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MECHANISM FOR THE DEVELOPMENT OF DIGITAL TRANSFORMATION OF TRANSPORT AND LOGISTICS ACTIVITIES

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Abstract

In modern economic conditions, the management of transport and logistics flows is associated with the universal penetration of digital technologies. Digitalization allows for the optimization of the entire supply chain, including transportation and warehousing operations. Digital technologies provide opportunities to increase the economic efficiency of business processes in logistics, improve the safety and quality of transport and logistics flow management, and enhance the competitiveness of entities in transport and logistics systems.

This article presents the research results of the mechanism for the digital transformation development of transport and logistics activities. The developed mechanism includes the process of automation and informatization of business processes; the process of combining various information technologies; the process of creating a model reflecting data online; the process of deciphering the received data; the process of compiling forecast data, as well as the process of editing the system without human intervention. The ultimate goals of developing this mechanism may be the creation of a digital product development system, the formation of a digital platform for integration into a flexible network, the creation of a digital transformation ecosystem, the implementation of flexible and integrated supply chain management, the development of a KPI system and evaluation of the effectiveness of transport and logistics activities, the selection and hiring of qualified personnel, the creation of an integrated information system and cloud data storage; as well as the implementation of electronic document management and a digital modeling and forecasting system.

The comprehensive development and transformation of transport and logistics systems through their digitalization will ensure such potential results as the transition to new business models for the functioning of systems, flexible communication channels in the process of performing transport operations, as well as to products and business processes that are based on fundamentally new approaches to information management using digital technologies, and, as a result, to a significant increase in the efficiency of transport and logistics systems and their long-term sustainability.

Keywords: transport and logistics activities, development, digital transformation, mechanism.

МЕХАНИЗМ РАЗВИТИЯ ЦИФРОВОЙ ТРАНСФОРМАЦИИ ТРАНСПОРТНО-ЛОГИСТИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ

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Реферат

В современных экономических условиях управление транспортно-логистическими потоками связано со всеобщим проникновением цифровых технологий. Цифровизация позволяет осуществлять оптимизацию всей цепи поставок, включая перевозку и складские операции. Цифровые технологии обеспечивают возможности повышения экономической эффективности бизнес-процессов в логистике, повышают безопасность и качество управления транспортно-логистическими потоками, усиливают конкурентоспособность субъектов транспортно-логистических систем.

В данной статье представлены результаты исследования по разработке механизма развития цифровой трансформации транспортно-логистической деятельности. Разработанный механизм включает процесс автоматизации и информатизации бизнес-процессов; процесс объединения различных информационных технологий; процесс создания модели, отражающей данные в режиме online; процесс расшифровки полученных данных; процесс составления прогнозных данных, а также процесс редактирования системы без участия человека. Конечными целями разработки данного механизма могут быть создание цифровой системы разработки продукции, формирование цифровой платформы для интеграции в гибкую сеть, создание экосистемы цифровой трансформации, внедрение гибкого и интегрированного управления цепями поставок, разработка системы KPI и оценки эффективности транспортно-логистической деятельности, осуществление подбора и найма квалифицированного персонала, создание интегрированной информационной системы и облачных хранилищ данных; а также внедрение электронного документооборота и системы цифрового моделирования и прогнозирования.

Комплексное развитие и преобразование транспортно-логистических систем путем их цифровизации обеспечат такие потенциальные результаты как переход к новым бизнес-моделям функционирования систем, гибким каналам коммуникаций в процессе выполнения транспортных операций, а также к продуктам и бизнес-процессам, которые базируются на принципиально новых подходах к управлению информацией с использованием цифровых технологий, и как следствие, к значительному повышению эффективности транспортно-логистических систем и их долгосрочной устойчивости.

Ключевые слова: транспортно-логистическая деятельность, развитие, цифровая трансформация, механизм.

Introduction

In the 21st century, rational management of transport and logistics flows is an important task for the development of the logistics system of any state, the solution of which cannot be imagined without the use of modern information technologies. In the process of research, the emerging set of various information technologies gives rise to such terms as informatization, digitalization and digital transformation.

A full description of the presented concepts is described in the Law of the Republic of Belarus "On Information, Informatization and Information Protection" dated November 10, 2008 No. 455-Z and STB 1693-2009 "Informatization. Terms and Definitions". Thus, informatization is an organizational, socio-economic and scientific-technical process that provides conditions for the formation and use of information resources and the implementation of information relations [1, 2]. Digitalization is a new stage of automation and informatization of economic activity and public administration, the process of transition to digital technologies, which is based not only on the use of information and communication technologies to solve production or management problems, but also on the accumulation and analysis of big data with their help in order to forecast the situation, optimize processes and costs, attract new contractors, etc. [3]. Digital transformation is a manifestation of qualitative, revolutionary changes, consisting not only in individual digital transformations, but in a fundamental change in the structure of the economy, in the transfer of centers for creating added value to the sphere of building digital resources and end-to-end digital processes. As a

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result of digital transformation, a transition to a new technological and economic structure is carried out, and new sectors of the economy are created [3]. Digitalization can be considered in three dimensions: 1) the use of digital technologies in the business sphere, associated with the formation, optimization and transformation of business processes, the transformation of digital data into useful knowledge; 2) use in a specific environment, for example, in the creation of a "digital workplace"; 3) the introduction of digital technologies in all areas of social and humanitarian activities [4]. To assess the effectiveness and level of digital transformation of transport and logistics, various approaches can be used [5, 6, 7, 8].

