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# METHODOLOGICAL SUPPORT FOR THE ASSESSMENT AND DEVELOPMENT OF THE DIGITAL TRANSFORMATION OF TRANSPORT AND LOGISTICS ACTIVITIES

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**Abstract**

With the rapid development of technology and the globalization of the economy, the transport and logistics sector is facing new challenges and opportunities. Digitalization, covering all aspects of business, is becoming a key factor determining the effectiveness and competitiveness of an organization in this area. The introduction of digital solutions will optimize supply chain management processes, improve interaction between market participants, and enhance customer service.

The article presents an analysis of the processes of digitalization as a whole, as well as the existing methodological support in this field for assessing digital transformation. Thus, the methods of digital development developed by JSC Giprosvyaz (Republic of Belarus), the Department of Management of Perm State National Research University (Russian Federation), and the Analytical Agency Arthur D. Little (USA) are described. All three techniques have both advantages and disadvantages. In this regard, there is a need to develop our own methodology that would take into account all the nuances of existing assessment systems.

In addition, the article describes the methodology developed by the authors for assessing the level of digital transformation, which will allow taking into account the opinions of various participants in transport and logistics activities, thanks to the developed expert indicators and the weight indicators assigned to them.

Thus, the article examines the key aspects of digitalization of transport and logistics activities, analyzes existing methods for assessing digital transformation, and develops an author's methodology for assessing the level of digitalization of transport and logistics activities.

**Keywords:** transport and logistics activities, development, digital transformation, methodological support.

## МЕТОДИЧЕСКОЕ ОБЕСПЕЧЕНИЕ ОЦЕНКИ И РАЗВИТИЯ ЦИФРОВОЙ ТРАНСФОРМАЦИИ ТРАНСПОРТНО-ЛОГИСТИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ

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**Реферат**

В условиях стремительного развития технологий и глобализации экономики транспортно-логистическая сфера сталкивается с новыми вызовами и возможностями. Цифровизация, охватывающая все аспекты бизнеса, становится ключевым фактором, определяющим эффективность и конкурентоспособность организации в данной области. Внедрение цифровых решений оптимизировать процессы управления цепями поставок, улучшать взаимодействие между участниками рынка и повышать уровень обслуживания клиентов.

В статье представлен анализ процессов цифровизации как в целом, так и существующего в данной области методического обеспечения для оценки цифровой трансформации. Так, описаны методики уровня цифрового развития, разработанные ОАО «Гипросвязь» (Республика Беларусь), кафедрой менеджмента Пермского государственного национального исследовательского университета (Российская Федерация), аналитическим агентством – Arthur D. Little (США). Все три методики имеют как преимущества, так и недостатки. В связи с этим возникает необходимость в разработке собственной методики, которая учла бы все нюансы существующих систем оценки.

Кроме того, в статье описана разработанная авторами методика оценки уровня цифровой трансформации, которая позволит учесть мнения различных участников транспортно-логистической деятельности, благодаря разработанным экспертным показателям и присвоенным им весовым показателям.

Таким образом, в статье исследованы ключевые аспекты цифровизации транспортно-логистической деятельности, проанализированы существующие методики оценки цифровой трансформации, а также разработана авторская методика для оценки уровня цифровизации транспортно-логистической деятельности.

**Ключевые слова:** транспортно-логистическая деятельность, развитие, цифровая трансформация, методическое обеспечение.

### Introduction

At the current stage of economic development, digitalization plays an important role. The processes of digital transformation are developing very rapidly, as evidenced by its penetration into all types of economic activity without exception. If we turn to the transport and logistics field of activity, the use of the latest inventions and the latest digital achievements in it helps to increase the effectiveness of relationships between participants, as well as guarantees competitive advantages, which makes the presented topic relevant. The development of informatization and digitalization sets a peculiar rhythm for the development of the economy, logistics and the public as a whole. The instantaneous penetration of digitalization into everyday life is an unambiguous and distinctive feature of the process under consideration.

