



Evaluating the Impact of Transport and Logistics Potential on International Trade

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ABSTRACT

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The primary focus of this study is to quantify the transport and logistics potential that influences effective international trade. Utilizing an integral assessment method, an analysis of key indicators contributing to this potential was conducted, resulting in the computation of eight coefficients. The pivotal finding of the study reveals a decreasing trend in the transport and logistics potential of enterprises, with predictions suggesting substantial declines based on the novel methodological approach employed. A comprehensive evaluation of the transport and logistics potential of enterprises was executed, and the results are subsequently discussed. This evaluation led to the determination of an integral indicator of transport and logistics potential, forming a dependency matrix that underpins the research findings. The novelty of this research lies in the unique methodological approach to assess the efficacy of the transport system management within business structures, emphasizing the coordinating and integrative role of logistics. This pioneering approach marks one of the first applications for evaluating transport and logistics potential in the context of international trade. Future research should address the optimization of transport and logistics potential to attract new trade development investments. However, this study's scope was limited to Ukrainian enterprises, thus future research should consider expanding the sample to include enterprises from neighbouring countries engaged in international trade with Ukraine, such as Poland and Romania.

1. INTRODUCTION

In light of globalization and the progression of European integration processes in Eastern Europe, the management of transport and logistic services within the realm of trade has gained substantial significance. The establishment of transport and logistics systems necessitates an evaluation of its elemental activities, along with the construction of a balanced strategy for the development of the respective economic entities. These systems require theoretical advancements to elucidate the conceptual framework of transport and logistics services, to scrutinize scientific developments within this sphere of activity, and to devise organizational and economic mechanisms for their enhancement, thereby modelling future prospects.

This study concentrates on the transport and logistics potential of Ukraine (Figure 1). The management of transport and logistics processes is defined as the execution of

management functions via the organization of control over information flows and implementation of processes that bolster the effective functioning of the system.



Figure 1. Transport and logistics communication on the territory of Ukraine

Present-day trends in trade development underline the necessity for the formation of new systems, the adoption of innovative approaches, and the implementation of novel solutions to retain a competitive edge. The logistics concept serves as a practical component, while the evaluation tools for logistics processes facilitate cost reduction or optimization during international trade introduction, ensure productivity enhancement in production and economic activities, and improve customer service processes, thereby generally augmenting competitiveness and providing additional competitive advantages.

The efficiency of a transport and logistics system management can be described as the optimum management decisions related to the construction of a rational transport and logistics system. Such a system will optimize transportation, warehousing, and distribution costs, in the context of guaranteeing growth in production and marketing activities, optimizing warehouse stocks, stimulating cargo flow growth, and ultimately achieving goals and positive financial performance for effective international activities.

Currently, the transport and logistics potential of Ukraine is suboptimal, owing to the impacts of war and the COVID-19 pandemic. However, the examination of transport and logistics aspects that specifically influence international trade in a European country is of paramount importance. Consequently, the research question posited in this study involves identifying an effective approach to assess the transport and logistics potential of international trade in a specific country.

The primary objective of this article is to determine the level of transport and logistics potential vital for effective international trade. The tasks undertaken in this article encompass the assessment of this potential within the framework of the development of the transportation system management in Ukrainian enterprises.

The article is structured to include a literature review, a description of the principal methods, a presentation of the research findings and their discussion, and conclusions.

2. LITERATURE REVIEW

2.1 Review of the literature on the formation of the transport and logistics system

As Dębkowska [1] and Bugarčić et al. [2] noted, increasing the transport and logistics potential and ensuring the development of the logistics activities of trade enterprises lies in the plane of building transport and logistics centers. Directly high-quality reforms and an efficient transport and logistics infrastructure are important priorities for the national economy to reach a new qualitative level of service for all sectors and the formation of the most developed transport service system. Today, most countries of the world have already passed the path of building a transport and logistics system in their country and creating a high-quality transport and logistics infrastructure to activate trade zones.

As Bazyliuk et al. [3] and Bensassi et al. [4] noted, respectively, the context of the development of the transport and logistics system, its qualitative construction, as well as implementation into a single European transport and logistics system, requires a deep study and analysis of the experience of foreign countries that have formed such a system and highlighting key positive solutions for building their own transport and logistics system-logistics infrastructure and

development of modern transport and logistics centers.

For example, Wang and Choi [5] and Yildiz [6] noted, the context of obtaining competitive advantages in the development of the transport and logistics system implies the presence of a developed infrastructure of transport and logistics centers; favorable logistical location along transport and logistics corridors; extensive cooperation between government and customs authorities; a variety of range of services and types of transport support; use of innovative functional and high-tech means for the development of transport and logistics support.

