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LOGISTICS SYSTEM MANAGEMENT IN THE CONTEXT OF DIGITAL TRANSFORMATIONS

Attention is focused on the fact that the logistics system in the context of digitalization is turning into a high-tech network capable of self-organization, adaptation and training. It is noted that the integration of intelligent management systems, big data analytics, the Internet of Things, cloud computing and automation makes it possible not only to optimize operations, but also to rethink the very concept of logistics management. As a result, there is a deep evolution of logistics processes from mechanistic execution to strategic management of digital flows.

The peculiarities of managing the logistics system in the context of digital changes caused by digitalization are determined. The study proves that at the same time, digital transformation poses new challenges for enterprises: the complexity of technical integration, the need for changes in organizational culture, the shortage of digital competencies among staff, as well as growing requirements for flexibility and transparency of logistics solutions. This necessitates the formation of new models of logistics system management based on digital principles, flexible methodologies and an analytical approach to decision-making.

Keywords: *digital economy, transformational changes, logistics activities, logistics, logistics management, digital logistics, digital tools, logistics system.*

Statement of the problem. In the context of the current globalization changes and the dynamic development of information technologies, modern enterprises are faced with the need to adapt to new challenges related to the digital transformation of business processes. One of the key areas that is significantly affected by digitalization is logistics. It is the logistics system that today becomes a strategically important element that ensures effective management of material, information and financial flows within and outside the enterprise.

The latest digital technologies, such as the Internet of Things, artificial intelligence, big data, blockchain and cloud computing, are significantly changing approaches to managing logistics systems. As a result of such transformational changes, new opportunities arise to increase transparency, flexibility, forecasting accuracy, automation, and optimization of supply chains. At the same time, there are new risks associated with cybersecurity, the technical complexity of implementing digital solutions, and the need for retraining personnel. In such changing economic conditions, the management of the logistics system requires not only updating the infrastructure, but also rethinking the conceptual foundations of logistics taking into account the digital paradigm.

It is worth noting that despite the obvious advantages of digital transformation, the introduction of modern digital technologies into logistics systems faces a number of problems. In particular, there is no systematic approach to the digitalization of logistics processes, there is a lack of clear strategies for digital integration at the enterprise level, and there is a low level of digital maturity of logistics structures in Ukraine. In addition, the theoretical and methodological substantiation of logistics management models in the context of digital transformation is insufficient. This complicates the adoption of effective management decisions, slows down the innovative development of enterprises and reduces the competitiveness of national business in the international environment.

Thus, the question arises as to the need to analyze modern approaches to the management of logistics systems, which are identified as the key factors of the impact of digital technologies on logistics activities and the formation of adaptive management models that can ensure the efficiency of logistics in the digital economy.

Analysis of recent research and publications. The problems of transformation of modern economic systems under the influence of digitalization have been studied in their works by many scientists and economists (in particular, H. Alioui [2], O. Desiatniuk [4, 5, 8], A. Karakitsiu [6], H. Crystal [7], A. Krysovatyi [4, 5, 8], O. Ptashchenko [4, 5, 8], K. Leah [9], A. Sharma [13] and others).

At the same time, it should be noted that certain issues of the development of the logistics system, logistics processes under the influence of the digital economy and general digitalization were considered by M. Aleksieiev [1], O. Prokopenko [10, 11], J. Reis [12] and other scholars.

It should be noted that the global economic space of today dictates certain directions for the development of economic processes. This makes it possible to continue the study of logistics system management in view of transformational changes and under the influence of the development of the digital economy.

The purpose of the article is determining the features of logistics system management under the influence of transformational changes caused by digitalization.

Summary of the main material. Modern economic conditions are characterized by a high level of competition, rapid changes in the market, globalization and growing consumer requirements for the quality of service, speed of delivery and cost of products. Under such conditions, effective management of the logistics system becomes one of the key factors in ensuring the stable development of enterprises, increasing their competitiveness and economic sustainability.

It is also worth noting that logistics today plays a central role in ensuring rational management of material, information and financial flows both within the enterprise and in the external environment. It covers a wide range of tasks – from the supply of raw materials to the distribution of finished products, as well as storage, transportation, inventory accounting, order management, etc. Not only the level of costs of the enterprise, but also the quality of customer service, the time of entry of products to the market, and the ability to quickly respond to changes in demand depend on the effective organization of logistics processes.

Logistics system management involves comprehensive planning, coordination, control and optimization of all logistics operations. This requires a systematic approach, deep knowledge in the field of management, economics, analytics, as well as the ability to make effective management decisions in conditions of uncertainty.

That is why it is necessary to pay attention to the very essence of the concept of "logistics system". Based on the theoretical basis of the study [1–14], the author proposes definitions of the concepts of "logistics system" and "logistics system management". Thus, in the future, the logistics system in the modern digital space can be understood as a holistic set of interrelated elements that provide effective management of the flows of material resources, goods, information and related financial flows within the enterprise or between enterprises, while it covers all stages of the movement of products from the sources of supply of raw materials to the delivery of finished goods to the end consumer.

