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LOGISTICS IN THE CONTEXT OF DIGITALIZATION IN UKRAINE

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Misiura Ie. Iu. Logistics in the Context of Digitalization in Ukraine

Modern digital solutions help to increase the efficiency, transparency and speed of logistics chains, forming new approaches to managing transport, warehouse and information flows in the digital economy. The article examines the key features of the transformation of logistics in Ukraine under the influence of digitalization and active implementation of Industry 4.0 technologies, which cause fundamental changes in the functioning of logistics processes. The aim of the article is to provide a thorough analysis of the processes of digitalization of logistics in Ukraine, taking into account current international experience, and to identify promising areas for further improvement of logistics processes through the use of modern digital technologies. Particular attention is paid to assessing the impact of digital solutions on the efficiency of logistics operations, increasing their transparency, speed and adaptability to the requirements of the global market. To achieve the formulated aim, the article describes the current state of Ukraine's logistics system, analyzes its strengths and weaknesses, and identifies key digital tools that significantly affect the development of logistics and ensure the optimization of logistics processes. These tools include big data technologies, artificial intelligence, supply chain management (SCM) systems, the Internet of Things (IoT), blockchain and electronic transport systems, and other digital solutions that help to increase the speed, accuracy and transparency of logistics operations. The article analyzes foreign experience in the digital transformation of logistics processes, in particular, the practices of the EU, the USA and China, and examines the specifics of their technological approaches and the effectiveness of the innovations applied. Based on this, the author compares the specifics of the Ukrainian logistics market with international models, which allowed to identify potential areas of adaptation and opportunities for implementing the best international practices in Ukraine. A special emphasis is placed on the formation of practical recommendations for the development of digital logistics in Ukraine in the context of postwar reconstruction, taking into account the need to restore infrastructure, modernize transport systems and strengthen integration with international logistics networks.

Keywords: *logistics, digitalization, digital transformation, SCM, Industry 4.0, blockchain, logistics processes.*

Tabl.: *1.* ***Bibl.:*** *22.*

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Місюра Є. Ю. Логістика в умовах цифровізації в Україні

Сучасні цифрові рішення сприяють підвищенню ефективності, прозорості та швидкості логістичних ланцюгів, формуючи нові підходи до управління транспортними, складськими та інформаційними потоками в умовах цифрової економіки. У роботі розглянуто ключові особливості трансформації логістики в Україні під впливом цифровізації та активного впровадження технологій Індустрії 4.0, які зумовлюють докорінні зміни у функціонуванні логістичних процесів. Метою статті є ґрунтовний аналіз процесів цифровізації логістики в Україні з урахуванням актуального міжнародного досвіду, а також визначення перспективних напрямів подальшого вдосконалення логістичних процесів шляхом застосування сучасних цифрових технологій. Особливу увагу приділено оцінці впливу цифрових рішень на ефективність логістичних операцій, а також на підвищення їхньої прозорості, швидкості та адаптивності до вимог глобального ринку. Для досягнення поставленої мети у статті охарактеризовано сучасний стан логістичної системи України; проаналізовано її сильні та слабкі сторони; визначено ключові цифрові інструменти, що суттєво впливають на розвиток логістики та забезпечують оптимізацію логістичних процесів. До таких інструментів віднесено технології Big Data, штучний інтелект, системи управління ланцюгами постачання (SCM), інтернет речей (IoT), блокчейн та електронні транспортні системи, а також інші цифрові рішення, які сприяють підвищенню швидкості, точності та прозорості логістичних операцій. У роботі проаналізовано зарубіжний досвід цифрової трансформації логістичних процесів, зокрема практики країн ЄС, США та Китаю; розглянуто особливості їхніх технологічних підходів та ефективність застосовуваних інновацій. На основі цього проведено порівняльну характеристику специфіки українського логістичного ринку з міжнародними моделями, що дозволило визначити потенційні напрями адаптації і можливості впровадження найкращих світових практик в Україні. Окремий акцент зроблено на формуванні практичних рекомендацій щодо розвитку цифрової логістики в Україні в умовах післявоєнної відбудови, з урахуванням необхідності відновлення інфраструктури, модернізації транспортних систем і зміцнення інтеграції з міжнародними логістичними мережами.

Ключові слова: *логістика, цифровізація, цифрова трансформація, SCM, Індустрія 4.0, блокчейн, логістичні процеси.*

Табл.: *1.* ***Бібл.****: 22.*

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The current global trends in the digital economy have a significant impact on the logistics sector, which is increasingly moving from traditional management models to integrated digital platforms, the spread of which is changing the principles of supply chain organization, making them more transparent, predictable and flexible.