It is argued in the practical and scientific literature [7-9] that only taking into account the positive directions in the development of transport and logistics processes, using innovative trends in the development of the transportation and logistics system, and building an internal efficient transport and logistics infrastructure in synergy will form a powerful base for the development of the domestic transport and logistics system and stimulate an increase in the effectiveness of the activities of the subjects of the international market.

2.2. Review of gaps in the literature and identification of new problems

Despite this, there are a number of gaps in the literature, we will highlight the main ones (Figure 2).

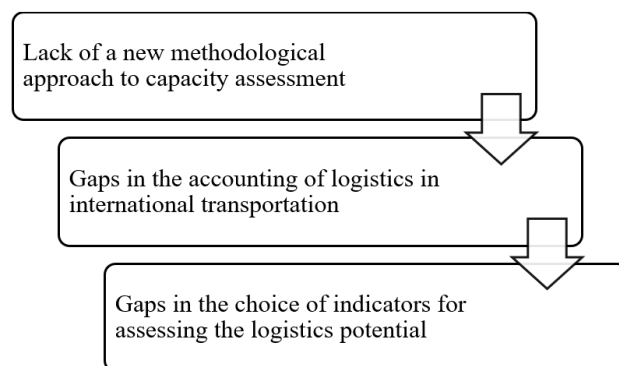


Figure 2. Key gaps in the literature in our study

It should be noted that the presented analysis of the literature indicates that most studies focus on the problems of transport and logistics support. When reviewing the literature, we took into account the European market and its transport and logistics features due to the choice of the country carrying out international trade on it.

Along with this, one of the questions is raised: How to assess the transport and logistics potential in such a way as to identify the best option for conducting the right trade activities? That is why our scientific task is to form a methodological approach to assessing the transport and logistics potential and the effectiveness of its use by Ukrainian enterprises engaged in international trade operations.

3. METHODOLOGY

The methodology section presents methodological tools for assessing the logistics potential and effectiveness of building a transportation management system in international trade. In accordance with the presented methods, we will assess the transport and logistics potential of the Ukrainian enterprises

selected in the framework of the study, actively introducing international trade: LLC Rozetka, LLC Yakaboo, and LLC Nestle UA. The choice of these enterprises is due to the fact that they all operate from the territory of one country, all have almost equal capital and all have their own transport and logistics system for introducing trade.

The integral assessment method involves the calculation of a generalized (integral indicator) that has a certain scale, presented in Table 1.

Table 1. Rating scale for the value of the indicator of logistics potential

Number	Level
0-0.4	Low level
0.4-0.6	Average level
0.6-0.8	High level
0.8-1	Very high level

The integral estimation method is based on the use of some coefficients shown in Table 2, involved in transport and logistics systems.

Table 2. Coefficients within the application of the integral assessment method

Number	Coefficients
C ₁	Coefficient of satisfaction of needs
C ₂	Coefficient of uniformity of product supplies to market
C ₃	Coefficient of the ratio of input and output one-way material flows
C ₄	Coefficient of the ratio of stocks and incoming material flow
C ₅	Coefficient of the ratio of stocks and the initial material flow
C ₆	Coefficient of customer service quality
C ₇	Coefficient of non-failure service to consumers of products
C ₈	Capacity utilization factor of logistics facilities

On the basis of these indicators, it is possible to derive an integral indicator that allows for a retrospective and comparative analysis with other enterprises, in accordance with the Eq. (1) for the average geometric downtime:

$$I = \sqrt[n]{C_1 * C_2 * C_3 * C_4 * C_5 * C_6 * C_7 * C_8} \quad (1)$$

Sometimes it becomes necessary to conduct a regression analysis directly on the chart, without entering values for the forecast into the worksheet. This can be done with a graphical trend line.

The data collection method was based on the reporting data of the enterprises we selected.

It should be noted that the source of data was the State Statistics Service of Ukraine and the reporting of the activities of selected organizations. The final application of the chosen method is the formation of a dependence matrix in which each organization takes a position on taking into account the result of calculating the integral indicator. Regression analysis is focused on the perception of the calculation of coefficients and trend bars. The matrix is based on the results of the integral indicator.

Note that the choice of organizations is due to the fact that these are the only participants in international trade in Ukraine that carry out transport and logistics operations.

As a result of the application of the selected methods, a

matrix is formed, which depends on the influence of the transport and logistics potential on the effectiveness of the introduction of international trade and the transportation management system as a whole.

4. RESULTS OF RESEARCH

Analyzing the data, it is necessary to note the growth of the integral indicator of the logistics potential of all the enterprises we have chosen, implementing transport and logistics activities in the framework of international trade. Analyzing the integral indicator of LLC Rozetka, it should be noted that the value of the indicator increased from 0.485 points (average level) in 2018 to the level of 0.58 points (average level) in 2022.

