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DIGITALIZATION OF LOGISTICS TO SOLVE THE PROBLEMS OF ITS DEVELOPMENT IN THE CONDITIONS OF THE POST-WAR RECOVERY OF UKRAINE'S ECONOMY ¹

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The article is devoted to the development of recommendations for the digital transformation of domestic logistics to solve the current problems of its development in the conditions of post-war recovery, as well as the development of Ukraine's economy. Based on the analysis of military actions' impact on the logistics infrastructure and the logistics practices during the war with Russia, the study identifies two main problems of domestic logistics. Additionally, it considers the requirement for post-war recovery and economic growth to transition to an innovative development path. The first group includes problems caused by the war. The second is the problem of adapting logistics systems to the conditions of post-war recovery and innovative development of Ukraine's economy. Recommendations have been developed to analyze and solve these groups of problems by addressing them, their consequences, and the digital technologies that can mitigate them. Appropriate tables for making managerial decisions regarding the digital transformation of logistics systems and their elements have been created. A consolidated scheme is proposed, outlining the sequence and content of management procedures. This scheme guides the selection of digital technologies to address the problems identified. It helps form relevant strategies based on digitalization. The obtained scientific and applied results, conclusions, and recommendations collectively deepen the principles of managing the digital transformation of logistics systems as a way to solve the problems of their development in the conditions of post-war recovery and the transition to innovative growth of the economy of Ukraine. They also contribute to the formation of the information and analytical base of the organizational and economic management mechanism for the development of logistics systems in the digital economy. Further research should be aimed at developing the methodological foundations of formalized management of the processes of digital transformation of domestic logistics to ensure its development in the conditions of the post-war recovery of Ukraine's economy in line with the concept of innovative growth.

Keywords: logistics activities, problems of post-war logistics, digitalization, post-war reconstruction of Ukraine, innovative development.

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Introduction and statement of the problem

The development of the fourth industrial revolution (Industry 4.0) initiated the formation of a digital economy, the essence of which is the digitalization of business processes and their transfer to the Internet. At the same time, the role of digital technologies as a source of competitive advantages for business entities at various levels is increasing sharply, including individual enterprises and institutions, industries, and the national economy. It stimulates digital transformations in the vast majority of spheres of human activity. World practice shows that one of these areas is logistics. The introduction of digital technologies significantly expanded their adaptive capabilities and increased their efficiency under quarantine restrictions of COVID-19. For Ukraine, which lost a significant part of its logistics potential in the war with Russia, the problem of finding and implementing new methods and tools of logistics with the aim of its transformation to the conditions of the war, as well as the period of post-war recovery, is becoming urgent. In this context, adopting world-proven approaches to digitalizing logistics in Ukraine's business practices would be appropriate, following necessary adaptations.

Analysis and research of publications

Many scientists have studied the problems discussed in the article. In particular, Margasova & Samoilovych [12] identified the current direction of the application of digital technologies in the logistics activities of Ukrainian enterprises. They outlined the main advantages and problems of digitalization and its further prospects. Gurzhii et al. [4] analyzed digital technologies used in the logistics activities of enterprises in various industries and scales of activity. The trends of digitalization of enterprises' logistics systems were determined. Gurzhii et al. considered attention to the digitization of transport and warehouse logistics, the use of digital technologies to ensure the coordinated interaction of information and material flows, and the problems of managing logistics systems. Averkina & Zagoruiko [2] identified the features of using cloud technologies (foreign and domestic) as a tool for information processing and analysis in logistics chains at Ukrainian enterprises. They showed that cloud technologies are used in almost all logistics systems. Hlebova et al. [3] studied the experience and prospects of using digital technologies to improve logistics processes. They outlined the central digital systems and technologies used in logistics.

The advantages of the digitalization of logistics, both in general and in terms of individual operations,

and the main factors restraining the digitalization of logistics were determined. The digitalization experience of logistics operations of the companies “Nova Poshta” and “Epicentr” was analyzed. Among their logistical innovations, they singled out postal drones, sorter robots, robotic departments for receiving and issuing parcels, self-service stations for postal shipments, electric cars in the delivery service, thermostable boxes for perishable goods, and other logistical innovations. Hurenko [6] revealed the peculiarities of the influence of modern information technologies on the development of marketing logistics. Gurenko highlighted the problems and prospects of digitalization in marketing logistics and outlined the positive aspects of digitalization. Zhelikhovska [15] proposed a model of the logistics system of the enterprise, which ensures its mutually coordinated interaction with economic counterparties: suppliers, transport and warehouse enterprises, trade and sales intermediaries, investors, and consumers. It shows that it optimizes the enterprise's procurement and production logistics, stock logistics, warehouse, distribution, and transport logistics.

