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WATER TRANSPORT ENTERPRISES COMPETITIVENESS ESTIMATION MODEL

Natalia Maslii[1], Maryna Demianchuk[2], Valentin Ternovsky[3], Aleksandrs Kotlars[4], Ineta Geipele[5], Valerijs Skribans[6]

[1] Government Agency Institute of Market and Economic-Ecological Research of the National Academy of Sciences of Ukraine
Frantsuzkyi boulevard, 29, Odessa, Ukraine, 65044
masliy.natalia@gmail.com
[2] University of Warsaw
Krakowskie Przedmieście 26/28, 00-927 Warszawa, Poland
m.demianchuk@uw.edu.pl
[3] National University Odessa Maritime Academy
8, Didrikhson str., Odessa, Ukraine, 65052
ternovsky_vmk@ukr.net
[4] Transport and Telecommunication Institute
Lauvas 2, Riga, LV-1019, Latvia
Kotlars.A@tsi.lv
[5] Riga Technical University
Kalnciema iela 6-211, Riga, LV-1048, Latvia
Ineta.Geipele@rtu.lv
[6] Riga Technical University
Kalnciema iela 6-216, Riga, LV-1048, Latvia
valerijs.skribans@rtu.lv

This paper presents a developed model for assessing the competitiveness of water transport enterprises, taking into account their specific characteristics. The model includes eight components: economic, social, material and technical, geographical, innovation and information support, organizational and management, environmental, and infrastructural fields. It enables the diagnosis and comparison of the competitiveness level of water transport enterprises and provides recommendations for improvement. The research was conducted on maritime industry enterprises in the Odessa region as a case study. The results highlighted the need for optimization of port areas, infrastructure development, and attracting investments to enhance the competitiveness of the enterprises. The developed model can be valuable for analyzing and improving the competitiveness of maritime transportation enterprises and promoting regional development.

Keywords: Water transport, enterprises, competitiveness, mathematical modelling

1. Introduction

Ports and maritime transportation play a crucial role in international trade and the global economy. They are key elements in international logistics, facilitating the smooth movement of goods and cargo worldwide. Maritime transport is the most cost-effective means of transporting goods over long distances and contributes to the development of the global economy and the exchange of goods between countries. However, the significance of ports and maritime transport extends beyond logistics and the economy. They also impact sustainable development and the environment. Enhancing enterprise efficiency is an integral part of this process.

Improving enterprise efficiency is a key factor in achieving competitive advantages and sustainable growth in today's business landscape. It involves the efficient use of resources, process optimization, and achieving maximum results. Enterprises actively striving to enhance their efficiency are more likely to succeed and thrive in a competitive environment. Enhancing the competitiveness of maritime transportation enterprises is a crucial aspect of their success and sustainable development in the modern maritime industry. In an increasingly competitive environment, maritime transportation companies must take measures to improve their market position and attract customers.

The goal of this paper is to represent authors' developed water transport enterprises competitiveness estimation model. To achieve the goal, following tasks are set:

- To represent the current state of science in fields of water transportation and competitiveness estimation models development;
- To represent developed model;
- To show model application results.

The provided water transport enterprises competitiveness estimation economical – mathematical model covers economic, social, material and technical, geographical external environment aspects as well as additional: innovation and information support, organizational and managerial ecological infrastructure internal enterprise aspects.

2. Literature review

Maritime transport plays a crucial role in the global economy, ensuring efficient delivery of goods between different regions of the world. Literature analysis, based on the research objective, has identified three main thematic groups related to maritime transport: the economic impact of maritime transport and ports, the resilience and efficiency of maritime enterprises, and modeling and evaluation in this field.