The growth of this parameter was due to an increase in the level of satisfaction of the needs of the enterprise up to 0.712 points, an increase in the uniformity of supply up to 0.502 points, an increase in the turnover of material flows, respectively (up to 0.318 points-the ratio input and output one-way material flows; up to 0.41 points-the ratio stocks and incoming material flow, up to 0.384 points-the ratio of stocks and the initial material flow).

A positive thing for the enterprise under study is the growth of indicators affecting the processes of transportation and transport and logistics services in general. In particular, in Figure 3 you can see: the indicator of the quality of customer service is high-0.998 points, the of non-failure service to consumers of products-0.903 points, and the capacity utilization of logistics facilities-0.795 points.

For LLC Yakaboo, the indicators remain significant, the customer service quality ratio, declined to the level of 0.972 points in the reporting year 2022, the non-failure service to consumers of products-0.716 points, the utilization factor of logistics facilities-0.895 points. These indicators you can see at the Figure 4.

When examining the indicators of the logistics potential of the LLC Yakaboo enterprise, it should be noted the lowest level of the indicator among the specialized enterprises, the corresponding value of the indicator increases over the period 2018-2020. From 0.434 points (average level) in 2018 to 0.548 points (average level), in the future, we observe a decrease in the integral indicator to 0.519 points (average level) in 2021 and 0.439 points (average level) in 2022.

The results of the analysis of the key indicators of the available transport and logistics potential of LLC Nestle UA testify to the highest logistics potential of this enterprise, as evidenced by the value of the indicator, which changes from 0.62 points (high level) in 2018 to the value of 0.681 points (high level) in 2022, only in 2020 the value of the indicator decreased slightly and amounted to 0.587 points (average level). This indicates a high level of available logistics potential, which is the highest among the enterprises of the presented profile, which is graphically depicted in Figure 5. The main emphasis of the formation of a high integral indicator of logistics potential is high indicators of satisfaction of consumer needs (the indicator varies from 0.854 points to 0.903 points), significant indicators of turnover of material flows (the indicator of the ratio of incoming and outgoing one-way material flows varies from 0.694 points in 2018 to a value of 0.801 points in 2021).

Through the trend line method, we will reflect the results of calculating the integral indicator for assessing the transport

and logistics potential for selected enterprises and a possible forecast.

Figure 6 shows the trend line (forecast indicators) of the integral indicator for assessing the transport and logistics potential of LLC Rozetka.

If the dynamics of the integrated indicator of the transport and logistics potential of LLC Yakaboo continues, we should expect the average level of efficiency in the use of the existing system of transport and logistics services, along with this, this

indicator may also decrease. We present the dynamics of predictive characteristics in Figure 7.

Among enterprises, LLC Nestle UA, a structural subdivision of the international company Nestle, has the greatest effect of implementing transport and logistics support during international trade. The integral indicator of the transport and logistics potential decreases from 0.746 points (high indicator) in 2018 to the level of 0.608 points (high indicator) in 2022.