Gupta et al. [5] determined the factors that influence the readiness of the personnel of Indian logistics companies to digitize their activities. The authors organized them into organizational, behavioral, and technological groups. They also established that organizational factors are the most important. An approach to calculating the readiness index of the company's personnel for digitalization is proposed and tested. Le Viet and Dang Quoc [11] analyzed factors that influence the digital transformation of logistics enterprises in Vietnam. They identified five main factors affecting the success of digital transformation: managers, human resources of digital transformation, information technology, investment costs, and support services of digital transformation. Junge [10] devoted to applying digital technologies in logistics, substantiates that additive manufacturing technologies and cloud technologies increase the efficiency of supply chains based on a systematic analysis of scientific publications. Richnak [13] showed a positive influence of Industry 4.0 digital technologies on the procurement, production, and distribution logistics of enterprises in Slovakia. Andiyappillai [1] describes the digital transformation of warehouse management systems that has taken place over the last decade in a leading logistics company. He notes that digital technologies have significantly increased the efficiency of the company's activities and the quality of service to its customers.

Summarizing the results of the analysis of literary sources, their authors highlighted the theoretical and applied aspects of using digital technologies in the logistics activities of domestic and foreign enterprises. They outlined the advantages and problems of digitization of logistics. However, the digital transformation of logistics to compensate for the loss of a part of the country's logistics potential during the war and to solve the resulting logistics activity problems remained insufficiently researched. It restrains the development of logistics as an essential component of the post-war recovery and development of Ukraine's economy.

The purpose of the article

The purpose of the article is to identify the problems of domestic logistics and develop recommendations for its digital transformation to solve the outlined problems and develop in the conditions of Ukraine's economy's post-war recovery.

Main material

To achieve the set goal, we formed a complex of research tasks, which included:

- first, determination of actual problems of logistics activities in Ukraine caused by the war;
- second, determination of the problems of adapting links (legal entities or individuals who are subjects of the logistics process) of logistics systems to the conditions of post-war recovery and development of Ukraine's economy;
- third, development of recommendations for determining ways to solve the outlined problems based on digitalization.

The analysis and generalization of the existing practice of logistics activity in the conditions of the war with Russia gave reasons to highlight some urgent problems of the post-war development of logistics:

- a) loss (partial or complete) of logistics infrastructure objects: procurement, production, stocks, warehouse, transport, distribution, and intermediary;
- b) violation of traditional transport routes: violation or destruction of bridges and roads, mine pollution, the threat of attack on these routes by sabotage groups, provocative shelling (on the territories bordering the aggressor);
- c) the danger (risk) of placing logistics infrastructure facilities in the territories bordering the aggressor (see point b), particularly those serving border guards, territorial defense, etc. [7];
- d) loss of personnel potential due to the death or injury of employees, conscription for military service, or evacuation to other regions of Ukraine

or abroad;

e) breaks in traditional ties with business partners (subjects of the logistics process) due to damage or destruction of their technical and technological base, termination or change of activity profile, or economic or other reasons.

The repercussions of these issues are not to be taken lightly: they lead to a surge in time and financial costs for logistics, a decline in the quality of logistics operations, a loss of competitiveness and market positions for domestic production and logistics enterprises, a decrease in their investment attractiveness, and a slowdown in the post-war recovery and economic growth of Ukraine and its regions.

It is also necessary to consider the problems of individual links of logistics systems, which are related to the choice of the strategic direction of the post-war recovery and development of the national economy of Ukraine in general and logistics in particular. Considering that the basis of the economy of Ukraine is the production of past technological systems, the orientation towards the innovative path of development (including that which is in line with the concept of innovative anticipation) becomes practically unalternative. World practice shows that the innovative path of development often requires the subjects of the innovation process, in this case, the links of logistics systems, to change traditional stereotypes of activity and form new ones. Among them, the following should be highlighted: innovative changes in traditional methods of carrying out activities, new forms of work organization, and changes in technological equipment and production or service delivery technologies. For the subjects of logistics activities that provide logistical support for innovative processes, this can create quite significant problems. Based on the above, a number of the following problems of individual links of logistics systems (subjects of the innovation process) are highlighted:

- first, one of the key challenges is ensuring organizational flexibility and adaptability to respond to the ever-changing conditions of the external micro- and macroenvironment and correspondingly to the requirements for logistics activities;
- second, technical and technological flexibility and adaptability are provided for adequate logistical support of innovative activities;
- third, Strengthening the degree of adaptability of personnel potential to actualize its knowledge, skills, experience, creative abilities, and innovative culture by choosing the direction and strategy of innovative development;

– fourth, increasing the innovative culture of organizations linked to logistical support systems of the innovation process to ensure their acceptance of product and process innovations;

– fifth, risk management of logistics support of the innovation process: individual links and logistics systems.