### Analysis of the existing methodological support for digital transformation assessment

It is worth noting that the concept and essence of the digitalization process, as well as a detailed description of the tools of digital transformation of transport and logistics activities, have been studied in detail in previous articles [1, 2]. Thus, digitalization of transport and logistics flows makes it possible to optimize the transport and logistics process. Digital technologies guarantee an increase in the economic efficiency of business processes in logistics, increase the safety and quality of transport and logistics services, and provide a significant competitive advantage [3, 4].

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



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The first model to start researching any techniques in the field of digitalization is presented by the Center for Digital Business at the Massachusetts Institute of Technology. This center was established in 1999 and is currently the most advanced in the industry. As a result of the analysis and synthesis of the digital development of more than 400 organizations over the course of more than one year, experts have identified the main blocks in the development of their own model. The essence of this model is that all its blocks, namely customer service, the production process and the provision itself, are interdependent. By working with these elements of the system, it is possible to achieve the desired level of digital development. However, it is impossible to achieve total digitalization in each individual block, since each organization only works on a specific block that it wants to bring to a new level for itself.

The first block is a block consisting of elements specific to working with clients, i.e. the relationship with the external environment. This block has three components inside itself:

– understanding of the clientele (working with the client through social networks, etc.);
– increase in income (revenue);
– finding points of intersection with clients.

The second block characterizes the production process itself. Namely:

– the very process of digitalization of a certain business process;
– the discovery of new employee opportunities during the production process, since with the increase in digitalization of a particular process, the employee has a new production reserve that can be directed in the right direction;
– the ability to manage and control the output and labor intensity of production.

The third block is the model itself, which must be achieved using the best practices of the first and second blocks. The third block is the goal to be achieved [5]:

– the introduction of digitalization in the organization;
– creating a new digital product or company as a whole;
– creating a global digital community.

However, it should be borne in mind that the necessary result can be achieved only if there is a leader who can organize the well-coordinated work of the entire team and who clearly understands what needs to be achieved in the final result.

The second model is Deloitte's Digital Maturity Model (DMF). This model evaluates the level of digital transformation using the following indicators:

– customer;
– the production process;
– the organization 's strategy;
– production technology;
– structure;
– the culture of the organization.

At the initial stage, the organization's strategy is being investigated. According to the results of her research, further directions of the organization's development in the field of digital transformation are visible [6].

Such a task as the digital transformation of a process or business as a whole, 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 the 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 states that digitalization of transport and logistics flow management contributes to the emergence and further development of innovative production, increasing competitiveness in conditions where the role of individualization of consumer requirements for goods and services increases [7]. However, based on the above, logistics at the current stage of development is somewhat lagging behind such types of economic activities as banking, trade, telecommunications and communications, etc. In the vast majority of transport and logistics organizations, there are many manual operations involved in organizing the workflow, and the organization's assets are not fully used effectively, which slows down the process of digital business transformation. It is important to note that many scientific papers on digitalization have been written today that define its conceptual framework, scope, technological component of digital transformation, etc., but it is difficult to find any recommendations that should be followed by transport and logistics organizations implementing digitalization tools, which is associated with some complexity of the process of perceiving such an abstract at the moment phenomena.

Today, there are various methods for assessing the level of digital development of organizations among various types of economic activity. In this article, we will compare some of them.

The methodology for assessing the level of digital development of organizations, industries and functional areas developed by JSC Giprosvyaz (Republic of Belarus) in its approach is based on a set of data from individual business processes and their contribution to the overall result, as well as summarizing information about the level of computerization, automation and informatization. The relationship between computerization, automation, informatization and digitalization is shown in Figure 1.