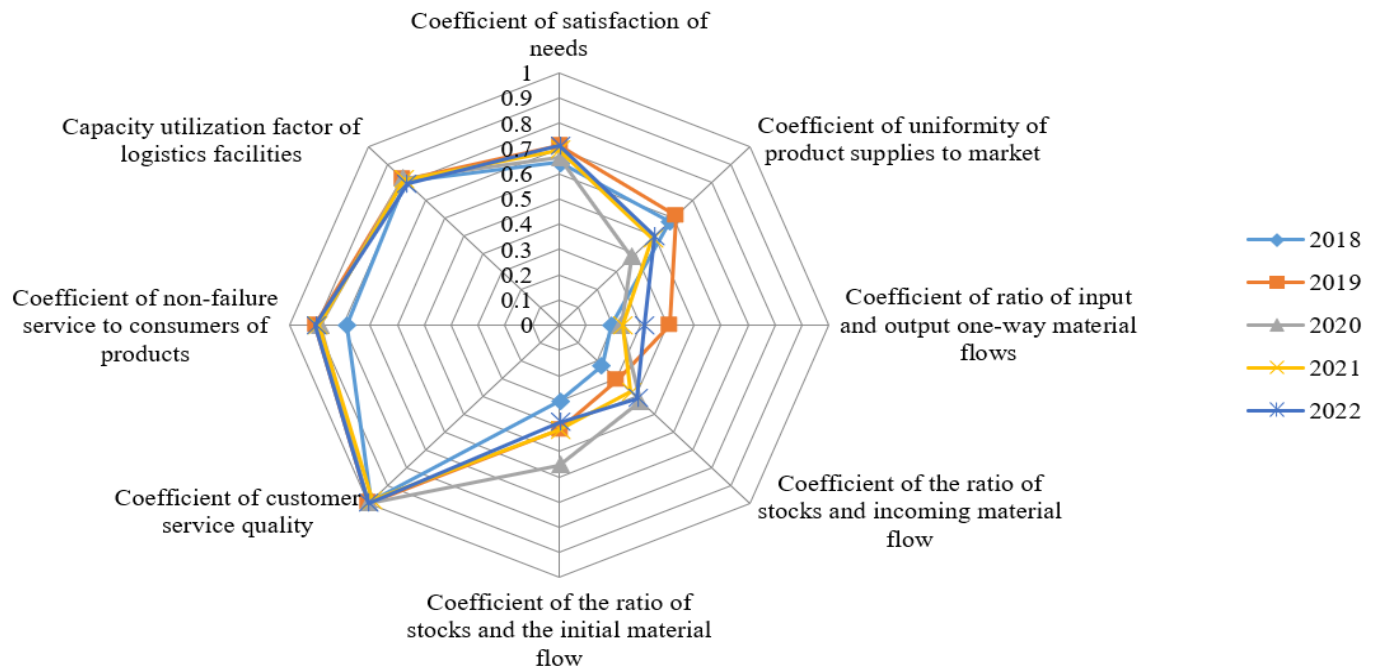


Figure 3. The results of the calculation of key coefficients for assessing the transport and logistics potential LLC Rozetka

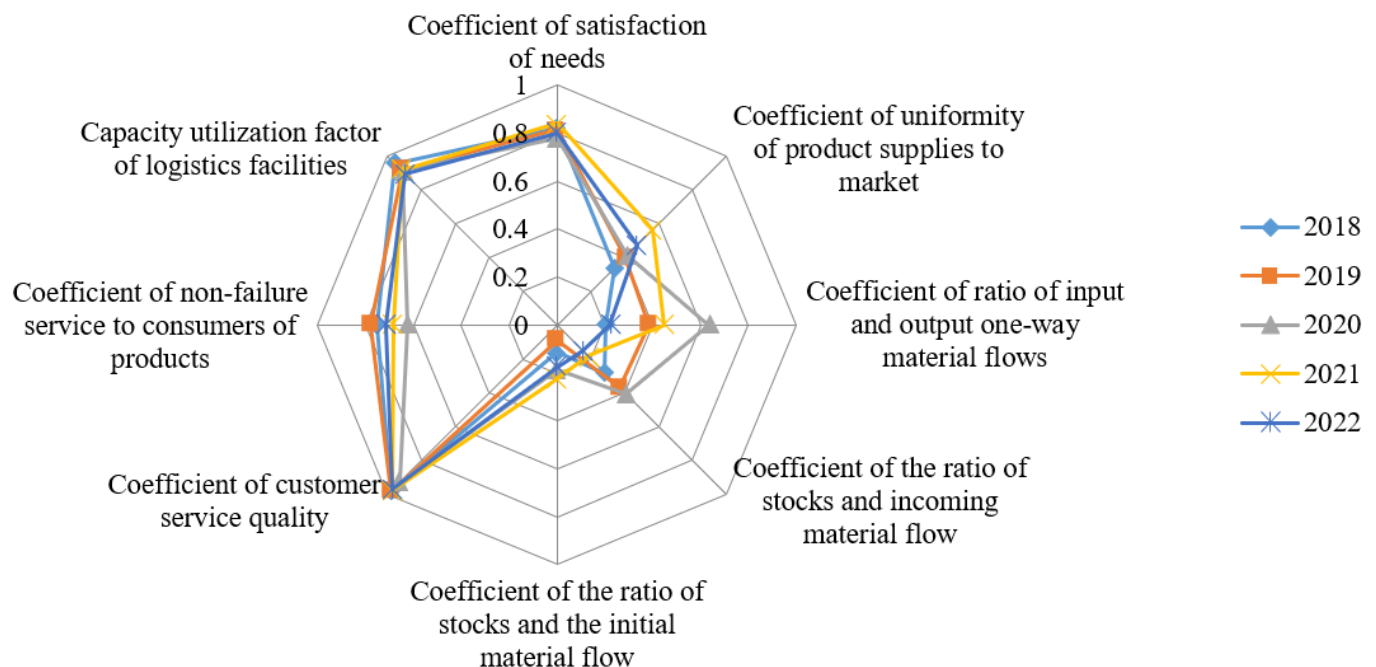


Figure 4. The results of the calculation of key coefficients for assessing the transport and logistics potential LLC Yakaboo