For example, we can consider the problems of suppliers of raw materials, materials, or components. They consist of the fact that the transition of their traditional customers to the production of innovative products may require changes in the characteristics of the suppliers' products and logistics: supply, warehousing, stocks, and distribution. Such changes are risk-associated and may require significant time and financial costs.

Of course, the two lists of problems presented still need to be completed. They can be supplemented and detailed in further research. However, they give a general idea of the scope and essence of the mentioned problems, which is necessary for developing recommendations for their solution based on digitalization.

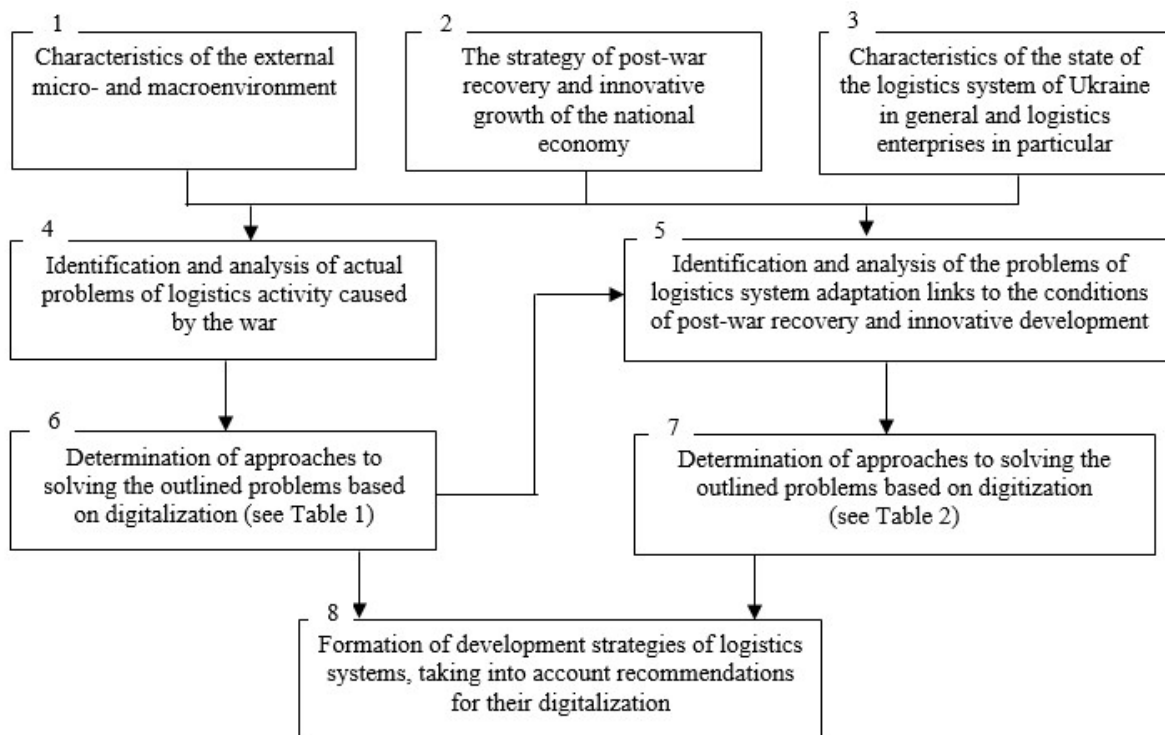
Based on the results of the analysis of the essence and possible consequences of the manifestation of the

specified problems, the essence and content of Industry 4.0 digital technologies [14], the practice of their application in logistics activities (see the analysis of literary sources), the authors' research [8], a set of recommendations for solving the identified problems based on digitization (Table 1, 2).

Table 1 demonstrates that digital technologies can be strategically applied across different links of logistics systems, such as suppliers, manufacturers, and intermediaries. It's essential to consider the specific activities of each business entity when making these strategic choices, empowering you in your decision-making process.

Recommendations presented in Table 2 apply to all types of logistics enterprises that provide logistical support for innovative processes implemented (will be implemented) by commodity-producing enterprises during wartime, as well as post-war recovery and innovative development of Ukraine's economy.

Summarizing what has been stated, a consolidated scheme for solving the problems of developing domestic logistics on the basis of digitalization is proposed as an important component of ensuring the post-war recovery and innovative growth of Ukraine's economy (Figure).