The logistics system has a hierarchical structure and operates on the basis of the principles of integrity, coherence, flexibility and adaptability. It can be internal (within the enterprise) or external (with the involvement of partners, suppliers, intermediaries, consumers, etc.).

If we pay attention to the logistics management system or to the essence of the concept of "logistics system management", it is possible to propose the following definition in the future: logistics system management is a process of planning, organizing, coordinating, motivating and controlling logistics operations that are carried out in order to optimize costs, increase the level of customer service and ensure the efficient functioning of the entire supply chain (the definition is formed on the basis of theoretical basis of the study [1–14]).

Modern management of the logistics system is based on the use of information technologies, data analytics, supply chain modeling, integrated logistics platforms, which makes it possible to ensure the speed, accuracy and flexibility of management decisions.

Under the influence of modern transformational changes caused by globalization and digitalization, the management of the logistics system is also transforming and adapting to changing environmental conditions. Thus, the main transformational changes are presented in Table 1.

Table 1 – Main transformational changes in the economic space

Transformation	The essence of transformations
Digitalization of the economy	Shaping the digital market, e-commerce, digital services and virtual ecosystems
Globalization and regionalization	Strengthening interdependence between countries' economies, expansion of transnational networks
Changes in the structure of employment and labor mobility	The emergence of new professions, the disappearance of traditional ones, the growing demand for digital competencies
Innovative transformation of production	Changing the structure of product value: the role of intellectual capital and innovation is growing
Green Transition and ecological transformation	Energy transition to renewable sources, ESG standards, circular economy
Changing the role of the state in the economy	Intensifying the role of governments in stimulating transformational processes, regulating digital markets, cybersecurity, supporting innovation and social stability
Transformation of logistics and financial infrastructures	Changes in the global financial architecture: the development of cryptocurrencies, central bank digital currencies, fintech

Source: formed taking into account [1, 2, 3, 5, 7, 8, 11, 12].

Thus, transformational changes in the economic space create both challenges and new opportunities for business entities. Adapting to them requires strategic thinking, flexible management models, an innovative approach and active participation in global and digital processes.

Based on the above, we will analyze the impact of transformational changes in the economic space on the logistics sector. Logistics, as one of the key industries that ensure the efficient movement of goods, information and resources, is the first to respond to these changes. The analysis of the main transformation factors and their impact on logistics is given in Table 2.

In addition, based on the identified factors of influence, it is possible to assess their level of impact on the management of the logistics system (the results are presented in Table 3).

Table 2 – Main factors of transformation and their impact on logistics

Factor	Feature of influence
Digitalization of logistics	Increasing transparency and controllability of processes Reduce costs and errors through automation The Growing Role of Analytics and Forecasting Transition to "smart" logistics
Globalization and regionalization	Increased risks and costs for international transportation Focus on supplier localization and regional chains The need for adaptive risk management strategies
Environmental requirements and green logistics	Demand for environmentally friendly modes of transport Route optimization to reduce carbon footprint Use of recyclable packaging
Change in consumption pattern	Reorientation to B2C models, last-mile logistics Development of warehouses closer to the consumer The growing role of logistics platforms and marketplaces
Transformation of the labor market	Demand for specialists with IT and analytics knowledge Transition to digital HR tools Reducing manual labor, increasing productivity

Source: formed taking into account [2, 4, 6, 7, 9, 10, 13, 14].

Table 3 – Assessment of the level of factors influencing the management of the logistics system

Factor	Weighted expert assessment	Impact Level Assessment
Digitalization of logistics	0.70	Average
Globalization and regionalization	0.85	High
Environmental requirements and green logistics	0.86	High
Change in consumption pattern	0.71	Average
Transformation of the labor market	0.81	High

The assessment was carried out by questioning a pre-formed expert group, which included 10 specialists – representatives of the business environment, scientists and specialists in the fields of logistics, innovation and entrepreneurship. To ensure the uniformity of the answers, it was agreed to use a five-point assessment scale, where the value of "5" corresponded to the highest level of influence of the factor, and "1" – to the lowest.

The processing of the results of the expert assessment involved the calculation of the arithmetic mean of each of the identified factors of influence. The analysis of the obtained data was carried out using methods of mathematical and statistical processing. To assess the degree of consistency of experts' opinions, the coefficient of variation was used, which made it possible to determine the level of consolidation of assessments.

The cumulative impact and interconnection of the analyzed factors directly form the level of transformational impact in a particular region or country. Rational policies and effective management decisions made taking into account the identified patterns can stimulate economic growth and contribute to improving the well-being of the population.

It should be noted that today digitalization has become a key catalyst for transformations in the field of logistics. It changes not only the technical means used in logistics operations, but also the very paradigm of managing the logistics system. Management is no longer limited to classical approaches to planning, organizing, controlling and coordinating material flows, it is turning into dynamic, data-oriented, customer-oriented processes that require deep digital integration. In Table 4, we present the current features of managing the logistics system in the context of digitalization, while the elements of the study presented above were taken as a basis.