Maritime transport and ports play a significant role in the economy, logistics networks, and urban development. The study by Glaeser and Kohlhase (2004) demonstrates a substantial reduction in transportation costs and its influence on cities and regions. They note that maritime transport contributes to the formation of economic activity and regional development. The role of ports in logistics networks and urban development is also important. The study by Fujita and Mori (1996) examines the influence of ports on the formation of major cities. They emphasize that ports serve as crucial nodes in logistics networks, facilitating the inflow of goods and capital, as well as providing jobs and economic growth for cities. Clark *et al.* (2004) highlights the significance of transportation expenses and infrastructure in explaining trade, market access, and per capita income growth. The authors examine indicators of transportation costs to the United States and find that port efficiency is an important determinant of transportation expenses. Danielis & Gregori (2013) present a methodology based on input-output analysis to assess the economic role of a port. They consider the specific case of the port system in the Friuli Venezia Giulia region in Italy and help understand the port's impact on the region's economy. Ducruet *et al.* (2018) investigate long-term relationships between global maritime flows and urban development. They reveal the role of ports and maritime transport in shaping urban structures and city development over an extended period.

Modeling and evaluation play a significant role in the development and optimization of maritime transport.

Ducruet *et al.* (2010) examines the evolution of the maritime network in the Atlantic region using graphical methods and cluster analysis. They analyze liner movements and identify changes in network structure and the role of key ports over a decade-long period. Wan *et al.* (2018) proposes a novel risk assessment model for maritime logistics chains based on fuzzy Bayesian networks. The authors apply this model to identify key risk factors in maritime supply chains and predict the probability of vessel delay. These findings are crucial for preventing accidents and optimizing logistics processes. Yang *et al.* (2018) presents an approach to risk assessment and prediction of vessel delay during compliance inspections with international security standards. The authors utilize vessel inspection data and construct a Bayesian network to analyze risks and determine the probability of delay. This enables port authorities to better plan and allocate resources for inspections. Valdez Banda and Goerlandt (2018) offers an engineering approach to designing safety management systems in maritime transport. The authors employ the STAMP (Systems-Theoretic Accident Modelling and Processes) model to represent and analyze safety control functions within ship traffic management systems in ports. This helps systematize safety functions and improve safety management in maritime transport.

In general, empirical study represents various aspects of maritime transport and ports. They investigate the economic impact of ports, their role in logistics networks and urban development, factors influencing the sustainability and efficiency of maritime transport, and propose strategies for industry improvement and modeling. Analyzing these sources helps us gain a deeper understanding of the complexities and interconnections in maritime transport and ports, as well as identify important aspects for further research and policy development in this field.

3. Formation of water transport enterprises competitiveness estimation model

It should be noted that the analysis of competitiveness indicators and the dynamics of the main indicators of the water transport sector is a prerequisite for the development of effective applied tools for

diagnosing the level of competitiveness of a water transport enterprise, taking into account the specifics of the activity of the water transport sector. The stages of such diagnostics, in which, according to the authors, the above is taken into account most fully, are shown in Figure 1.

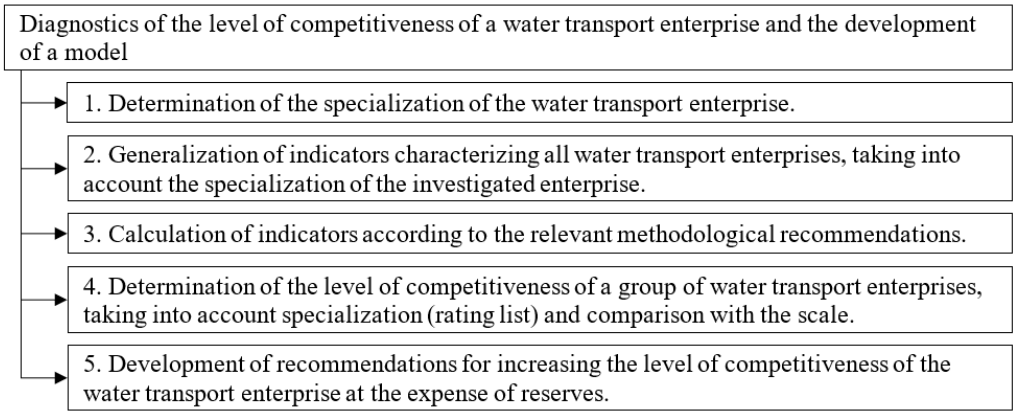

Figure 1. Stages of diagnostics of the level of competitiveness of the water transport enterprise (by authors)

The first stage of diagnostics is to determine the specialization of the activities of these enterprises, the criteria of which can be: type of used transport (such as a sea, river); organizational form of economic entities; type of economic activity; the size of the enterprise; type of work performed and services provided (such as logistics, unloading and loading, information, storage, organizational and administrative, transportation, maintenance); type of message (coastal and foreign).