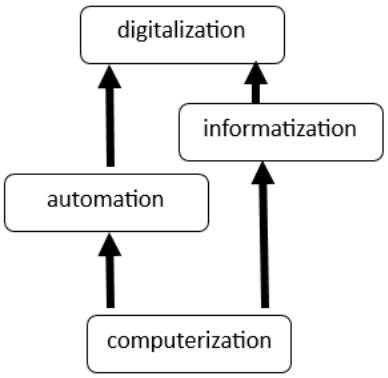


**Figure 1** – The relationship of the methodology elements

The approach to assessing the level of digitalization of an organization is presented in formula (1):

$$C = \frac{\sum_{1}^{n} \alpha_i \cdot C_i \left| \begin{matrix} K_i & \geq & K_{tr} \\ A_i & \geq & A_{tr} \\ E_i & \geq & E_{tr} \end{matrix} \right.}{\sum_{1}^{n} \alpha_i}, \quad (1)$$

where $C$ – an indicator of the level of digitalization of an organization;

$C_i$ – an indicator of the level of digitalization of the first business process;

$\alpha_i$ – the weight of the I-th business process in the organization's activities;

$K_i$, $A_i$, $E_i$ – levels of computerization, automation and informatization of the I-th business process;

$K_{tr}$, $A_{tr}$, $E_{tr}$ – required levels of computerization, automation and informatization.

In cases where it is difficult to obtain information about the impact of individual factors on the digitalization process, you can use a simplified version of formula (2):

$$C = \sqrt[2]{\frac{C_O^2 + C_B^2 + C_Y^2}{3}}, \quad (2)$$

where $C_Y$ – an indicator of the level of digitalization of business management processes;

$C_O$ – an indicator of the level of digitalization of the main business processes;

$C_B$ – an indicator of the level of digitalization of auxiliary business processes;

$n$ – the number of private indicators of automation and informatization related to a specific type of business processes.

The value of the indicator of the level of digitalization is determined based on expert estimates in accordance with the developed assessment scale:

0 – there is no digitalization;

1 – computerization of the enterprise (organization) and automatic digital data collection is carried out in real time, without human involvement (your business, suppliers, consumers, competitors, market conditions, logistics, preferences of a higher-level system, market trends);

2 – the informatization of the enterprise (organization) is carried out, automatic digital data collection in real time, without human intervention, and subsequent dynamic analysis of this data in real time (a digital asset has been created);

3 – an intelligent decision support system has been implemented, including automatic digital data collection and subsequent dynamic analytics, the results (digital asset) are used by the company's management to make operational and optimal decisions;

4 – an enterprise ecosystem has been created in which all business processes are digitized, management decisions are formed and implemented automatically (if necessary, some of them are approved or adjusted by the company's management, who is responsible for the consequences of the management decision made and implemented). The role of managers is to determine the goals (sub-goals) of the functioning of the enterprise management system, the system of constraints and performance criteria, development directions and areas of activity [8–12].

This method of assessing the level of digitalization based on data on the levels of computerization, automation and informatization allows you to obtain general information about the company, monitor changes in the field of digitalization and identify growth points.

The Department of Management of Perm State National Research University (Russian Federation) has developed a methodology that allows assessing the degree of use of modern information and communication technologies for the implementation of various business processes of the organization.

The essence of this methodology is to identify six large business processes (personnel management, service provision (production), marketing, logistics, finance and accounting, general business activities) and divide them into subprocesses. The assessment process itself consists of three stages: mailing, filling out and processing questionnaires. As a result, you can get an accurate level of digital development. A distinctive feature of the method under study is the simplicity of working with the questionnaire, minimal time, but accurate and reliable results [13]. A fragment of the questionnaire is shown in Figure 2.