Development of organizational and economic foundations for the mechanism for developing digital transformation of transport and logistics activities

Today, it is generally recognized that the future development of the economy, and subsequently of all mankind, is associated with the digital economy. In this regard, the attention of researchers is increasingly attracted by theoretical and practical problems of digitalization. The continuous process of digitalization development is associated with the endless growth of information flows. The constant growth of volumes of heterogeneous information, which can come in numerous directions, has recently accompanied both large and fairly small transport and logistics organizations. All information flow entering the organization is subject to certain storage, evaluation, structuring, analysis and accounting. Without the use of specialized information systems, it is difficult and almost impossible to solve the above problem, and even with a huge amount of information. And since today the most important factor is the speed of response to incoming requests in doing business, organizations that want to work effectively need to radically improve the processing of incoming and outgoing information flows. Digital technologies make it possible to accumulate huge amounts of information that companies not only can, but must use to make management decisions. The vast majority of areas of human activity, including logistics, are subject to global automation. In other words, thanks to the development of digitalization, new opportunities have emerged for the creation and development of end-to-end management systems for material and related flows in the economy, which has contributed to the development of logistics as an activity for managing these flows based on pre-developed, controlled indicators. A marketing study of the business services market by the consulting company Deloitte showed that only a third of all surveyed representatives of the largest companies are confident that they will be able to adapt to the conditions that the digitalization era will set for them. In addition, J. Chambers' forecast is as follows: in the next decade, of all the companies studied to date, only slightly more than half (about 60 %) will remain operating in the economy, which is due to the unpreparedness of companies for the total digitalization of business [9].

Today, there are already many examples of brands that used to have a large market share, but today their customer base has become invisible (Kodak, MySpace, Motorola, Blackberry, etc.). Having studied the other side of this phenomenon, it is necessary to note those corporations that, on the contrary, used this situation to improve their position in the market (Google, Apple, Microsoft, Amazon, etc.) [10]. McKinsey&Company experts claim that "in today's reality, innovations are needed by businesses not only to accelerate the pace of development, strengthen leadership and break away from competitors, but also for timely protection against damage to the industry in the event of the introduction of radical innovations that make entire areas of business economically inexpedient" [11]. When managing transport and logistics flows, various factors arise that significantly affect the process under consideration. Such factors, according to K. V. Kholopov are divided into external and internal [12]. External factors impose greater uncertainty on the process of managing transport and logistics flows. Based on this, their study should be approached with a greater degree of responsibility and analysis should be carried out with a large number of experimental samples (examples) [12].

In the conditions of the economic development that modern society dictates to us, the management of transport and logistics systems and flows, as noted earlier, is associated with the universal penetration of digital technologies.

Digitalization allows you to optimize the transport and logistics process. Digital technologies guarantee increased economic efficiency of business processes in logistics, improve the safety and quality of transport and logistics services, and provide a significant competitive advantage. At the same time, according to some authors, at the current stage of digital transformation in international road transport, there is a fragmentary use of modern digital technologies, which is due to their disunity [13]. But with the digitalization of the transport industry, due to a certain unification of cargo and commercial information, it is possible to introduce an "electronic transportation passport" [14].

It should be noted that digital traceability of the movement of products, goods, services and digital assets is one of the six top priorities for the implementation of the digital agenda of the Eurasian Economic Union (EAEU) until 2025 [15], which is confirmed by the introduction of electronic document management systems by the customs authorities of the EAEU [16]. In addition, Resolution No. 66 of the Council of Ministers of the Republic of Belarus dated February 2, 2021 approved the State Program "Digital Development of Belarus" for 2021–2025, which determined the creation of an integration platform for the national electronic logistics system [17].

Today, there are already some models that systematize the process of digital transformation of an organization.

The first model is presented by the Center for Digital Business at the Massachusetts Institute of Technology. The essence of this model is that all its blocks and elements are interdependent. The first block is a block consisting of elements characteristic of working with clients, i.e. the relationship with the external environment. The second block characterizes the production process itself. The third block is the model itself, which must be achieved using the developments of the first and second blocks. The third block is the goal to be achieved [18].