The presented list of criteria is not exhaustive and may be supplemented.

At the next stage, it is necessary to generalize the indicators characterizing all water transport enterprises, taking into account the specialization of the studied enterprise and the subsequent development of methodological recommendations for calculating the coefficients, a complex indicator of the level of competitiveness and the scale of its characteristics. Diagnostics should be carried out simultaneously for a group of enterprises, which will help to compare the level of their competitiveness and form their generalized rating list and more detailed by individual components of the complex indicator. The 3rd and 4th stages of diagnostics have technical nature, simple calculation according below shown model. The last fifth stage is the development of recommendations for increasing the level of competitiveness of the water transport enterprise at the expense of the established reserves.

When determining the overall assessment of the component of the complex indicator of the level of competitiveness of water transport enterprises, it is necessary to take into account the degree of influence of its indicators and introduce the weighted values of these indicators, since not all of them equally affect the level and trends of changes in the level of a separate component. The complex indicator of the level of competitiveness of a water transport enterprise includes characterizing components and indicators, therefore, for the numerical determination of the complex indicator, it is proposed to use the following formula (Eq. 1).

$$CILC_{WTE} = \sum_{i=1}^{m}\left(\sum_{j=1}^{\mathrm{n}} I_{ij} \cdot W_{\mathrm{i}}\right) \cdot W_j, \quad (1)$$

where: *ij* the *j*-th indicator on the *i*-th component;

W_i – the degree of influence of the *j*-th indicator on the *i*-th component of the complex indicator of the level of competitiveness of the water transport enterprise $\left(\sum W_j = 1\right)$;

W_j – the degree of influence u that component by the total value of the complex index of the competitiveness of the enterprise waterway $(\sum W_i = 1)$;

n – is the number of indicators of the j-th indicators in the i-th component;

m – is the number of components of the complex indicator of the level of competitiveness of the water transport enterprise;

Note that $\left(\sum_{j=1}^{\mathrm{n}} I_{ij} \cdot W_{\mathrm{i}}\right)$ shows the value *i*-th of the component in view of its weight.

The determination of the weighted values of the indicators of each component can be carried out using the method of expert assessments. In this case, the sum of the weight values of the components of the complex indicator of the level of competitiveness of water transport enterprises is equal to one

$\left(\sum_{t=1}^{k} W_{com_t} = 1\right)$. According to the method of expert assessments, a number of experts - specialists in this field of activity are selected to determine significant values, guided by the experience and knowledge, who rank the indicators. In using the method of expert assessments, an important issue is to assess the degree of consistency of expert opinions. To assess the generalized degree of consistency of opinions for all indicators, a multiple rank correlation coefficient (concordance coefficient) is used according to the formula (Eq. 2):

$$w = \frac{12S}{m^2(n^3-n)}, \tag{2}$$

where m – is the number of factors;

n – is the number of observation units;

S – is the deviation of the sum of squares of the total ranks for all factors from the mean square of the sum of the ranks, determined by the formula (Eq. 3):

$$S = \sum_{i=1}^{n}\left(\sum_{j=1}^{m} R_{ij}\right)^2 - \frac{\left(\sum_{i=1}^{n}\sum_{j=1}^{m} R_{ij}\right)^2}{n}, \tag{3}$$

where R_{ij}– the rank for each i-th factor in the j-th unit together.

To calculate the weight values of the components or indicators of individual components, the method of expert assessments should be used using a point scale of values from 0 to 10. When calculating the final weight values, it is advisable to use the questionnaire and make calculations, as shown Table 1.

