al.*, 2009; Tarhan *et al.*, 2016; van Looy *et al.*, 2011), there is no model dedicated to the inland transport sector. Therefore, the main purpose of this paper is to present the multicriteria model for process maturity assessment for transport sector entities.

The paper is structured as follows: the first section is dedicated to a literature review concerning the process maturity assessment model. The second chapter presents the results of the research. The last chapter includes the conclusions.

## **2. Literature Review**

Many publications that relate explicitly or implicitly to the inland transport operations, or process maturity assessment can be found during literature study. Therefore, the following text includes main results of the literature review.

In the majority of studied publications, the category of process is defined by both its internal relationships, encompassing its logic, and all interactions with the environment. These interactions include internal relations, such as those with other

processes within the company, as well as external relations, such as those with customers and the market (Sawicki and Jaworek, 2017).

Shifting to the next category - process maturity, it is usually perceived as a measure for evaluating the capabilities of an organization in the context of the degree to which processes are identified, measured, managed, and improved (Sliz, 2018). The principal aim of process maturity is to ascertain the level of organizational advancement and the trajectory for progression.

Looking in process maturity process maturity from modelling aspect, the maturity model is defined as a conceptual framework comprising distinct maturity levels for the category of processes within one or more organizations, or business domains (Becker *et al.*, 2009; Tarhan *et al.*, 2016). Presented usually in table form, the model of process maturity delineates an envisioned, desired, or typical evolutionary trajectory for organization's processes. Numerous standards expound on varying maturity levels, contingent on the specific domain to which they are applied.

A great number of literatures focuses on the issues related to methodological aspect of process maturity assessment (Röglinger *et al.*, 2012; Tarhan *et al.*, 2016). Hence, methodologies for evaluating business process maturity level, are pertinent to highlight the initial model developed for process assessment, namely the Capability Maturity Model (CMM), created by the Software Engineering Institute (SEI) from 1986 to 1991 (Butzer *et al.*, 2017). The original CMM model facilitated maturity assessment across five levels.

However, its impracticality for assessing the entire organization led to challenges in practical application. Consequently, this model underwent an expansion to facilitate the optimization of business processes organization-wide.

Within the framework of the Capability Maturity Model Integration (CMMI), all organization processes were systematically categorized, with 22 process areas being assigned to them (Butzer *et al.*, 2017). The profusion of designed and published process maturity models has made the selection and application of an appropriate one progressively more challenging (Röglinger *et al.*, 2012). In the literature, despite the abundance of models in the domain of process maturity, only a limited subset has undergone verification and practical implementation (Tarhan *et al.*, 2016).

A shared characteristic found in all models is the lack of process identification at the lowest level and the impact of organizational culture on process improvement at the highest level. The long-term characteristic is denoted by value (usually the higher value is the higher level) or by letter (usually letter "A" denotes the highest level of process maturity) (Becker *et al.*, 2009; Charłampowicz and Grzelakowski, 2022; Röglinger *et al.*, 2012; Sliz, 2018; van Looy *et al.*, 2011; Kadlubek *et al.*, 2022).

Moreover, it is essential to introduce various levels and dimensions of a particular process maturity model. According to the short-term dimension, it is possible to distinguish three such levels: development (+), stagnation, and atrophy (-) (Sliż, 2018). Development is connected with the possibility to sustain or achieve a higher level of process maturity. Stagnation means that the organization is staying at its current level. Atrophy is a situation, where further actions are dedicated to discontinuing the implementation of a process-oriented solution and orientation towards a functional approach.

Even though, the problem of process maturity assessment has been widely described in the literature (Becker *et al.*, 2009; Butzer *et al.*, 2017; Röglinger *et al.*, 2012; Sliż, 2018; Tarhan *et al.*, 2016; van Looy *et al.*, 2011, Lee *et al.*, 2007; Bai *et al.*, 2018; Moutchnik, 2015; Ormazabal, Rich, *et al.*, 2017; Ormazabal, Sarriegi, *et al.*, 2017; Raschke and Ingraham, 2010; Tarhan *et al.*, 2015), very little space has been devoted to the process maturity dedicated for the transport sector (Charłampowicz and Grzelakowski, 2022; Sawicki and Jaworek, 2017; Thalassinou and Zampeta, 2012).