Ukraine, in the midst of war and economic instability, is in particular in need of efficient digital logistics that ensures transparency, security, speed, and cost optimization. The war has destroyed transport infrastructure, changed trade routes, and highlighted the need for uninterrupted supply of military units and humanitarian supplies, as well as increased dependence on digital tools to coordinate and control logistics processes. Given the importance of logistics infrastructure for exports, military support, and post-war reconstruction, the transformation of logistics processes is a strategic task that determines Ukraine's competitiveness in global markets and contributes to the resilience of the national economy [1].

Despite the significant potential of digitalization, Ukraine's logistics system faces a number of challenges that slow down its development and implementation of innovative solutions. First of all, it is the insufficient level of automation of transportation operations: a significant number of carriers still use paper-based document flow, which complicates coordination, increases the risk of errors, and increases order processing time. The problem of outdated infrastructure, worn-out roads, limited capacity of railroad corridors, insufficiently modernized ports and logistics hubs significantly increase logistics costs and reduce delivery speed.

The low level of integration of information systems between supply chain participants leads to fragmentation of data, which makes it impossible to effectively plan, forecast and control the flow of goods. The limited availability of modern digital solutions for small and medium-sized businesses, which often do not have the financial or technical resources to implement integrated IT platforms, automated warehouse or transport logistics management systems, is particularly noticeable. A separate challenge is the lack of qualified personnel in the field of digital logistics, in particular, data analysts, IT engineers, and automated system operators [2].

Taken together, these factors significantly hinder the efficiency of supply chains, increase costs, limit transparency of operations, and reduce the competitiveness of Ukrainian companies in the international market, making the modernization of the logistics system an urgent task for the state and business and confirming the relevance of the research topic.

The aim of the article is to analyze the processes of digitalization of logistics in Ukraine, taking into ac-

count international experience, and to identify areas for improving logistics processes based on modern digital technologies.

The issues of logistics digitalization and digital transformation of supply chains are widely discussed in contemporary scientific literature, reflecting the growing role of digital technologies in improving the efficiency, transparency, and resilience of logistics systems. A significant body of research focuses on the analysis of the current state and development prospects of the logistics sector in Ukraine, emphasizing its structural weaknesses and the need for technological modernization. In particular, Svychynska and Reznyk [1] assess the current condition of the Ukrainian logistics market and identify key barriers to its development, highlighting the insufficient level of digitalization and infrastructure constraints.

A number of studies examine digital transformation as a systemic process that reshapes logistics activities at both enterprise and national levels. Illiashenko, Illiashenko, and Shypulina [2] consider digital transformation of logistics in Ukraine as the implementation of integrated information systems, automation of management decisions, and transformation of business models. The authors underline the fragmented nature of digital technology adoption and limited access to modern logistics IT solutions, especially for small and medium-sized enterprises.

Digitalization of logistics processes in the context of globalization is explored by Ptashchenko and Kurtsev [3], who emphasize organizational and cultural transformations driven by digital technologies. Their research confirms that digitalization affects not only operational efficiency but also management practices; however, practical mechanisms for integrating digital tools into national logistics systems remain insufficiently elaborated.

A substantial number of publications focus on specific digital technologies applied in logistics. Kantsedal, Leha, and Morozov [4] analyze the impact of Big Data, the Internet of Things (IoT), and artificial intelligence on logistics optimization, proving their effectiveness in enhancing transparency and adaptability of supply chains. Similar conclusions are drawn by Hurzhii, Havran, and Sapotnitska [6], who emphasize the role of digital technologies in improving enterprise-level logistics management.

The relevance of logistics digitalization for postwar economic recovery in Ukraine is addressed by Illiashenko et al. [5], who highlight the strategic importance of digital tools for restoring supply chains, supporting exports, and ensuring economic resilience. At the same time, these studies mainly focus on general directions of digital development and pay limited attention to the integration of Ukrainian logistics into international digital transport and logistics networks.

International research largely concentrates on the concept of Logistics 4.0 and digital supply chain integration. Barcizza et al. [8] provide a comprehensive review of Big Data analytics and machine learning applications in Supply Chain 4.0, while Pauli, Fielt, and Matzner [9] analyze digital industrial platforms as a foundation for integrated logistics management. Boysen, de Koster, and Weidinger [10] examine warehouse automation and robotics in the context of e-commerce development, emphasizing their impact on productivity and accuracy of logistics operations.

