

IDENTIFICATION OF PROBLEMATIC ISSUES IN THE MANAGEMENT OF SPARE PARTS DELIVERY TECHNOLOGY BASED ON CLUSTERING OF TRANSPORT AND LOGISTICS CENTRES IN THE CONTEXT OF DYNAMIC CHANGES IN DEMAND

О.В. Павленко, к.т.н., доцент

А.Г. Бойко, аспірант

Харківський національний автомобільно-дорожній університет

*I. Taran, professor of Department of Roads and Bridges,
Rzeszow University of Technology, Rzeszów, Poland*

The current globalisation of economic relations in the world market, development of existing and creation of new international transport corridors, trade and transport networks, development of logistics infrastructure, expansion of technologies confirm the importance for Ukraine of the development of the logistics services market, which is experiencing rapid development in the world and is estimated at more than five trillion US dollars, growing by 4-5 % annually [1].

The development of the logistics market in any country, including Ukraine, depends on the state of its economy [1]. Its operators ensure the interaction of participants in economic relations, link production chains, and allow goods to find their buyers. The volume of services provided in the logistics sector directly depends on the level of activity of their customers, production dynamics, domestic and foreign trade. The revival of the logistics market will lead to an increase in demand for warehouse space. Further increase in turnover will lead to a decrease in vacancy of existing warehouses and, in the long run, to a shortage of storage space [2, 3].

As is well known from general theory, the logistics component of the structure of the product produced in a country is an important characteristic of the country's economic development, a kind of macroeconomic indicator. In developed countries, the logistics component of the gross domestic product (GDP) is 10-15 % (in the EU and the US it is 12-16 % of GDP, in China – 26 %, in Japan – 6 %) [1]. As for Ukraine, most experts compare the country's economy to the level of the Third World, where logistics costs can reach 40% of GDP. In Ukraine, this figure ranges from 30-35 %. At the same time, 70 % of logistics costs are accounted for by transport (USD 7 billion), 25 % – by warehousing (USD 2.5 billion) and about 5 % – by logistics flow management (USD 0.5 billion).

The total area of warehousing and logistics space that can be classified as modern and located in the five largest regional centres of Ukraine (Kyiv, Kharkiv, Dnipro, Odesa and Lviv) is approximately 2.35 million square metres [4]. In comparison, Poland has a market size of around 11.6 million square metres, with the quality of space in many cases significantly higher than in Ukraine.

The wide variety of logistics concepts in foreign literature has led to the emergence of many definitions similar to the concept of a "transport and logistics centre", including [5]:

- freight villages – in the USA, EU;
- logistics centres (centredelogistique), transport platforms (plates-formeslogistiques / multimodales) – in France;
- interporti – in Italy;
- goods movement centre (gueterverkehrscentren (GVZ)) – in Germany;
- logistics park, freight platform (platformfreightterminal) – in some European and American countries;
- cargo coordination centres (centro integrado de mercancías), transport centres (centro de transporte), logistics square (plaza logistica) – in Spain;
- railway service centre (railservi cecentre (RSC)) – in the Netherlands;
- transport centre – in Denmark.

The most comprehensive interpretation of the concept of "transport and logistics centre", which takes into account the specifics of its structure, management and functioning, is that of the Europlatform (European Association of Transport and Logistics Centres): a transport and logistics centre is a certain territory where all activities related to the transportation, logistics and distribution

of goods for both national and international transit are carried out by different operators on a commercial basis [5,6].

As part of the study, more than fifty 3PL operators – transport and logistics centres (TLCs) and shippers were asked to assess the quality of logistics services and share their vision of the market [7]. According to the experts, the current state of the market can be defined in two ways: 40 % believe that the logistics market is stagnant, 37 % – that it has passed the stage of formation and is developing, 21 % – that the market is at the stage of formation, 2 % – at the stage of redistribution.

A properly organised technological process of the TLC ensures: clear and timely quantitative and qualitative acceptance of goods; efficient use of mechanisation of loading and unloading and transport and warehousing operations; consistent and rhythmic performance of warehouse operations, which contributes to the systematic workload of warehouse employees and the creation of favourable working conditions; rational warehousing of goods, which ensures maximum use of warehouse volumes and areas; safety of goods; clear organisation of centralised [8-10].

The main objectives of the TLC include: improving the coordination of different modes of transport in the organisation of mixed and intermodal transport; proper organisation of comprehensive transport services for customers; expanding the types of services provided and improving their quality; attracting additional volumes of transit cargo; reducing the time of delivery of transit cargo by reducing downtime at transshipment points for other modes of transport and at border crossings; expanding international cooperation; attracting new customers [11].

Modern enterprises whose warehouses are aimed at competitiveness and efficient operation should use advanced management methods – IT technologies focused on clear planning and coordination of components of all trade and technological processes. Thanks to modern IT technologies, the organisation of warehouse operations based on the rational use of space brings maximum effect, which is achieved through the optimal organisation of warehousing, equipment and warehouse technologies [12].

The paper [13] studies general issues of management of logistics transport and warehouse centres. The article provides a classification of logistics processes in transport and warehouse centres. The main logistics processes in transport and warehouse systems are disclosed. The schematic diagram of the transport and logistics system of cargo delivery through terminals is considered. The positioning of the transport and warehouse centre as an element of the architecture of the logistics system is carried out. The basics of building an effective system of transport and warehouse services for cargo flows are formulated.

A number of scientists have also dealt with the introduction of modern technologies, considering the need and effectiveness of introducing modern warehouse technologies: in the operation of warehouse systems, order processing, use of the latest equipment to reduce costs, and improve the quality of warehouse functioning [14, 15].