After ranking the weight values of the components and their characteristics, a complex indicator of the level of competitiveness of the aqua transport company is determined.

Table 1. Auxiliary table for determining the weight composite values and their indicators of a complex indicator of the level of competitiveness of water transport enterprises (Source: compiled by the authors)

Components (indicators) included in the complex indicator of the level of competitiveness of water transport enterprises	**Expert assessments**				**Integral rank assessment,** R_{Σ}	**Weight value of the component (indicator),** $W_{C(IC)}$
	Expert 1	**Expert 2**	**…**	**Expert i**		
Component (indicator) 1	R_{11}	R_{12}	...	R_{1i}	$R_{\Sigma^1} = \sum_{j=1}^{i} R_{1i}$	$W_{C(IC)^1} = \frac{R_{\Sigma}{}^1}{\sum R_{\Sigma}{}^j}$
Component (indicator) 2	R_{21}	R_{22}	...	R_{2i}	$R_{\Sigma^2} = \sum_{j=1}^{i} R_{2i}$	$W_{C(IC)^2} = \frac{R_{\Sigma}{}^2}{\sum R_{\Sigma}{}^j}$
…	…	…	…	…	…	…
Component (indicator) j	R_{j1}	R_{j2}	...	R_{ji}	$R_{\Sigma^j} = \sum_{j=1}^{i} Rji$	$W_{C(IC)^j} = \frac{R_{\Sigma}{}^j}{\sum R_{\Sigma}{}^j}$

Taking into account the peculiarities of the activities of enterprises in the field of water transport, their multidirectional activities, dependence on climatic and geographical conditions, financial condition, technical and technological support and other factors, it is advisable to develop a model method for diagnosing the level of competitiveness, which can be expanded with additional indicators that have a significant impact on level of competitiveness. The authors highlighted the components that, in our opinion, cover all the features of the activities of water transport enterprises, and indicators (Table 1), according to which it is proposed to diagnose their level of competitiveness. That is, the list of indicators is not exhaustive and can be supplemented.

In the proposed model, all indicators are selected in such a way that when they increase, the overall level of enterprise competitiveness increases, and when they decrease, the overall level of enterprise competitiveness decreases, which makes it possible to determine and compare changes in the index ratio in dynamics. The model is aimed at determining the competitiveness and comparing enterprises within the water transport sector at different levels of the economy. We believe that each indicator in each group of

indicators has an equal impact on the integral value of each component; similarly, each component has an equal impact on the complex indicator of the level of competitiveness of water transport enterprises.

Let us consider in more detail the groups of indicators of the proposed model for diagnosing the level of competitiveness of water transport enterprises, which consists of 8 components, in particular: economic, social, material and technical, geographical, innovation and information support, organizational and management, environmental and infrastructural (Table 2).

Table 2. Basic and additional components and indicators of a model for diagnosing the level of competitiveness of water transport enterprises

Components of a comprehensive indicator	Indicators of the components of a comprehensive indicator for diagnosing the level of competitiveness of water transport enterprises	Diagnostic methods
1. Economic	1.1. Level of profitability of a water transport enterprise	A; G
	1.2. Degree of attracting investment funds	A; G
	1.3. Share of a water transport enterprise in terms of freight turnover	A; G
	1.4. Coefficient of the enterprise value	A; G
2. Social	2.1. Level of wages of a water transport enterprise	A; G
	2.2. Level of job provision	A; G
	2.3. Level of labor productivity at the enterprise	A; G
3. Material and technical	3.1. Coefficient taking into account the parameters of berths	I; G
	3.2. Level of workload of the water transport enterprise	A; G
	3.3. State of the material and technical base of the enterprise (capital productivity)	A; G
4. Geographic	4.1. Share of the territory of the water transport enterprise in the volume of the territory of the place of presence	A; G
	4.2. Coefficient of integration of a water transport enterprise into the international and transboundary transport space	A; G
	4.3. Coefficient of potential transportation	A; G
5. Innovation and information support	5.1. Navigational and hydrographic support	A; G
	5.2. Technologies for transshipment and transshipment of goods	A; G
	5.3. Information and digital support	A; G
	5.4. Marketing activities (ways to attract customers, sales channels, transformation of services using technology)	M; G
6. Organizational and managerial	6.1. Level of the average load of water transport	A; G
	6.2. Level of the administrative and financial burden of the profit of a water transport enterprise	A; G
	6.3. Quality factor for the provision of services	A; G
7. Ecological	7.1. Level of pollution by the water transport enterprise of the surrounding territories and water areas	A; G
	7.2. Level of compensation for the consequences of pollution of the surrounding territories and water areas	A; G
	7.3. Level of environmental friendliness of the activity of the water transport enterprise	A; G
8. Infrastructure	8.1. Multimodality coefficient	I; G
	8.2. Coefficient taking into account the processing and storage parameters of a water transport enterprise	I; G
	8.3. Level of diversification of activities	A; G
Comprehensive indicator of the level of competitiveness of a water transport enterprise		I; C