Cybersecurity and risk management issues associated with logistics digitalization are discussed by Shram and Rudenko [11], who identify data security and system vulnerability as critical challenges in the era of cloud computing, IoT, and Big Data. These risks are particularly relevant for large-scale and highly integrated logistics networks.

A separate group of studies focuses on international experience in logistics digital transformation. Research on the European Union, the United States, and China [12–18] highlights different institutional and technological models of digital logistics development, including regulatory-integrated, market-driven, and state-oriented approaches. These studies demonstrate the effectiveness of digital platforms, intelligent transport systems, robotics, and artificial intelligence in improving logistics performance. However, they are mainly descriptive and do not sufficiently consider the specific conditions of countries with transitional economies or post-crisis development trajectories.

Overall, the analysis of recent scientific publications indicates that, despite extensive research on logistics digitalization, several important aspects remain insufficiently explored. In particular, there is a lack of comprehensive studies aimed at developing an integrated national model of digital logistics for Ukraine, assessing the level of digital maturity of logistics enterprises, and substantiating mechanisms for integrating Ukrainian logistics systems into European and global digital transport corridors. These unresolved issues determine the relevance and scientific novelty of the present study, which seeks to address these gaps by analyzing the digital transformation of logistics in Ukraine in the context of international experience and post-war economic recovery.

The current stage of development of the global economy is characterized by the growing role of digital technologies in shaping the competitiveness of production and logistics systems. Logistics is a system of managing material, information and financial flows aimed at ensuring the delivery of goods to the right

place, at the right time, in the right quantity and with minimal economic costs. It covers the processes of supply, transportation, storage, distribution of products, as well as the management of supporting information and financial settlements.

Digitalization is transforming traditional approaches to managing material, information and financial flows, providing a new level of transparency, integration, flexibility and speed of logistics operations. In the scientific literature, this process is interpreted as a comprehensive transformation of logistics under the influence of information and communication technologies, which includes automation of operations, integration of information systems, implementation of intelligent solutions and changes in organizational models of supply chain management [3].

Digitalization helps to increase the responsiveness to changes; better forecast demand; minimize losses from supply interruptions; and restore logistics processes after crisis events, which is especially important for Ukraine, which is at war. Digital technologies such as the Internet of Things, forecasting systems, Big Data, and artificial intelligence reduce risks and increase the ability of supply chains to quickly adapt to current conditions [4].

In Ukraine, the digitalization of logistics processes is in the process of active development, but is characterized by uneven and fragmented implementation of technologies. Some sectors are showing dynamic progress, while others remain at the initial level of digital transformation. The most significant progress has been made in the introduction of electronic documents (including eB/L), the development of GPS vehicle tracking systems, digital services in seaports, and the use of automated warehouse systems and big data analytics tools.

At the same time, a significant number of enterprises, especially small and medium-sized businesses, continue to use traditional paper-based processes, have limited access to modern IT solutions, or face a shortage of qualified digital specialists.

Furthermore, digitalization is complicated by the lack of common standards and insufficient integration between the information systems of the supply chain participants. This leads to duplication of data, delays in information exchange, and low transparency of processes. Given the growth in transportation volumes and the need to quickly adapt to changes in the external environment, these challenges are becoming critical.

Nevertheless, the general trend shows a gradual expansion of digital tools, increased investment in technology, and businesses realizing the benefits of digital solutions to improve the efficiency, speed, and competitiveness of logistics operations. Digital technologies have become a key factor in improving the competitiveness of logistics companies and optimizing their operations, as they can significantly reduce costs, increase the speed and accuracy of operations, and ensure transparency of all logistics processes. The use of digital solutions allows companies to respond quickly to changes in market demand, minimize the risk of delivery delays, effectively manage inventory, and improve customer service. In today's environment, the digitalization of logistics is becoming not just a competitive advantage, but a prerequisite for the stable development and survival of companies in the global market [5].

Modern logistics systems and supply chain management are increasingly relying on digital technologies, in particular the Internet of Things (IoT) and big data analytics. IoT provides the ability to continuously collect and monitor real-time data on the condition of goods, transportation conditions, vehicle utilization, and warehouse resources. The use of IoT in logistics and SCM has moved from theoretical concepts to large-scale practical implementations, which indicates its importance as a working tool for many logistics companies [4].