Management scheme for the selection of digital technologies to solve the problems of the development of domestic logistics and the formation of strategies for the development of logistics systems based on digitalization

Source: developed by authors

Table 1

Recommendations for the application of Industry 4.0 digital technologies to solve the problems of domestic logistics caused by the war

Problem	Possible consequences	Digital technologies
Loss (partial or complete) of logistics infrastructure facilities	Increase in time and financial costs for logistics, decrease in its quality and efficiency	Predicative analytics, Big Date, artificial intelligence, industrial Internet of Things, cloud technologies, and self-learning robots - to optimize logistics infrastructure objects and their management. Creation of virtual objects, for example, warehouses that store digital models of parts or assemblies in the cloud, which are printed on a 3-D printer as needed
Violation of traditional transport routes	The increase in time and financial costs for transportation, schedule violations, difficulties in accessing certain areas	Cloud technologies, artificial intelligence, GPS monitoring, blockchain - to optimize routes and control transport processes. Drones (air, ground, water) – for transporting goods to hard-to-reach places
The danger of placing logistics infrastructure facilities in territories bordering on the aggressor	The possibility of provocations causing injury and death of people, loss of logistics facilities, and disruption of transport routes	Cloud technologies, artificial intelligence, GPS monitoring, and blockchain are used to manage material, information, and financial flows. Virtual warehouses, transport drones (air, ground, water)
Loss of personnel potential of logistics systems and facilities	Increase in time and financial costs for logistics, decrease in its quality and efficiency	Digital technologies of remote work, including new forms of labor organization (digital outsourcing), artificial intelligence, chatbots, Big Date, and robotics – optimize and automate business processes, reduce labor needs
Breaks in traditional ties with business partners		Predictive analytics, Big Date, artificial intelligence, cloud technologies, analytical digital technologies (Google Analytics, etc.), and digital marketing – to establish, maintain, and optimize relationships with business partners

Source: developed by authors

The scheme presented in Figure shows the sequence of stages of solving two types of problems of the development of domestic logistics based on digitalization: problems caused by the war (blocks 4, 6) and problems of adapting logistics system links to the conditions of post-war recovery and innovative development (blocks 5, 6, 7), taking into account the decisions made to solve the first group of problems. Blocks 1–3 characterize the initial data necessary for analysis and decision-making. Block 8 gives an idea of the use of recommendations for solving the specified problems, particularly as components of strategies for the digital development of logistics systems.

Conclusions

We can summarize the above by the following conclusions.

First. Current problems of logistics activities in Ukraine caused by the war and possible consequences of their manifestation are identified.

Second. The problems of adapting the logistics system linked to the conditions of post-war recovery

and innovative development of Ukraine’s economy are identified. The possible consequences of these problems’ manifestation are determined.

Third. Recommendations have been developed for solving the identified two sets of problems based on digitalization. Corresponding decision tables regarding the digital transformation of logistics systems and their elements have been built as a way of solving the identified problems. Their construction is carried out according to the scheme: problem, possible consequences of its manifestation, digital technologies, and their complexes that allow solving the problem.

Fourth. The proposed generalized management scheme for choosing digital technologies to solve the problems of developing domestic logistics and forming strategies for developing logistics systems based on their digital transformation.

The obtained results collectively deepen the principles of managing the digital transformation of logistics systems to solve the problems of their development in the conditions of post-war recovery

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Table 2

Recommendations on the application of Industry 4.0 digital technologies to solve the problems of logistics system links caused by changes in their activities in the process of post-war recovery and innovative development of the national economy