The second model is the digital maturity model (DMF) of Deloitte. This model assesses the level of digital transformation using the following indicators:

- client;
- production process;
- organization strategy;
- production technology;
- structure;
- organization culture.

At the initial stage, the organization's strategy is studied. Based on the results of its study, further directions of the organization's development in the field of digital transformation are visible [19].

Such a task as digital transformation of any process, or business in general, and in this case flow management, is in service with the vast majority of organizations among various types of economic activity. Being a fairly new direction that has replaced partial computerization and informatization of business processes, digitalization creates conditions for the growth of the number of companies that need to develop and implement their own digital software products. Thus, there is an increase in the innovative component of business, which in turn contributes to the effective development of the economy and logistics. It is important to note the opinion of T. G. Shulzhenko, which says that digitalization of transport and logistics flow management contributes to the emergence and further development of innovative production, growth of competitiveness in conditions in which the role of individualization of consumer requirements for goods and services increases [20]. However, based on the above, logistics at the current stage of development is somewhat behind such types of economic activity as banking services, trade, telecommunications and communications, etc. In the vast majority of transport and logistics organizations, when organizing the work process, there are many manual operations, the organization's assets are not used fully effectively, which slows down the process of digital transformation of business. It is important to note that today many scientific papers have been written on digitalization, which define its conceptual apparatus, scope of application, technological component of digital transformation, etc., but it is difficult to find any recommendations that need to be followed by transport and logistics organizations implementing digitalization tools, which is due to the complexity of their perception at the moment.

Thus, the study of the main and auxiliary business processes of the organizations contributes to the creation of a special mechanism for the development of digital transformation of transport and logistics activities, which would be standard for any logistics organization.

Obviously, the digitalization of an organization is a rather long and complex process that requires a certain level of attention. In addition, the digital transformation of business at its various stages should have a positive effect on the company's performance indicators. To develop a mechanism for the development of digital transformation of transport and logistics activities, it is necessary to solve the following problems:

- define the goals and objectives of the mechanism;
- define the subjects and objects of the mechanism;
- develop the principle of operation of the mechanism.

The purpose of the developed mechanism is to structure the sequence of actions for organizations moving to digital transformation of their activities.

To achieve this goal, it is necessary to solve the following problems:

– develop a sequence of stages for the mechanism of digital transformation of transport and logistics activities;

– provide for a list of activities required at one or another stage of the developed mechanism;

– ensure the interconnection between all stages of the digital transformation mechanism of transport and logistics activities.

The objects of the mechanism for developing digital transformation of transport and logistics activities are the transport and logistics flows of the organization in the context of digital transformation, as well as the transport and logistics system of the country as a whole. The subjects of the mechanism are various organizations that carry out any transport and logistics activities. When developing specific stages of digitalization, it is necessary to take into account that each stage should be based on the previous one and include a description and a set of tools necessary for its implementation. The mechanism for developing digital transformation of transport and logistics activities developed by the authors includes a set of stages and activities characteristic of digitalization.

Stage 1. The process of automation and informatization of business processes. At this stage, you can consider the use of specialized systems for managing transport and logistics flows in the organization. For example, to informatize the process of transporting goods, you can provide for the introduction of a satellite tracking system that will allow you to control the order fulfillment time. If we consider an enterprise that has an established warehousing system, then at the first stage we can consider connecting a WMS system (Warehouse Management System) to manage the flow of goods that pass through the warehouse.

This stage is the basis of this mechanism. Its peculiarity consists in partial automation and informatization, that is, the information technologies present in the organization at this stage are used without connection into a single whole.

Stage 2. The process of combining various information technologies. At the second stage, the information technologies used by the organization are combined, which are necessary for solving issues that arise in the process of doing business, namely flow management. Such products include TMS (Transportation Management System), WMS, automated inventory management systems and others, which can be combined, for example, in the ERP (Enterprise Resource Planning) system.

However, it should be noted that despite the use of various information and communication technologies that are capable of mutual connection and exchange of information data, total integration in this area has not been formed at the present stage.

Stage 3. The process of creating a model that reflects data online. Providing data in real time is possible by installing RFID tags. These tags have the ability to record events and the state of objects online throughout the entire process of information flow through the organization's logistics system. Such information will contribute to making more effective decisions due to the constantly available up-to-date information.

Stage 4. The process of deciphering the received data. In order to use and present the received data correctly, it is necessary to process and analyze them correctly. Thus, generalization, understanding the nature and role of the received information and analysis of large amounts of data leads to making adequate management decisions in a relatively short time. Since at this stage it is necessary to process and analyze huge amounts of data, then for such cases it is advisable to use digital platforms like Big Data technology.