Big data analytics plays a key role in transforming logistics processes into intelligent and predictive systems. The combination of Big Data with IoT and artificial intelligence allows for the creation of warehouse and transportation management systems in which decisions are made based on real data. Integration of Big Data with other digital technologies is critical to increasing the flexibility, efficiency, and sustainability of supply chains [6].

Analytical approaches provide numerous benefits, including accurate demand forecasting, route optimization, inventory planning, and strategic decision support. At the same time, researchers note the challenges associated with the need for significant investments in the relevant infrastructure, development of data processing competencies, and ensuring data quality and security [7].

Integration of IoT and Big Data into logistics forms the basis of the concept of logistics 4.0, providing not only technological but also economic benefits: reduction of losses, reduction of risks of product damage, increase of accuracy and efficiency of logistics processes, as well as the ability to make decisions based on real-time data.

Artificial intelligence and machine learning are becoming key tools for optimizing logistics processes, ensuring supply chain efficiency and sustainability. Applying machine learning models such as regression, XGBoost, and neural networks to real logistics data

can reduce operational costs, improve route efficiency, and reduce environmental impact (lower CO_2 emissions, optimized fuel use). Artificial intelligence is one of the leading tools for supply chain management today, and its implementation is one of the key factors in increasing the competitiveness of companies. AI and machine learning are not limited to optimizing routine operations; they are transforming approaches to logistics management, making it more predictable, flexible, and "smart" [8].

Cloud computing plays a fundamental role in the transformation of warehouse and transportation logistics under the influence of Industry 4.0 technologies. Cloud platforms provide centralized data storage and processing, remote access to management systems, and integration with other digital tools such as IoT, Big Data, and robotics.

The use of cloud infrastructure can reduce IT maintenance costs, increase system scalability, and accelerate the implementation of new solutions, which is especially important for companies with extensive logistics networks or rapid growth. Cloud technologies form the basis on which other digital solutions in logistics are built, providing flexibility, mobility, scalability and integration of modern management systems [9].

Robotization and automation of warehouse operations is one of the priority areas for the development of modern logistics systems in the context of digital transformation and Industry 4.0. In the world practice, autonomous guided vehicles (AGV), autonomous mobile robots (AMR), robotic sorting systems, and unmanned aerial vehicles for inventory are increasingly being implemented. The use of these technologies helps to increase the efficiency of material flow management, reduce the time of warehouse operations, reduce the level of errors and operating costs, and reduce dependence on the human factor [10].

Along with the benefits of cloud infrastructure, companies face a number of serious cybersecurity challenges. These include unauthorized access to data, possible loss or damage to information, ransomware attacks, non-compliance with security standards, difficulties in managing access and user roles, dependence on external suppliers, and limited control over integration with other systems. As a result, the main risks are reduced to data leakage or loss, cyber threats, and access control issues, which makes security a critical issue for large and fast-growing logistics companies with extensive networks [11].

Despite the existing challenges, it should be noted that the digital transformation of logistics in the world's leading economies is actively used and considered as a strategic tool to improve the efficiency, transparency and sustainability of supply chains. The introduction of digital technologies into logistics systems is carried out in a comprehensive manner by combining the automation of physical processes, digitalization of management and the use of analytical tools based on big data and artificial intelligence.

The EU countries are consistently implementing the policy of digital transformation of logistics within the framework of the Smart Logistics concept, which is part of the European Green Deal and the Sustainable Transport Strategy. One of the key areas is the creation of digital transport corridors that ensure the integration of information flows between all participants in the supply chain, from carriers and warehouse operators to customs and regulatory authorities [12, 13].

Germany is actively implementing digital supply chain management platforms based on the Industrial Internet of Things (IIoT), digital twins, and artificial intelligence, which allows optimizing transportation routes, inventory management, and energy consumption. The logistics sector of this country is closely integrated with Industry 4.0 initiatives, which ensures a high level of automation and standardization of processes [14]. The Netherlands, as one of the key logistics hubs in Europe, focuses on the development of port and multimodal digital logistics, in particular through the use of Port Community Systems, blockchain solutions for documentary support of transportation and big data analytics for forecasting cargo flows [15]. Poland demonstrates the dynamic development of integrated SCM platforms, cloud logistics services, and digital customs procedures, which contributes to the growth of its role in European transport and logistics chains [16].

The European model of digital transformation of logistics is characterized by systematicity, a high level of regulatory support, and a focus on environmental sustainability and interstate integration.