Problem	Possible consequences	Digital technologies
Insufficient organizational flexibility and adaptability	Inconsistency of development strategies with the conditions of the external micro- and macroenvironment. Slow response to their change	Predicative analytics, Big Date – for analysis and forecasting trends in the development of the external environment. The specified technologies, as well as artificial intelligence, cloud technologies, analytical digital technologies, robotics, artificial intelligence, and blockchain – for horizontal and vertical system integration of business process management, ensuring flexibility and adaptability of digital interaction of divisions within the logistics organization, as well as the organization with its customers
Insufficient technical and technological flexibility and adaptability	Moral obsolescence of equipment and technologies. Technical and technological lag and loss of competitive positions	Artificial intelligence, industrial Internet of Things, GPS monitoring, blockchain, contactless digital identification of objects, robotics, self-learning robots – for automated management of business processes in real-time, ensuring technological flexibility and adaptability
Insufficient adaptability of personnel management	Loss of relevance of knowledge and skills of personnel, ability to creatively implement them in new conditions	Predicative analytics, Big Date, and digital marketing (including benchmark marketing) are used to analyze and forecast labor market trends and determine and select the best personnel management practices. Digital technologies are also used to monitor the relevance of personnel’s knowledge, skills, and creative abilities in the labor market and in a specific organization. Digital distance learning technologies – for updating knowledge and skills, as well as developing staff creativity
Insufficient level of innovative culture	Difficulties in perceiving innovations, low level of readiness for their creation and use	The allocation of digital communication lines for the free exchange of information and knowledge between employees (as an alternative to a hierarchical approach). Open access of personnel to training programs (including remote access), professional development, internships, and the development of creative abilities. Placement in open access to information about the current motivation system for creative work. Benchmarking of methods of managing the development of innovative culture
Low level of logistics risk management	Direct financial and time losses due to the implementation of risk situations, lost profit due to the rejection of promising business operations, low level of innovative activity as a reaction to risk	Calculation software for optimizing the composition of links in external logistics chains and the motivation system for their relationships (including cloud technologies, predictive analytics, Big Date, and artificial intelligence) – for external risk management. Software for optimizing the processes of coordinated interaction of internal logistics chains (including the Internet of Things, self-learning robots, artificial intelligence, and Big Data) – for internal risk management The approach described in the work [9] can be applied to identify and calculate the risks of logistical support of innovative processes.

Source: developed by authors

and the innovative growth of Ukraine's economy. They can be used as an information and analytical base for the organizational and economic management mechanism for developing logistics systems in the digital economy.

Further research should be aimed at developing methodological principles for managing the processes of digital transformation of logistics according to formalized procedures to ensure its development in the post-war recovery of Ukraine's economy.

REFERENCES

1. Andiyappillai, N. (2020). Digital transformation in warehouse management systems (WMS) implementations. *International Journal of Computer Applications*, 177(45), 34-37. DOI: <https://doi.org/10.5120/ijca2020919957> [in English].
2. Averkyna, M., & Zahoruiko, O. (2023). Zastosuvannia khmarnykh tekhnolohii u lohistychnykh systemakh [Application of cloud technologies in logistic systems]. *Modeling the Development of the Economic Systems*, 1, 45-49. DOI: <https://doi.org/10.31891/mdes/2023-7-6> [in Ukrainian].