Some of the developed process maturity assessment models have general characteristics (Sliż, 2018), however, they could not be successfully implemented in inland transport companies, or the transport sector in general, due to, among others, the lack of emphasis on environmental issues.

Additionally, the literature has not sufficiently addressed issues related to the determination of the trend (pathway) in process maturity, which allows for the assessment of such maturity over both short and long-term horizons. It is pertinent to mention a general model (Sliż, 2018) that introduces such a crucial managerial concept. The division into short and long-term horizons employed in the general model proposed by Sliż (2018) has been adopted in the authors' proposed model for evaluating process maturity for inland transport enterprises.

### **3. Results - Proposed Model of the Process Maturity Levels for Inland Transport Companies**

The proper measurement of the current and future path of an organization in the context of process improvement requires not only to develop levels of process maturity but also identification of dimensions, which are the characteristics of short-term development of the given objects of assessment (Sliż, 2018). If there is a "+" after the long-term designation (letter value), then the characteristic of the short-term dimension is "development". If there is "-" it means atrophy. If there is no object after the long-term designation, then this parameter is dedicated to stagnation.

In the context of the transport sector, both sector-specific (Dewi and Mahendrawathi, 2019; Ormazabal *et al.*, 2017) and general models (Lee *et al.*, 2019;

Moutchnik, 2015) found in the literature, though potentially applicable, fail to conform to the specific criteria of this sector.

This non-conformity leads to a misalignment with the operational conditions of land transport enterprises. Such conditions are defined by the imperative to comply with increasingly stringent environmental regulations and the substantial interdependence of the land transport sector on other economic sectors.

Therefore, as a result of research works linking the theory on inland transport characteristics with the methodology of process maturity assessment, the model of process maturity levels for inland transport companies was elaborated. The structure of the model is presented in the table form (Table 1).

**Table 1.** *Model of the process maturity levels for inland transport companies*

<b>Level</b>	<b>Dimension</b>	<b>Characteristics</b>
Level 4 - Improvement of processes	L4 A+	The inland transport enterprise shows exceptional maturity in the area of process improvement.
	L4 A	High inland transport enterprise ability to improve processes thanks to the use of modern management methods. The entity manages the impact of its activities on the natural environment not only in terms of mega-processes and main processes. All employees of the inland transport enterprise are initiators and stimulators of changes and improvements. The process organization structure is implemented in the organization.
	L4 A-	No long-term improvement strategy for all processes. Customer requirements are the driver of changes. Knowledge is treated as a key resource, and the inland transport enterprise, by supporting its employees, causes them to initiate internal training to transfer the acquired knowledge and/or skills.
Level 3 – Management of processes	L3 B+	Measured processes are managed, and mainly mega-processes are improved. Training is carried out in response to the forecast changes in the market, moreover, the inland transport enterprise pays more attention to supporting and accelerating the development of employees, e.g. by referring them to postgraduate or MBA studies.
	L3 B	Within the inland transport enterprise, more and more attention is paid to environmental management, but the implemented standards systems from the ISO 14000 series or similar are not functioning. The growing importance of the implementation of training resulting from the current needs and changes in the organization as well as obligatory training increasing qualifications - training is treated as an element of the strategic and operational plan of the organization. The manager supports the transfer of knowledge and skills between employees and also controls and intervenes in the event of failure to achieve the set