In the United States, the digital transformation of logistics is being driven mainly by large corporations and market mechanisms. Leading logistics operators and e-commerce platforms, such as Amazon, FedEx, and UPS, are driving the introduction of advanced digital technologies.

American companies are widely using robotic warehouses, autonomous mobile robots, and automated sorting systems to ensure high order processing speeds in large-scale distribution networks. Machine learning and big data analytics are used to forecast demand, optimize delivery routes, and manage peak loads.

A separate area is the experimental and commercial use of drones and autonomous vehicles for last-mile delivery, which is seen as a promising solu-

tion to reduce delivery time and operating costs. In addition, the United States is actively researching and implementing blockchain technologies to increase the transparency and reliability of cargo tracking, especially in international transportation and pharmaceutical supply chains.

The American model of digital transformation of logistics is characterized by a high level of innovation, significant private investment, and rapid scaling of technological solutions [17].

China leads the world in terms of the pace and scale of logistics digitalization, driven by government support, the development of digital infrastructure, and the integration of logistics with national digital platforms. 5G technologies, artificial intelligence, and automated logistics hubs play a central role in this process.

Chinese logistics operators and e-commerce platforms are making extensive use of fully automated warehouses, robotic sorting systems, and autonomous vehicles. The introduction of 5G ensures real-time data processing, which allows for the coordination of a large number of robotic devices and transport units within a single logistics ecosystem.

An important feature of the Chinese approach is the development of digital customs and administrative platforms that integrate logistics, financial and regulatory processes. This significantly reduces the time it takes to complete customs procedures and increases the transparency of international trade. China's model of digital transformation of logistics is based on scale, deep digital integration, and active involvement of the state in shaping the digital environment [18].

A comparative analysis of foreign experience in the digital transformation of logistics shows significant differences in approaches to the introduction of digital technologies due to the institutional, economic and strategic features of the development of the respective regions (Table 1).

Table 1

Comparative characteristics of the digital transformation of logistics in the EU, the US and China

Comparison criteria	EU	USA	China
1	2	3	4
Digital transformation model	Regulatory integration, focused on intergovernmental coordination and standardization	Market-innovative, dominated by private corporations	Government-oriented, large-scale, and centralized
Key concepts	Smart Logistics, Green Logistics, digital transport corridors	Smart Warehousing, Last-Mile Innovation, Data-Driven Logistics	Smart Logistics, Digital Silk Road, Intelligent Logistics
Level of digital integration SCM	High, due to unified digital platforms and EU standards	High within corporations, lower between operators	Very high, integration of logistics with government and trade platforms
Key digital technologies	IoT, digital twins, Big Data, blockchain, AI	Robotics, machine learning, Big Data, blockchain, drones	5G, AI, robotics, Big Data, cloud and satellite technologies
Warehouse logistics	High level of automation, widespread hybrid models	Complete or near-complete robotization of warehouses in large corporations	Large-scale automated and fully autonomous warehouses
Transport and delivery	Multimodal digital transport corridors	Active research into autonomous delivery and drones	Mass adoption of autonomous transport and drones
Role of the state	Formation of a regulatory framework and digital standards	Limited direct intervention, stimulation through the market	Active participation in financing, regulation, and scaling
Customs and administrative processes	Single electronic environment for customs clearance	Digitization through corporate and federal systems	Fully digital customs platforms with AI analytics
Focus on sustainable development	Very high (carbon reduction, green course)	Average, depending on corporate strategy	Growing, mainly as a government priority
Typical implementation results	Increased transparency and environmental efficiency	Maximization of speed and scalability	Reduction of logistics costs and time at the national level

End tbl. 1

1	2	3	4
Key risks	Regulatory complexity and intergovernmental coordination	High capital intensity and social consequences of automation	Technological dependence and cybersecurity issues

Source: [12; 13; 14; 15; 16; 17; 18].

The comparative analysis shows that the digital transformation of logistics in the European Union is based on the principles of regulatory coherence, sustainable development, and interstate digital integration. The American model is characterized by high innovation dynamics, dominance of private logistics corporations, and rapid scaling of technological solutions. The Chinese approach is characterized by systematic, large-scale and active role of the state in the formation of digital logistics infrastructure. These models demonstrate different trajectories of digital development, while confirming the universal trend towards the use of artificial intelligence, robotics, and integrated digital supply chain management platforms. It is advisable to take this experience into account when formulating a national strategy for the digital transformation of logistics in Ukraine.