3. Hlebova, A. O., Vasylchenko, M. I., & Ivanov, Yu. V. (2023). Informatsiino-komunikatsiini tekhnolohii v protsesakh lohistychnoho obsluhovuvannia: sutnist, osoblyvosti ta rozvytok v umovakh rozvytku tsyfrovyykh tekhnolohii [Information and communication technologies in the processes of logistic servicing: essence, features, and development in the conditions of digital technologies growth]. *Ekonomika i rehion – Economy and region*, 3(90), 45-52. DOI: [https://doi.org/10.26906/EiR.2023.3\(90\).3027](https://doi.org/10.26906/EiR.2023.3(90).3027) [in Ukrainian].
4. Hurzhyi, N., Havran, V., & Sapotnitska, N. (2023). Tsyfrovii tekhnolohii ta yikhnyi vplyv na upravlinnia lohistychnymy protsesamy pidpriemstv [Digital technologies and their impact on the management of logistics processes of enterprises]. *Ekonomika ta Suspilstvo – Economy and Society*, 55. DOI: <https://doi.org/10.32782/2524-0072/2023-55-20> [in Ukrainian].
5. Gupta, A., Singh, R.K., & Gupta, S. (2022). Developing human resource for the digitization of logistics operations: readiness index framework. *International Journal of Manpower*, 43(2), 355-379. DOI: <https://doi.org/10.1108/IJM-03-2021-0175> [in English].
6. Hurenko, A. V. (2019). Vplyv suchasnykh informatsiinykh tekhnolohii na rozvytok marketynhovoii lohistyky [The impact of modern information technologies on the development of marketing logistics]. *Menedzher. Visnyk Donetskoho Derzhavnogo Universytetu Upravlinnia – Manager. Bulletin of Donetsk State University of Management*, 85(4), 39-47. DOI: <https://doi.org/10.35340/2308-104X.2019.85-4-05> [in Ukrainian].
7. Illiashenko, S. M., Illiashenko, N. S., & Shypulina, Yu. S. (2023). Osoblyvosti povoiennoho vidnovlennia prykordonnnykh z ahresorom terytorii [Features of post-war recovery of territories bordering the aggressor]. In Ye.V. Khlobystov (Ed.), *Stalyi Rozvytok – XXI Stolittia. Dyskusii 2023: Materialy VIII Mizhnarodnoi Naukovo-Praktychnoi Konferentsii – Sustainable development – 21st century. Discussions 2023: materials of the VIII International Scientific and Practical Conference* (pp. 119-126). Retrieved from <https://repository.kpi.kharkov.ua/handle/KhPI-Press/74384> [in Ukrainian].
8. Illiashenko, S. M., Illiashenko, N. S., & Shypulina, Yu. S. (2023). Tendentsii rozvytku lohistyky v tsyfrovii ekonomitsi [Trends in logistics development in the digital economy]. In *Buhhalterskyi Oblik, Kontrol ta Analiz v Umovakh Instytutsiinykh Zmin: Zbirnyk Naukovykh Prats VI Vseukrainskoi Naukovo-Praktychnoi Konferentsii – Accounting, control and analysis in conditions of institutional changes: Collection of scientific works of the VI All-Ukrainian Scientific and Practical Conference* (pp. 47-49). <https://repository.kpi.kharkov.ua/handle/KhPI-Press/70921> [in Ukrainian].
9. Illiashenko, S., Shypulina, Y., Illiashenko, N., & Golysheva I. (2023). Logistics risks of commercialization of innovations of industrial enterprises. *Economic Herald of State Higher Educational Institution «Ukrainian State University of Chemical Technology»*, 2, 56-65. DOI: <https://doi.org/10.32434/2415-3974-2023-18-2-56-65> [in English].
10. Junge, A. L. (2019). Digital transformation technologies as an enabler for sustainable logistics and supply chain processes an exploratory framework. *Brazilian Journal of Operations & Production Management*, 16(3), 462-472. DOI: <https://doi.org/10.14488/BJOPM.2019.v16.n3.a9> [in English].
11. Le Viet, H., & Dang Quoc, H. (2023). The Factors Affecting Digital Transformation in Vietnam Logistics Enterprises. *Electronics*, 12(8), 1825. DOI: <https://doi.org/10.3390/electronics12081825> [in English].
12. Marhasova, V., & Samoilovych, O. (2023). Rol tsyfrovyykh tekhnolohii v orhanizatsii efektyvnoho funktsionuvannia marketynhovoii ta lohistychnoi system promyslovoho pidpriemstva [The role of digital technologies in organizing the effective functioning of the marketing and logistics systems of an industrial enterprise]. *Problemy i Perspektyvy Ekonomiky ta Upravlinnia – Problems and Prospects of Economics and Management*, 2(34), 26-37. DOI: [https://doi.org/10.25140/2410-9576-2023-2\(34\)-26-37](https://doi.org/10.25140/2410-9576-2023-2(34)-26-37) [in Ukrainian].
13. Richnak, P. (2022). Current trend of Industry 4.0 in logistics and transformation of logistics processes using digital technologies: an empirical study in the slovak republic. *Logistics*, 6(4), 79. DOI: <https://doi.org/10.3390/logistics6040079> [in English].
14. Schwab, K. (2017). The fourth industrial revolution. Penguin [in English].