Table 4 – Main features of logistics system management in the context of digitalization

Peculiarity	Characteristics features
Reorientation to digital platforms	It is based on digital ecosystems that combine the functions of supply, warehousing, transportation, inventory control, analytics and customer service in a single IT infrastructure (ERP, TMS, WMS, SCM systems)
Data centralization and analytics Real-time	Logistics systems get a transparent, real-time picture of the entire supply chain, allowing them to make quick decisions, predict disruptions, and automatically adjust plans
Increased flexibility and adaptability	Provide the ability to quickly adapt logistics operations to changes in demand, supply, customs conditions or geopolitical risks
Integration of automation and robotics	The introduction of autonomous vehicles, warehouse robots, and delivery drones needs to be taken into account, which changes logistics at the operational level and requires new competencies from management personnel
Reprioritizing key performance indicators (KPIs)	Traditional performance indicators are complemented by digital metrics: the level of automation, forecasting accuracy, order processing speed, customer experience index (CX), digital maturity of the logistics system
Fostering a culture of digital thinking in management	It involves not only a change in tools, but also a change in the thinking of managers: orientation to innovation, flexibility, openness to change, interdisciplinarity

Source: formed by the author.

Thus, digitalization significantly changes approaches to the management of the logistics system – from hierarchical and reactive models to proactive, digital, customer-oriented ones. Successful management in such conditions requires not only technical re-equipment, but also the transformation of management processes, corporate culture, communication structure and the logistics strategy of the enterprise.

Conclusions

Management of the logistics system in the context of digital transformations acquires a new essence, where not only the speed and accuracy of logistics operations, but also the ability of the system to adapt and self-optimize become key. That is why it is possible to say that digital tools, which until recently played the role of auxiliary tools, are turning into fundamental components of management processes. They not only provide technical modernization, but also form new requirements for logistics strategies, structures and business models.

Thus, under the influence of digital changes, logistics is transforming from a classic provision function into an integrated information and analytical platform that covers the full life cycle of a product or service from the moment of planning to delivery to the end consumer. Management in the digital environment goes beyond the traditional hierarchy and moves to networked, decentralized models, where the logistics system functions as a living structure, dynamic, open-minded to change, capable of self-learning and continuous improvement.

The development of digital technologies, on the one hand, opens up new horizons for increasing the efficiency of logistics, and on the other hand, it requires managers to think strategically, be technologically literate, and be ready to transform all business processes.

Therefore, logistics in the digital age becomes the main link in the value chain, and the intelligent module is able to form new competitive advantages, accelerate innovation and ensure the resilience of the enterprise in a world of constant change.

The rapid development of digital technologies, changes in global supply chains, and the increasing instability of the economic environment necessitate further in-depth study of both strategic and operational aspects of digital logistics.

The main areas of further research are the following: integration of artificial intelligence and machine learning into logistics; modeling of digital supply chains (Digital Supply Chain); analysis of risks and resilience of logistics systems in the digital environment, assessment of the digital maturity of logistics systems; personnel transformation and development of digital competencies of logistics managers; development of hybrid models of logistics management, last-mile management in the context of e-commerce.

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УПРАВЛІННЯ ЛОГІСТИЧНОЮ СИСТЕМОЮ В УМОВАХ ЦИФРОВИХ ТРАНСФОРМАЦІЙ

Акцентовано увагу на тому, що логістична система в умовах цифровізації перетворюється на високотехнологічну мережу, здатну до самоорганізації, адаптації та навчання. Зазначено, що інтеграція інтелектуальних систем управління, аналітики великих даних, Інтернету речей, хмарних обчислень та автоматизації дає змогу не лише оптимізувати операції, а й переосмислити саму концепцію логістичного менеджменту. Як наслідок відбувається глибока еволюція логістичних процесів від механістичного виконання до стратегічного управління цифровими потоками.

Мета статті – визначення особливостей управління логістичною системою в умовах цифрових змін, викликаних цифровізацією. У ході дослідження доведено, що водночас цифрова трансформація ставить перед підприємствами нові виклики: складність технічної інтеграції, потреба у змінах організаційної культури, дефіцит цифрових компетенцій серед персоналу, а також зростаючі вимоги до гнучкості й прозорості логістичних рішень. Це зумовлює необхідність формування нових моделей управління логістичною системою, що базуються на цифрових принципах, гнучких методологіях та аналітичному підході до прийняття рішень. Управління логістичною системою в умовах цифровізації передбачає запровадження нових підходів до планування, моніторингу, контролю й оптимізації логістичних процесів. Цифрові інструменти дають можливість підвищити ефективність, зменшити витрати, забезпечити прозорість ланцюгів постачання та поліпшити якість обслуговування. Для забезпечення сталого розвитку логістичних систем у цифрову епоху необхідно формувати інноваційні моделі управління, здатні інтегрувати новітні технології, швидко реагувати на зміни зовнішнього середовища та орієнтуватися на створення довгострокової цінності.

Подальші дослідження можуть бути спрямовані на розроблення адаптивних цифрових стратегій управління логістикою з огляду на специфіку окремих галузей, регіонів чи типів підприємств.

Ключові слова: *цифрова економіка, трансформаційні зміни, логістична діяльність, логістика, управління логістикою, цифрова логістика, цифровий інструментарій, логістична система.*

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