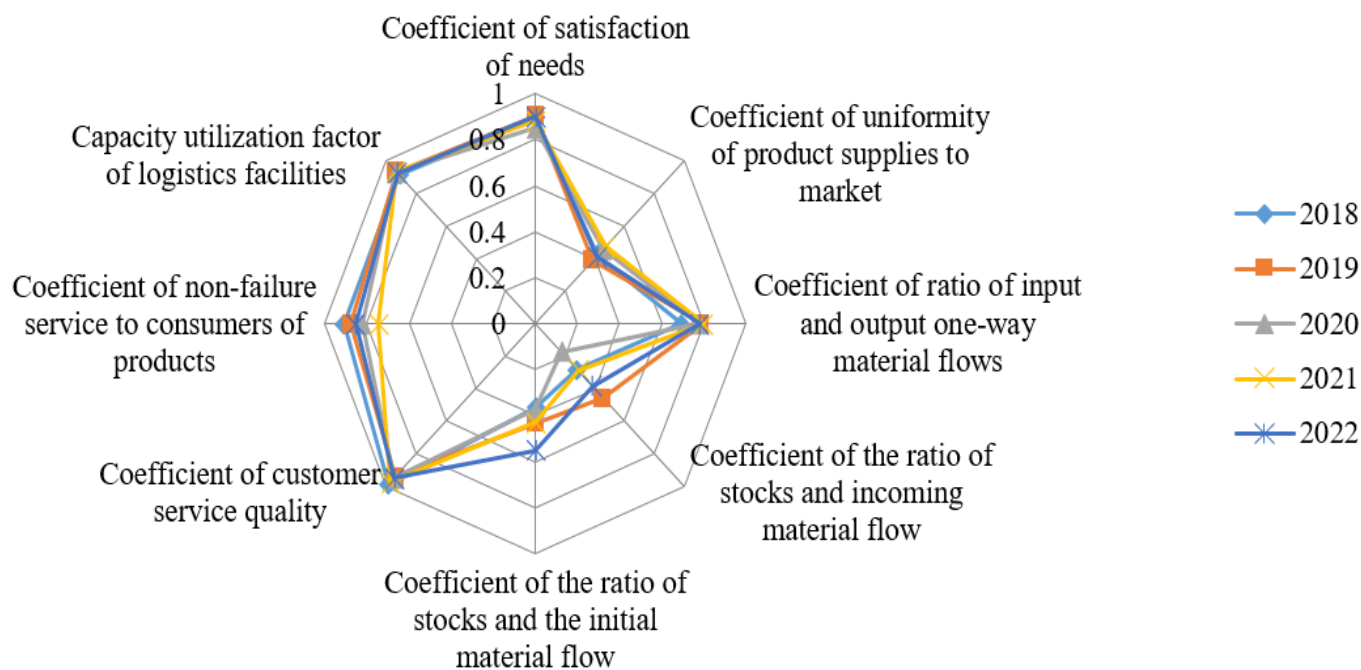


Figure 5. The results of the calculation of key coefficients for assessing the transport and logistics potential LLC Nestle UA

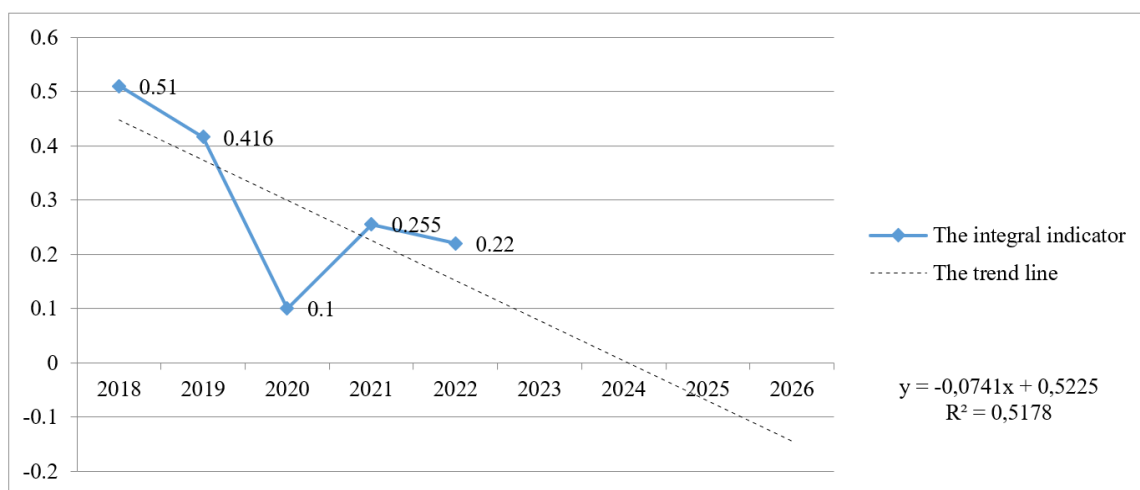


Figure 6. The trend line (forecast indicators) of the integral indicator for assessing the transport and logistics potential of LLC Rozetka