15. Zhelikhovska, M. V. (2022). Modeliuvannia lohystychnoi systemy pidpriemstva v umovakh tsyvrovoi ekonomiky [Modeling of the enterprise's logistic system in the conditions of the digital economy]. *Visnyk Khmelnytskoho Natsionalnoho Universytetu. Seriya: "Ekonomiczni Nauky" – Bulletin of Khmelnytsky National University. Series: "Economic Sciences"*, 4, 50-55. DOI: <https://doi.org/10.31891/2307-5740-2022-308-4-8> [in Ukrainian].

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ЦИФРОВІЗАЦІЯ ЛОГІСТИКИ ДЛЯ ВИРІШЕННЯ ПРОБЛЕМ ЇЇ РОЗВИТКУ В УМОВАХ ПОВОЄННОГО ВІДНОВЛЕННЯ ЕКОНОМІКИ УКРАЇНИ

Ілляшенко С. М., Шипуліна Ю. С., Ілляшенко Н. С., Голишева Є. О.

Статтю присвячено розробленню рекомендацій щодо цифрової трансформації вітчизняної логістики для вирішення актуальних проблем її розвитку в умовах повоєнного відновлення і розвитку економіки України. Спираючись на результати аналізу впливу воєнних дій на логістичну інфраструктуру, практики логістичної діяльності в умовах війни з Росією, а також враховуючи той факт, що повоєнне відновлення і зростання національної економіки потребує переходу на інноваційний шлях розвитку, визначено дві групи проблем вітчизняної логістики. До першої групи віднесено проблеми, що спричинені війною. До другої – проблеми адаптації ланок логістичних систем до умов повоєнного відновлення і інноваційного розвитку економіки України. Розроблено рекомендації щодо аналізу і вирішення зазначених груп проблем у системі: проблема; наслідки її прояву; цифрові технології та їх комплекси, що вирішують проблему. Побудовано відповідні таблиці прийняття управлінських рішень стосовно цифрової трансформації логістичних систем і їх елементів. Запропонована укрупнена схема, що відображає послідовність і зміст процедур управління вибором цифрових технологій для вирішення на засадах цифровізації проблем повоєнного інноваційного розвитку вітчизняної логістики і формування відповідних стратегій. Отримані науково-прикладні результати, висновки і рекомендації у сукупності поглиблюють засади управління цифровою трансформацією логістичних систем, як способу вирішення проблем їх розвитку в умовах повоєнного відновлення і переходу до інноваційного зростання економіки України. Вони також сприяють формуванню інформаційно-аналітичної бази організаційно-економічного механізму управління розвитком логістичних систем в цифровій економіці. Подальші дослідження повинні бути спрямовані на розроблення методичних засад формалізованого управління процесами цифрової трансформації вітчизняної логістики для забезпечення її розвитку в умовах повоєнного відновлення економіки України в руслі концепції інноваційного зростання.

Ключові слова: логістична діяльність, проблеми повоєнної логістики, цифровізація, повоєнне відновлення України, інноваційний розвиток.

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The article is devoted to the development of recommendations for the digital transformation of domestic logistics to solve the current problems of its development in the conditions of post-war recovery, as well as the development of Ukraine's economy. Based on the analysis of military actions' impact on the logistics infrastructure and the logistics practices during the war with Russia, the study identifies two main problems of domestic logistics. Additionally, it considers the requirement for post-war recovery and economic growth to transition to an innovative development path. The first group includes problems caused by the war. The second is the problem of adapting logistics systems to the conditions of post-war recovery and innovative development of Ukraine's economy. Recommendations have been developed to analyze and solve these groups of problems by addressing them, their consequences, and the digital technologies that can mitigate them. Appropriate tables for making managerial decisions regarding the digital transformation of logistics systems and their elements have been created. A consolidated scheme is proposed, outlining the sequence and content of management procedures. This scheme guides the selection of digital technologies to address the problems identified. It helps form relevant strategies based on digitalization. The obtained scientific and applied results, conclusions, and recommendations collectively deepen the principles of managing the digital transformation of logistics systems as a way to solve the problems of their development in the conditions of post-war recovery and the transition to innovative growth of the economy of Ukraine. They also contribute to the formation of the information and analytical base of the organizational and economic management mechanism for the development of logistics systems in the digital economy. Further research should be aimed at developing the methodological foundations of formalized management of the processes of digital transformation of domestic logistics to ensure its development in the conditions of the post-war recovery of Ukraine's economy in line with the concept of innovative growth.

Keywords: logistics activities, problems of post-war logistics, digitalization, post-war reconstruction of Ukraine, innovative development.