| IV. Logistics | | | |
|---|---|---|---|
| 4.1 Procurement management | yes | no | - |
| 4.2 Sales management | no | no | no |
| 4.3 Managing the movement of inventory within the company | yes | no | no |
| 4.4 Transportation of inventory (to/from the company) | yes | yes | Beltransputnik, Resurscontrol |
| 4.5 Warehousing | no | no | - |
| Is at least one of the software you specified in paragraphs 4.1 - 4.5 an integrated module of a unified company management system (for example, ERP systems)? | no | | |
| Does at least one of the software/cloud services you specified in paragraphs 4.1 - 4.5 provide interaction with at least one external counterparty? | no | | |

**Figure 2** – Fragment of a questionnaire for assessing the level of digitalization according to the methodology of Perm State National Research University

The Arthur D. Little analytical agency has developed the Digital Transformation Index (USA), which evaluates the level of digitalization in the following sectors: strategy and leadership, products and services, customer management, operations and supply chains, corporate services and control, information technology, workplace and culture. This is a cumulative indicator based on comparative expert estimates [14]. The essence of the methodology is to compile a radar with industry averages and indicators of companies that have achieved significant success in digitalization. Such a system makes it possible for an organization to understand its level in comparison with other enterprises. However, the negative side of this technique is that it is difficult to find the necessary statistical information, and you also need to have certain skills to build a radar, and then process the results from the radar.

Thus, after conducting a comparative analysis of three methods for assessing the level of digital development of transport and logistics enterprises, it can be concluded that a distinctive feature of all methods is the interpretation of the final evaluation results, while the indicators themselves for assessing the level of digitalization are generally similar. In addition, a consistent process of processing results is not indicated either in the methodology of the Perm Institute or in the index of the Arthur D. Little agency, therefore, further improvement of the methods under consideration is necessary.

**Methodology for assessing the digital transformation of transport and logistics activities**

Based on the analysis of various methods for assessing the level of digital transformation of a transport and logistics organization, it is concluded that all approaches are based on similar aspects. However, the author suggests another method that takes into account the opinion about the level of digital development of a transport and logistics organization from various sides.

The essence of the proposed methodology is that it is necessary to develop a specific list of indicators characterizing the digital transformation of the transport and logistics business and assign weight to each of the presented indicators (criteria). This weight will reflect the importance of a criterion for the digitalization process. It is worth noting that the technique is quite flexible and both the indicators and their weight can be adjusted depending on the case and need. The only distinguishing feature is that the sum of the weights of all criteria should give 1 or 100 % if the weight is presented in relative terms. In addition, the developed methodology is applied twice, namely, at the first level, the weights are set by a trained group of experts, and at the second by the organization's staff. The average is derived from the two values obtained. This allows for a more comprehensive assessment of the degree of digitalization, as the assessment takes into account the opinions of different parties. It is important to note that the number of such assessments can be increased, which will allow for an even more accurate assessment of the level of digital transformation of transport and logistics activities.

The result of assessing the level of digital transformation of a transport and logistics organization can be presented graphically.

Table 1 shows the indicators for assessing the digital transformation of transport and logistics activities.

After summing up the weights of those indicators that can be attributed to the organization under study, it is possible to assess the degree of digital development of the transport and logistics organization.

If the sum of all indicators is up to 30 %, then we can talk about the digitalization of several business processes.

If the sum of all indicators is up to 85 %, then the main business processes of the organization are being digitized.

If the sum of all indicators is over 85 %, then all business processes of the organization are fully digitized.

Thus, this methodology is simple enough to evaluate any organization and shows accurate end results.

It is important to note that the assessment of the digital transformation of an organization using this methodology should be carried out over a certain period of time in order to monitor the "digital" situation. This will make it possible to quickly make attempts to improve the company's development in the field of business digitalization, if there is an emphasis on this. For greater clarity, it is possible to depict the results of the assessments in the form of a graph, where there will be a clear trend of development or, conversely, decline. An example graph is shown in Figure 3.