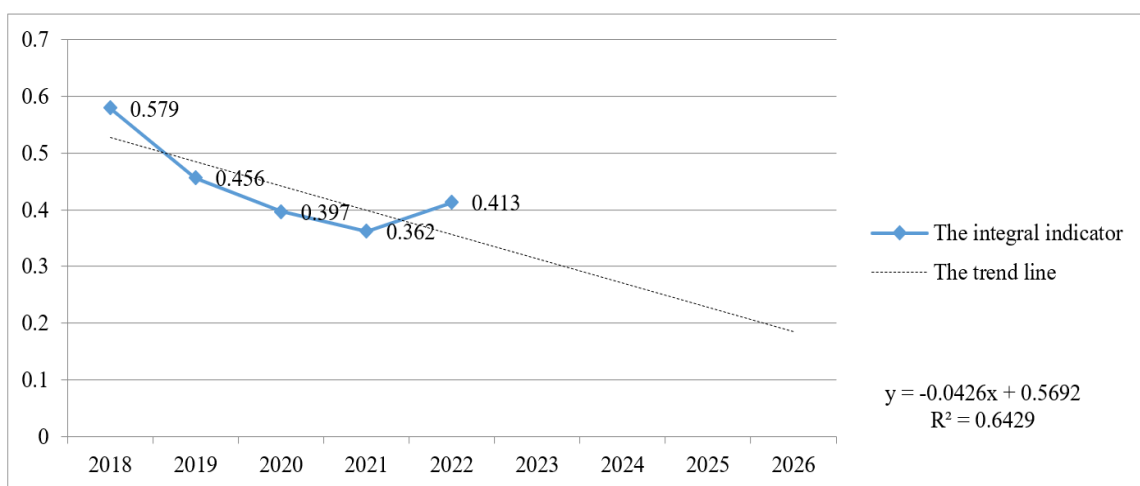


Figure 7. The trend line (forecast indicators) of the integral indicator for assessing the transport and logistics potential of LLC Yakaboo

Positive trends in the activities of LLC Nestle UA are a high level of reliability of product deliveries, the workload of transport capacities, and a significant utilization rate of the existing transport fleet. At the end of the study, we will present a forecast for the development of the situation related to the transport and logistics potential of LLC Nestle UA, presenting the data in Figure 8.

The forecast dynamics indicate that without significant changes in the organization of transport and logistics services

of LLC Nestle UA (trend line equation $y = -0.0322x + 0.7718$), there will be a decrease in the integral indicator in the future period and indicates further inefficiency in the use of significant logistics potential.

Summarizing the results of the study, the calculation data will be presented in a summary matrix of the dependence of the use of transport and logistics potential and its impact on the efficiency of the transportation management system during international trade (Figure 9).

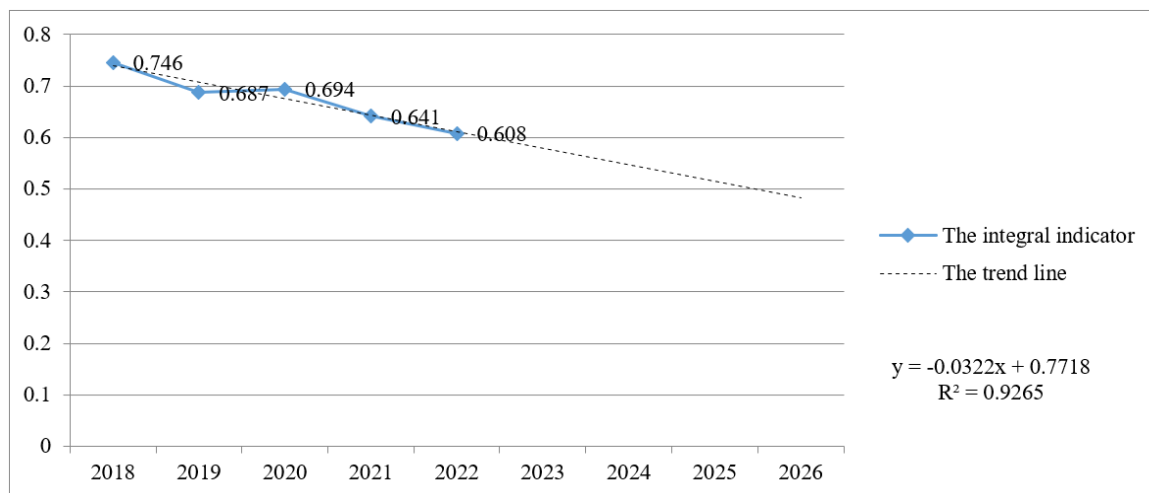


Figure 8. The trend line (forecast indicators) of the integral indicator for assessing the transport and logistics potential of LLC Nestle UA