The use of information technology for warehouse management can improve management efficiency, increase accuracy and increase cost-effectiveness. The articles by foreign authors present modern approaches to warehouse management, the use of the latest methods and systems that accelerate the speed of order processing, movement of goods within the warehouse, accounting and search for goods, and return of goods. The article also considers studies of real warehouse systems by building models based on graph theory, Markov processes, Petri nets, etc. [16, 17, 18]

So, in order to successfully perform the entire range of works and operations and reduce the cost of delivering TLC goods in modern warehouses with intensive commodity flows, it is necessary to implement a streamlined technological process based on advanced technology and best practices.

Література:

1. Особливості ринку логістичних послуг в Україні. [Електронний ресурс]. Режим доступу: <https://pro-consulting.ua/ua/pressroom/osobennosti-rynka-logisticheskikh-uslug-v-ukraine>
2. Pavlenko O., Muzylyov D., Ivanov V., Bartoszyk M., Jozwik J. Management of the grain supply chain during the conflict period: case study Ukraine. *Acta Logistica*. 2023. № 10(3), P. 393-402.

3. Ніколаєнко І.В. Вдосконалення міжопераційних процесів транспортно-складського комплексу: Автореф. дис... канд. техн. наук: 05.22.01 / І.В. Ніколаєнко ; Київ. ун-т економіки і технологій трансп. К., 2002. 19 с.
4. Складська нерухомість: якісна трансформація ринку. [Електронний ресурс]. Режим доступу: <http://investment-estate.com/uk/novosti/skladska-neruhomist-yakisna-transformaciya-rinku>
5. FV-2000. Quality of Freight Villages Structure and Operations. European Commission. [Електронний ресурс]. Режим доступу: <https://cordis.europa.eu/project/id/IN-97-SC.2115/de>
6. Kalinichenko O., Pavlenko O., Nagornyy Y., Sevidova V., Soldatenko I. Determination of Conditions to Provide Transport Logistics Support Service to Aircraft at Aerodromes in Ukraine. In: Arsenyeva, O., Romanova, T., Sukhonos, M., Biletskyi, I., Tsegelnyk, Y. (eds) Smart Technologies in Urban Engineering. STUE 2023. Lecture Notes in Networks and Systems. 2023. Vol 807. pp. 390-399. Springer, Cham.
7. Що стримує розвиток ринку логістики – результати дослідження. [Електронний ресурс]. Режим доступу: <http://retailers.ua/news/partneryi/5942-chto-sderjivaet-razvitie-ryinka-logistiki--rezultatyi-issledovaniya>
8. Taran I., Litvin V., Klymenko I. Optimization of the functioning of a warehouse complex with front shelves in the anylogic environment. Modern technologies in mechanical engineering and transport. 2023. № 1(20), P. 261-272.
9. Pavlenko O., Muzylyov D., Ivanov V. Determination of an Effective Supply Chain: Case Study for Delivering Products from the USA to Ukraine. Grabchenko's International Conference on Advanced Manufacturing Processes. Springer. 2023. P. 82-93.
10. Волкова Т.В., Павленко О.В. Удосконалення управління якістю доставки зерна автомобільним транспортом на території України. Комунальне господарство міст. №154 (1). 2020, С.216-222.
11. Pavlenko O., Muzylyov D., Trojanowski P. Finding a Rational Option for a Cold Supply Chain Using Simulation on International Routes. In: Arsenyeva, O., Romanova, T., Sukhonos, M., Biletskyi, I., Tsegelnyk, Y. (eds) Smart Technologies in Urban Engineering. STUE 2023. Lecture Notes in Networks and Systems, 2023. Vol 807. pp. 297-307. Springer, Cham.
12. Васюк І. В. Зарубіжний досвід впровадження маркетингових логістичних концепцій на підприємстві [Електронний ресурс]. – Режим доступу: http://zbirnuk.bukuniver.edu.ua/ed_work/n_7/13.pdf
13. Pavlenko O., Muzylyov D., Shramenko N., Cagaňová D., Ivanov V. Mathematical Modeling as a Tool for Select-ing a Rational Logistical Route in Multimodal Transport Sys-tems. In: Cagaňová, D., Hornáková, N. (eds) Industry 4.0 Challenges in Smart Cities. EAI/Springer Innovations in Com-munication and Computing. Springer, Cham., 2023. P. 23-37.
14. Muzylev D., Kamaux N., Berezhnaya N., Kutya O. The criteria of choice of a rational technology of delivery the agricultural goods. Motrol. Commission of motorization and energetics in in Agriculture. 2015. Vol.17. No.7. P. 67-72.
15. Павленко О.В., Музильов Д.О. Стабільна модель функціонування логістики для постачання швидкопсувних продуктів маршрутами Україна – Польща. Комунальне господарство міст, Т. 1, Вип. 175, 2023, С. 237-242.
16. Музильов Д.О., Павленко О.В. Модель функціонування системи доставки насіння зернових культур у контейнерах з США до України. Комунальне господарство міст. 2022, № 171 (4), 179-184.
17. Samchuk G., Kopytkov D., Rossolov O. Freight Fleet Management Problem: Evaluation of a Truck Utilization Rate Based on Agent Modeling. *Komunikacie*, 2021, 24. P. 46–58.
18. Kopytkov D., Pavlenko O., Kalinichenko O. A technique to determine the optimum package of logistic services provided by the transport and logistics centre. *Modern Management: Logistics and Education. Monograph*. 2018. pp. 150-157.