REFERENCES

1. Andiyappillai, N. (2020). Digital transformation in warehouse management systems (WMS) implementations. *International Journal of Computer Applications*, 177(45), 34-37. DOI: <https://doi.org/10.5120/ijca2020919957> [in English].
2. Averkyna, M., & Zahoruiko, O. (2023). Zastosuvannia khmarnykh tekhnolohii u lohistychnykh systemakh [Application of cloud technologies in logistic systems]. *Modeling the Development of the Economic Systems*, 1, 45-49. DOI: <https://doi.org/10.31891/mdes/2023-7-6> [in Ukrainian].
3. Hlebova, A. O., Vasylychenko, M. I., & Ivanov, Yu. V. (2023). Informatsiino-komunikatsiini tekhnolohii v protsesakh lohistychnoho obsluhovuvannia: sutnist, osoblyvosti ta rozvytok v umovakh rozvytku tsyfrovyykh tekhnolohii [Information and communication technologies in the processes of logistic servicing: essence, features, and development in the conditions of digital technologies growth]. *Ekonomika i rehion – Economy and region*, 3(90), 45-52. DOI: [https://doi.org/10.26906/EiR.2023.3\(90\).3027](https://doi.org/10.26906/EiR.2023.3(90).3027) [in Ukrainian].
4. Hurzhyi, N., Havran, V., & Sapotnitska, N. (2023). Tsyfrovi tekhnolohii ta yikhnyi vplyv na upravlinnia lohistychnymy protsesamy pidpriemstv [Digital technologies and their impact on the management of logistics processes of enterprises]. *Ekonomika ta Suspilstvo – Economy and Society*, 55. DOI: <https://doi.org/10.32782/2524-0072/2023-55-20> [in Ukrainian].
5. Gupta, A., Singh, R.K., & Gupta, S. (2022). Developing human resource for the digitization of logistics operations: readiness index framework. *International Journal of Manpower*, 43(2), 355-379. DOI: <https://doi.org/10.1108/IJM-03-2021-0175> [in English].
6. Hurenko, A. V. (2019). Vplyv suchasnykh informatsiinykh tekhnolohii na rozvytok marketynhovoii lohistyky [The impact of modern information technologies on the development of marketing logistics]. *Menedzher. Visnyk Donetskoho Derzhavnogo Universytetu Upravlinnia – Manager. Bulletin of Donetsk State University of Management*, 85(4), 39-47. DOI: <https://doi.org/10.35340/2308-104X.2019.85-4-05> [in Ukrainian].
7. Illiashenko, S. M., Illiashenko, N. S., & Shypulina, Yu. S. (2023). Osoblyvosti povoiennoho vidnovlennia prykordonnykh z ahresorom terytorii [Features of post-war recovery of territories bordering the aggressor]. In Ye.V. Khlobystov (Ed.), *Stalyi Rozvytok – XXI Stolittia. Dyskusii 2023: Materialy VIII Mizhnarodnoi Naukovo-Praktychnoi Konferentsii – Sustainable development – 21st century. Discussions 2023: materials of the VIII International Scientific and Practical Conference* (pp. 119-126). Retrieved from <https://repository.kpi.kharkov.ua/handle/KhPI-Press/74384> [in Ukrainian].
8. Illiashenko, S. M., Illiashenko, N. S., & Shypulina, Yu. S. (2023). Tendentsii rozvytku lohistyky v tsyfrovii ekonomitsi [Trends in logistics development in the digital economy]. In *Buhhalytskyi Oblik, Kontrol ta Analiz v Umovakh Instytutsiinykh Zmin: Zbirnyk Naukovykh Prats VI Vseukrainskoi Naukovo-Praktychnoi Konferentsii – Accounting, control and analysis in conditions of institutional changes: Collection of scientific works of the VI All-Ukrainian Scientific and Practical Conference* (pp. 47-49). <https://repository.kpi.kharkov.ua/handle/KhPI-Press/70921> [in Ukrainian].
9. Illiashenko, S., Shypulina, Y., Illiashenko, N., & Golysheva I. (2023). Logistics risks of commercialization of innovations of industrial enterprises. *Economic Herald of State Higher Educational Institution «Ukrainian State University of Chemical Technology»*, 2, 56-65. DOI: <https://doi.org/10.32434/2415-3974-2023-18-2-56-65> [in English].
10. Junge, A. L. (2019). Digital transformation technologies as an enabler for sustainable logistics and supply chain processes an exploratory framework. *Brazilian Journal of Operations & Production Management*, 16(3), 462-472. DOI: <https://doi.org/10.14488/BJOPM.2019.v16.n3.a9> [in English].
11. Le Viet, H., & Dang Quoc, H. (2023). The Factors Affecting Digital Transformation in Vietnam Logistics Enterprises. *Electronics*, 12(8), 1825. DOI: <https://doi.org/10.3390/electronics12081825> [in English].
12. Marhasova, V., & Samoiloivych, O. (2023). Rol tsyfrovyykh tekhnolohii v orhanizatsii efektyvnoho funktsionuvannia marketynhovoii ta lohistychnoi system promyslovoho pidpriemstva [The role of digital technologies in organizing the effective functioning of the marketing and logistics systems of an industrial enterprise]. *Problemy i Perspektyvy Ekonomiky ta Upravlinnia – Problems and Prospects of Economics and Management*, 2(34), 26-37. DOI: [https://doi.org/10.25140/2410-9576-2023-2\(34\)-26-37](https://doi.org/10.25140/2410-9576-2023-2(34)-26-37) [in Ukrainian].
13. Richnak, P. (2022). Current trend of Industry 4.0 in logistics and transformation of logistics processes using digital technologies: an empirical study in the slovak republic. *Logistics*, 6(4), 79. DOI: <https://doi.org/10.3390/logistics6040079> [in English].
14. Schwab, K. (2017). The fourth industrial revolution. Penguin [in English].
15. Zhelikhovska, M. V. (2022). Modeliuvannia lohistychnoi systemy pidpriemstva v umovakh tsyfrovii ekonomiky [Modeling of the enterprise's logistic system in the conditions of the digital economy]. *Visnyk Khmelnytskoho Natsionalnoho Universytetu. Seriya: “Ekonomiczni Nauky” – Bulletin of Khmelnytsky National University. Series: “Economic Sciences”*, 4, 50-55. DOI: <https://doi.org/10.31891/2307-5740-2022-308-4-8> [in Ukrainian].