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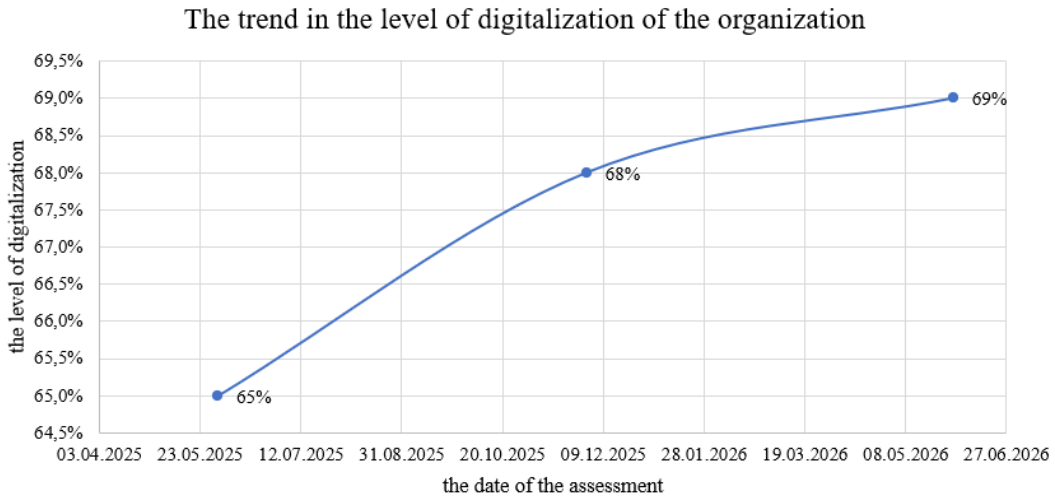


**Figure 3** – The trend in the level of digitalization of a transport and logistics organization

**Table 1** – Indicators for the methodology of assessing the digital transformation of a transport and logistics organization

| **Experts** | | |
|---|---|---|
| *Indicator number* | *Indicator* | *Weight (fraction)* |
| *1* | *2* | *3* |
| 1 | Costs of innovation in digitalization | 0,07 |
| 2 | Own digital developments (patents) | 0,25 |
| 3 | Using electronic document management | 0,1 |
| 4 | Availability of digital systems (e. g. ERP) | 0,15 |
| 5 | Working with Artificial Intelligence (AI) | 0,08 |
| 6 | Updating data online | 0,09 |
| 7 | Working on an electronic platform | 0,06 |
| 8 | The ratio of workers to machinery (computer) | 0,05 |
| 9 | The organization's prominence through the use of digital transformation achievements | 0,05 |
| 10 | Working with clients online | 0,1 |
| **Employees of the organization** | | |
| *Indicator number* | *Indicator* | *Weight (fraction)* |
| 1 | Costs of innovation in digitalization | 0,07 |
| 2 | Own digital developments (patents) | 0,25 |
| 3 | Using electronic document management | 0,1 |
| 4 | Availability of digital systems (e. g. ERP) | 0,15 |
| 5 | Working with Artificial Intelligence (AI) | 0,08 |
| 6 | Updating data online | 0,09 |
| 7 | Working on an electronic platform | 0,06 |
| 8 | The ratio of workers to machinery (computer) | 0,05 |
| 9 | The organization's prominence through the use of digital transformation achievements | 0,05 |
| 10 | Working with clients online | 0,1 |

**Conclusion**

Thus, the developed methodology for assessing the level of digital transformation of a transport and logistics organization differs from other existing methods due to the simplicity of obtaining results and the low time required for its implementation. However, the accuracy of the obtained results remains at a high level and with minimal error. This methodology will allow, using real data, to analyze your position in the field of business digitalization, compare yourself with other organizations engaged in the same type of economic activity, and, consequently, identify possible growth points. Obviously, the digitalization of an organization is a rather lengthy and complex process that requires a certain level of attention. In addition, the digital transformation of a business at its various stages should have a positive impact on the company's performance indicators. In this regard, a model of digital transformation of transport and logistics activities has been developed in previously published articles [15–20].

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