		goals.
	L3 B-	Despite the measurement of the processes, there are no management decisions based on the results obtained. Internal training on raising qualifications is optional.
Level 2 – Measurement of processes	L2 C+	Process measurement is carried out in the area of relationship management in terms of customer satisfaction. The inland transport enterprise conducts training for management staff and conducts training for new employees. Managers of individual departments are involved in solving problems during the process.
	L2 C	Process measurement is carried out in the areas of operational, strategic, risk, and security management in terms of the value of revenues generated by the processes. The employee is treated as an independent member of the team that stimulates improvement throughout the inland transport enterprise. The training is integrative, obligatory, and optional and is dedicated to employees of particular departments.
	L2 C-	Process measurement is carried out superficially, mainly in the area of operational and strategic management in terms of time and cost. An additional role of the employee is to initiate improvements in the position held. The training is carried out following the training cycle planned by the company's headquarters, they are treated as an incentive or are not carried out at all.
Level 1 – Identification of processes	L1 D+	Within the inland transport enterprise, processes have been identified and formalized, process measurement is random and distorted. The role of the employee is to perform the tasks entrusted to him.
	L1 D	The inland transport enterprise correctly employs the term 'process,' signifying a coherent, recurring sequence of sequentially executed activities to create added value. Within the entity, only mega processes and select auxiliary processes are formally recognized. This extends to the formalization of processes through the use of process maps.
	L1 D-	The inland transport enterprise does employ the concept of processes; however, the application is marred by misidentification. Processes are frequently conflated with procedures, standards, or tasks. Even though mega processes (or core processes) have been identified and formally structured, the management approach remains predominantly task-centric.
Level 0 – Functional organization with poor process preorientation	L0 E+	The inland transport enterprise is actively exploring novel management approaches. The prevailing functional management framework steers its focus towards functions and tasks. Over an extended temporal horizon, strategic initiatives are underway to deviate from the conventional top-down management structure. This shift is exemplified by the internal adoption of quality management systems,

		such as ISO standards, prompted by the organization's inherent requirements.
	L0 E	The inland transport enterprise displays minimal indicators of incorporating the process approach. There are no discernible factors that might facilitate a shift in the future management orientation during forthcoming managerial endeavours.
	L0 E-	An inland transport enterprise characterized by a predominant functional management approach exhibits a multi-level hierarchical structure that inhibits horizontal pre-orientation. Over an extended timeframe, there is an absence of any isolated indicators suggestive of a shift in management orientation. The entity refrains from embracing the concept of a process-driven framework.

*Source: Own elaboration.*

In the order to achieve a higher level of process maturity, according to the developed methodology, the minimum criteria for the previous level must be met. To achieve the first level of the proposed model the inland transport company needs to fulfil the following conditions: within the organization term “process” is correctly defined and used. Moreover, the mega processes and selected auxiliary processes are correctly identified.

To achieve level 2 it is essential to measure the processes connected with safety management, operational, strategic, and risk management. If these conditions are met, then the organization can be considered as one on the first level of process maturity according to the presented model.

To categorize an inland transport company at the third level of the presented model, specific conditions must be fulfilled: the manager should facilitate knowledge transfer within the department, and the organization should offer various internal and external training programs aimed at enhancing employees' qualifications.

For an inland transport company to be classified at the highest fourth level of process maturity, careful attention should be given to environmental considerations, encompassing implemented environmental management systems and aspects related to the monitoring and measurement of environmental operations.

Additionally, effective management methods like elements of lean management, process capability analysis, or the ABC method should be integrated. The organizational structure can play a significant role in accelerating process maturity improvement, particularly when a well-defined process structure operates within the organization.



#### 4. Discussion and Conclusions

Based on the literature review a research gap concerning process maturity assessment for transport sector organizations has been identified. Most papers focused on universal models (Röglinger *et al.*, 2012; Sliž, 2018; Tarhan *et al.*, 2016; van Looy *et al.*, 2011), and the very little place has been devoted to the transport sector with special attention paid to Transport-Freight forwarding-Logistics (TFL) sector (Sawicki and Jaworek, 2017).

However, in the aforementioned research, there was a lack of issues concerning the environmental issues of transport activity. This paper attempts to fill this gap by developing a model for process maturity assessment for inland transport companies.

Process maturity evaluation is a vital feature of modern management. The possibility for accurate assessment of the organization's process maturity could provide knowledge concerning further activities, that need to be taken for organization improvement. To attain a higher level, the enterprise must meet the criteria of a lower level, as indicated by its placement in a dimension associated with long-term development.

The organization's classification across various long-term dimensions is determined by comparing the total points obtained in criteria for adapting to a specific level with the point ranges that enable classification in the long-term dimension. This implies that the total sum achieved by the organization does not directly determine classification into a specific level of process maturity. However, within specific levels, it functions as an indicator of the long-term dimension.

Further research directions are connected with empirical verification of this model in various TFL companies. The ability to implement this model could be beneficial both for practice and theory as a reference model for many application purposes (benchmarking, recommendations, improvement, certification, IT support).

The main research limitation is the necessity for self-assessment made by a particular organization. This subjective point of view should be confronted with more objective, quantifiable indicators such as revenue, tonnage, number of transported TEUs, etc.

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