Stage 5. The process of compiling forecast data. At this stage, the expected development options for a particular logistics business process of the organization are modeled based on the information obtained after processing by Big Data. If any problematic situations were identified during the modeling process, then using digital technologies such as artificial intelligence, it is possible to develop response and protective measures. As a result, the management of the organization's transport and logistics flows becomes quite predictable and predictable, which makes it possible to quickly respond to any changes without significant time and material costs.

Stage 6. The process of editing the system without human participation. The formed flexibility of the organization and its predictability make it possible to transfer the process of making optimal decisions for the company using artificial intelligence (AI) technologies. If, with the help of AI, some proposals were made for options for solving the problems that arose, and they turned out to be the most effective and were implemented in the shortest possible time, while human participation was not envisaged, then this is direct evidence of the success of this solution.

The developed mechanism for the development of digital transformation of the organization's transport and logistics activities is shown in Figure 1.

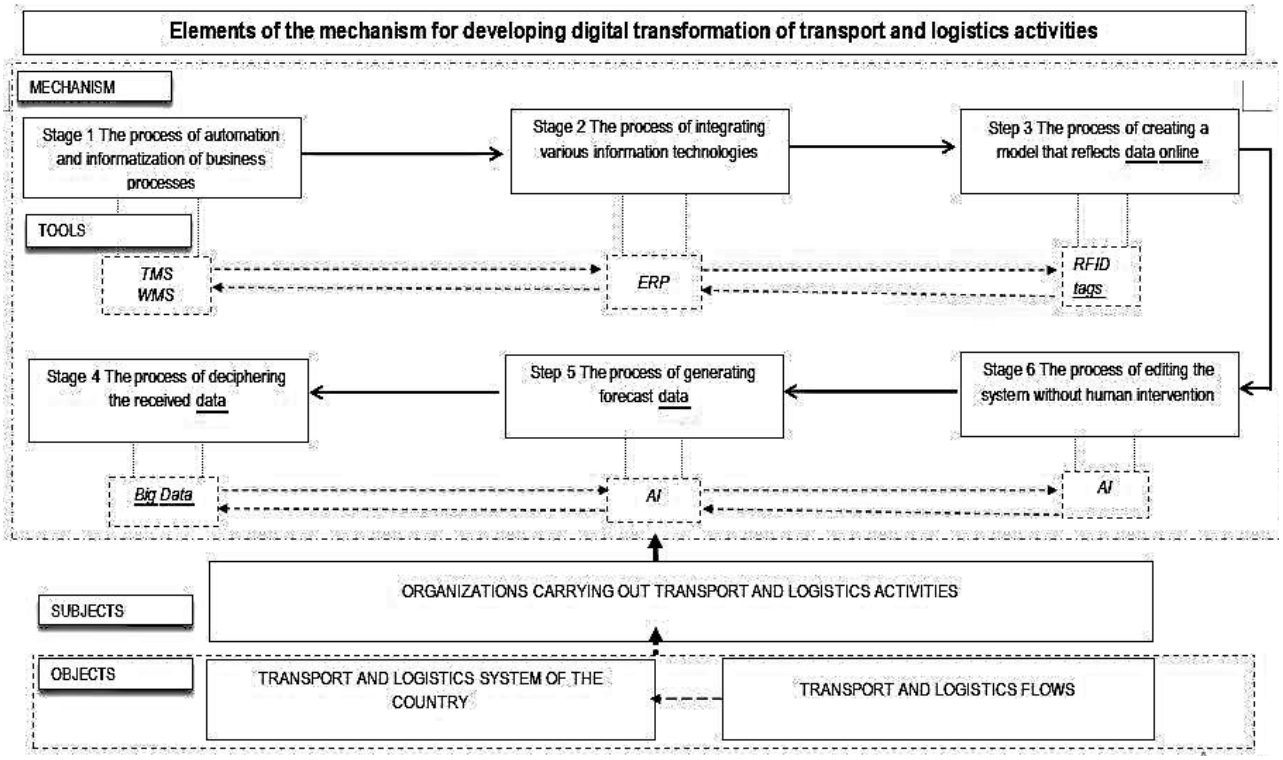

Figure 1 – Mechanism for digital transformation developing of transport and logistics activities

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Today, the agenda of many transport and logistics organizations includes the issue of creating a suitable information base or infrastructure that will allow companies to move to the second stage of digital transformation of the logistics business as a whole. Since it is necessary to understand that partial digitalization of individual business processes slows down the formation of unified digital platforms that would unite the entire supply chain.

The transition from the first to the second stage is the beginning, without which the transition to digital transformation of a transport and logistics organization is impossible.

Conclusion

The purpose of this mechanism is to select the target stage of digitalization that the organization wants to achieve during the digital transformation of its activities.

Thus, the developed mechanism can become a kind of tool for a transport and logistics organization to determine its current position in the process of achieving business digitalization. In addition, this mechanism will help the organization develop a list of activities necessary to achieve the target stage of digital transformation.

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