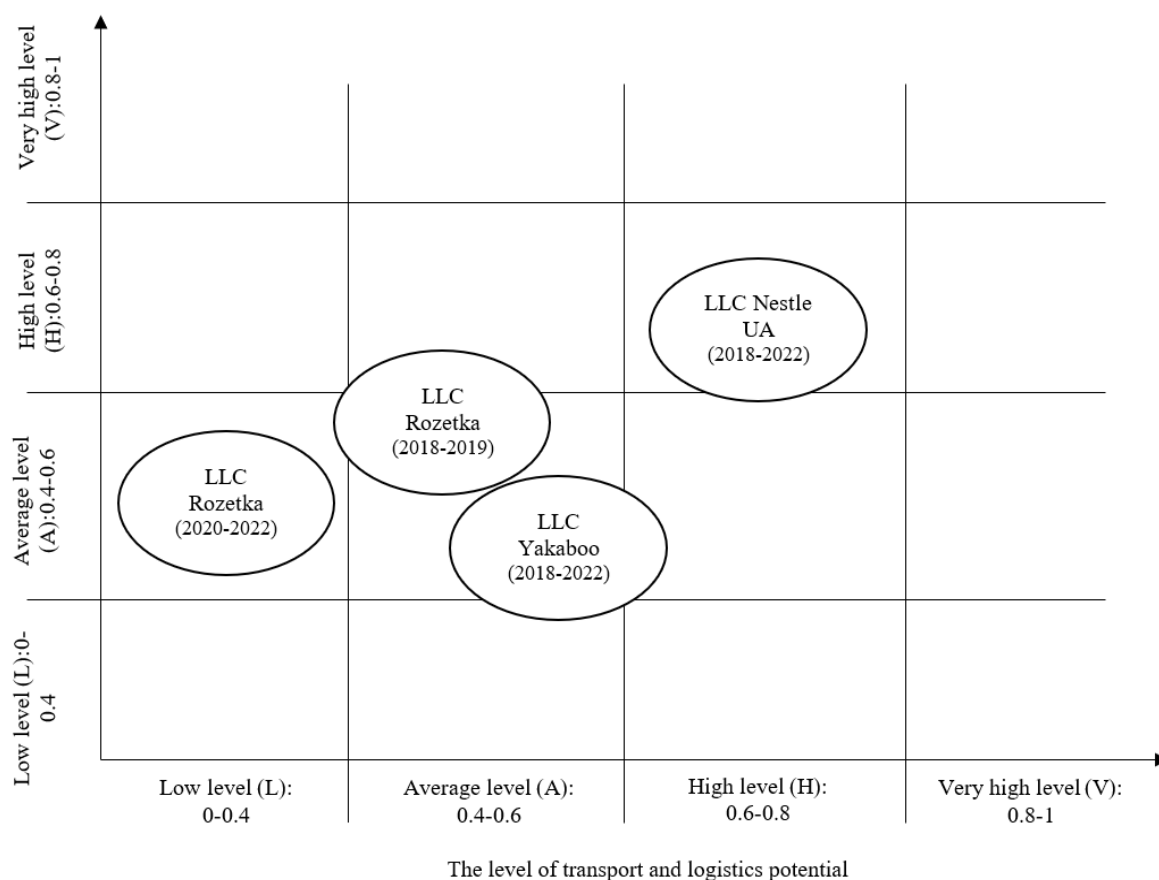


Figure 9. The matrix of the dependence of the use of transport and logistics potential and its impact on the efficiency of the transportation management system during international trade

LLC Rozetka in recent years has entered the LA zone, which is a low level. In this case, the main areas of improvement are: attracting new qualified personnel employed in transport and logistics processes and activating innovative developments.

LLC Yakaboo has been in the AA zone, that is, the average level, in recent years. The main areas of improvement are the need to develop a strategy to increase the transport and logistics potential and ensure greater efficiency of its use in the strategic period.

The transport and logistics potential and logistics capabilities are somewhat higher, and, accordingly, in its use by LLC Nestle UA during the period 2018-2022, most of the indicators are in the HH zone (high transport and logistics potential and a high level of efficiency in the use of the transportation management system).

In conclusion, the resulting matrix allows us to identify the following areas for improving the transport and logistics activities of LLC Nestle UA: the presence of an above-average level of logistics potential and its use suggests that only the quality of the selected personnel involved in the transport and logistics activities of goods should be improved.

Symbols, for example HH means that a particular company is in a high position in the transport management system and transport and logistics potential.

As a quick summary, we note that although we have placed companies in the matrix according to their performance, their placement in the matrix may change depending on changes in the ratios.