Foreign experience in the digital transformation of logistics shows that there are different models of its implementation: regulatory-integrated (EU), market-innovative (USA), and state-oriented (China). At the same time, a common trend is the active implementation of robotization, artificial intelligence, digital supply chain management platforms, and big data technologies. The study and adaptation of this experience is an important basis for the formation of an effective strategy for the digital transformation of logistics in Ukraine, as the digital transformation of logistics is a key factor in improving the efficiency of supply chains, reducing the time of operations and increasing the transparency of processes [19].

An analysis of foreign experience allows us to identify a number of strategies and technologies that can be adapted in Ukraine, taking into account national infrastructure, regulatory environment and European integration priorities.

The National Logistics Platform envisages the integration of digital services of all supply chain participants: carriers, warehouse operators, customs authorities, and regulators. Such a platform helps to increase the transparency of processes, reduce the time of document flow and create conditions for integration with international transport corridors [13].

Implementation of the platform in Ukraine requires the development of an architecture based on federated principles, APIs, and semantic data exchange standards. It is recommended to launch pilot domains in port logistics, multimodal routes, and warehouse operations management with further integration into the national digital logistics ecosystem.

The electronic consignment note (e-CN) is a basic tool for the digitalization of transport operations, which allows to reduce administrative barriers and increase transportation efficiency [20].

Ukraine is already implementing pilot e-CN projects that require integration with WMS, ERP systems, and customs registries.

Blockchain technology can increase transparency and trust between supply chain participants, especially in multimodal transportation and international trade. At the same time, international practice (e.g., the TradeLens project) demonstrates the need to thoroughly test the business model and technical architecture before large-scale implementation [21].

Robotization of warehouses and the introduction of automated sorting systems and AMR can significantly increase the productivity, accuracy, and safety of logistics operations [10].

In Ukraine, there are already local developers and integrators of robotic solutions implementing pilot and commercial projects.

To ensure the effective use of robotics, demonstration centers and hubs for testing AMR/AGV should be created, a certification system for local solutions should be implemented, and personnel training should be provided. It is important to gradually scale up and evaluate KPIs (productivity, accuracy) before commercial use.

The digitalization of customs and border procedures can reduce the time of cargo transit, increase transparency, and reduce administrative barriers. Ukraine has developed strategic plans (MASP-C) for the implementation of electronic transit systems and risk management automation.

It is recommended to implement a fully electronic customs clearance cycle, ensuring synchronization with the European eFTI and DTLF systems, which will allow Ukrainian logistics to be integrated into international transport corridors.

The interoperability of Ukrainian digital platforms with EU systems ensures seamless data exchange, standardization of electronic signatures and certificates, and compliance with procedural require-

ments. Ukraine can integrate into European projects and working groups, receiving technical expertise and co-financing for pilot projects [22].

Adapting international experience in the digital transformation of logistics for Ukraine is strategically expedient, with the main areas of focus being: large-scale implementation of e-CN and integration with WMS/ERP and customs registers; development of local robotic warehouses and automated hubs; digitization of customs and border procedures with synchronization with the EU; creation of a national digital logistics platform with further integration into European transport corridors. Phased implementation, KPI assessment, and staff training will ensure the effectiveness of the transformation and minimize risks.

CONCLUSIONS

Based on the research conducted, it can be concluded that in the context of digitalization, logistics is undergoing significant transformations and is becoming a complex digital ecosystem. Most logistics operations are being automated and integrated into unified information platforms that ensure continuous data exchange between all participants in the supply chain. Management decisions are increasingly being made based on the analysis of large amounts of data obtained in real time.

Digital logistics involves the use of modern IT solutions, such as cloud services, warehouse and transport management systems, artificial intelligence, and the Internet of Things. This allows for accurate control of goods movement, demand forecasting, transportation route optimization, and reduction of the human factor. In the context of digitalization, logistics is transitioning from traditional, predominantly manual management methods to an intelligent, flexible, and highly efficient system capable of quickly adapting to the dynamic conditions of the modern market.

The digitization of logistics is strategically expedient, acts as a key factor in improving the efficiency of supply chains in Ukraine, and involves the introduction of e-CN with integration into WMS/ERP and customs systems, the development of robotic warehouses, the digitization of customs procedures in cooperation with the EU, and the creation of a national digital logistics platform integrated into European corridors, which will promote transparency, security, speed of data processing, cost reduction, and Ukraine's integration into global logistics networks.

Further research should focus on developing a model for a national digital logistics platform, assessing the level of digital maturity of enterprises, and analyzing the post-war impact of digitalization on logistics infrastructure. ■

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