5. DISCUSSIONS

Discussing the results obtained by us, it is necessary to highlight the key differences in comparison with similar ones. So, Puertas et al. [10] and Host et al. [11], for example, proposed a system of a model for evaluating the efficiency of the level of organization of the transport and logistics system of enterprises based on the theory of fuzzy sets.

Some studies [12-14] proposed a mechanism for implementing the controlling of transport and logistics services for a domestic industrial enterprise that combines three aspects of control.

Some studies [15-17] have developed a conceptual model of the strategic management of the national transport and logistics system in the context of the implementation of the European integration strategy, in which the distribution of functions, tasks of responsibility, and related resources is organically carried out both vertically (state-region (society)-enterprise) and horizontally between industries.

Other studies [18-20] have developed a system model of logistics management, which is formed under the influence of the external environment and involves a controlled influence on the processes of infrastructure formation, planning, organization, and the most optimal coordination and control of the movement of material, financial and information flows in accordance with the needs of economic development, including foreign trade relations, to ensure the uninterrupted supply of goods in accordance with the needs of consumers.

Discussing our results, they have both similarities and differences compared to others. We refer to similarities:

1. We also share a similar view that transport and logistics capacity plays a key role in international operations and transport management in general.

2. Similarly, our vision of the need for constant assessment of one's own potential.

Discussing the differences, we highlight the innovative aspects of the research results. Innovation in the presented methodological approach to assessing the effectiveness of the management of the transportation system of business structures based on the coordinating and integrating role of logistics. This technique is based on the selection of the most significant estimated indicators that allow an objective analysis of the transport and logistics potential. Structuring the methodology for assessing the logistics functionality allows you to identify the problem area and develop a set of organizational and economic measures that can be aimed at eliminating the identified problems.

One of the unique features of our study compared to others is the proposed matrix, demonstrating the result of calculating the integral indicator through a set of 8 main coefficients of transport and logistics potential.

Discussing the results, it should be noted that, for example, the calculation of the trend line, which showed a possible forecast of decline, was unexpected. In our opinion, the selected companies had potential for growth, but along with this, the forecast also has its inaccuracies.

Discussing the consequences, we note that they are of a practical nature when used by the managers of selected companies in their transport and logistics activities. The constant calculation of the matrix that we proposed in our study provides the necessary information for making management decisions in transport and logistics activities.

6. CONCLUSIONS

The estimation technique proposed by us is based on the determination of integral parameters with the calculation of the formula for the mean geometric idle time. Integral indicators can be used to identify the logistics potential and evaluate the effectiveness of the management of the transport and logistics system. In general, it should be noted a wide range of tools for assessing the effectiveness of the management of the transport and logistics system, the use of which makes it possible to comprehensively explore all aspects of the use of logistics resources and logistics potential. We have proposed to use a comprehensive assessment of the logistics potential and management efficiency, which is based on the generalization of integral indicators and determining the impact of the existing logistics potential on the efficiency of transport and logistics services for international trade.

In conclusion, summing up the results of the study, the following should be noted:

- Satisfactory logistical potential and logistical capabilities of transport and logistics trade enterprises of Ukraine, which creates conditions for its more efficient use in the future;
- Inefficient use of the existing transport and logistics potential today;
- The main problems of Ukrainian enterprises: the lack of a strategy for the development of the transport and logistics system, outdated methods of personnel management, the lack of a well-functioning system of motivation and staff development, the lack of a synergistic effect "The state-transport enterprises", which makes it impossible to stimulate their development; emphasis on traditional logistics operations, and, accordingly, the lack of innovative moments of implementation and development.

These trends and problems require high-quality management decisions that are balanced with modern realities, which would have a stimulating effect on the development of domestic industrial enterprises that implement transport and logistics processes.

Basically, the main results of the study can be presented in the following list:

1. Key indicators of transport and logistics potential for selected organizations in Ukraine were calculated.

2. Through the matrix approach, the level of potential is determined and the trend line shows the forecast of changes in the indicator in the future.

The study has a limitation by taking into account the specifics of the transport and logistics potential of only Ukrainian enterprises. This limitation has its consequences by not being able to test the effectiveness of the proposed assessment approach for other countries.

Certain limitations may be addressed in the future. Prospects for further research should be devoted to expanding the scope and involvement in the study of enterprises from neighboring countries of Ukraine, leading international trade with it: the Republic of Poland and Romania. It should be noted that it would be useful to analyze those organizations conducting international trade with Ukraine. You need to better understand the transport and logistics potential of the countries with which you trade.

In general, to summarize, it should be noted that transport and logistics potential is a complex phenomenon and requires detailed calculations. Our study demonstrates that new assessment approaches are always open to the development of transport and logistics capacity and new assessment approaches should continue to be applied.

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