Where: A – analytical; G – graphic; I - index, M -matrix, C -complex

The main reasons for including indicators in the model, as well as their essence and functions, are described below.

The level of profitability of a water transport enterprise characterizes the efficiency of economic and financial activities of water transport enterprises.

The degree of attraction of investment funds characterizes the amount of attracted investments in the equity capital of the enterprise, which takes into account the funds spent on the renewal of fixed assets, investments in working capital from attracted investment sources aimed at updating and improving the efficiency of navigation, hydrographic, innovative information and technological support.

The share of a water transport enterprise in terms of freight turnover characterizes the part of a separate water transport enterprise from the total freight turnover of the water transport sector according to the criterion of freight turnover for a certain period of time.

The coefficient of the enterprise value shows the level of excess or discrepancy of the average cost of enterprises in the field, which indicates its effectiveness. It demonstrates the excess of the enterprise value over the average cost of enterprises in the field of water transport, and below the discrepancy between the average cost of enterprises in this field.

The level of wages of a water transport enterprise characterizes the degree of correspondence of the average wages of employees of the enterprise in the field of water transport.

The level of job provision characterizes the degree of job provision of the population in the territory of the enterprise's presence per 100 people.

The level of labor productivity at the enterprise characterizes the ratio of labor productivity of workers of a water transport enterprise to the average level of labor productivity of workers in the field of water transport.

The coefficient taking into account the parameters of the berths show the maximum possible dimensions of ships that can be accepted by the water transport enterprise for service.

The level of workload of the water transport enterprise shows the correspondence of the freight traffic of the water transport enterprise to its carrying capacity.

The share of the territory of the water transport enterprise in the volume of the territory of the place of presence demonstrates the share of the territory of the enterprise in the volume of the territory of the place of presence.

The coefficient of integration of a water transport enterprise into the international and transboundary transport space demonstrates the share of a water transport enterprise in the volume of traffic on international water transport routes.

The coefficient of potential transportation demonstrates the profitability of the geographical location of water transport enterprises and existing and potential suppliers of goods; it is advisable to carry out using the method of expert assessments.

Navigational and hydrographic support, showing the provision and use of innovative geolocation and navigation products and technologies by the enterprise of water transport.

Technologies for transshipment and transshipment of goods, characterizing the provision and use of the latest highly efficient technologies for transshipment and transshipment of goods by a water transport enterprise using modern energy-efficient and resource-saving technologies.

Information and digital support, characterizing the available provision and use of the latest information technologies and systems by the water transport enterprise, taking into account the elements of electronic logistics, digitalization of its activities and the basic / additional services provided by it.

Marketing activity characterizes the use of digital tools of Internet marketing, virtual and augmented reality to increase the level of attendance at a water transport enterprise. When assessing this indicator, according to the authors, it is necessary to take into account the methods of attracting customers, sales channels, transformation of services using technologies, etc. on the application, for example, STEP analysis or STEEPV analysis.

The level of the average load of water transport characterizes the level of the average actual load of water transport from the average maximum important load.

The level of the administrative and financial burden of the profit of a water transport enterprise demonstrates the level of expenses for administrative activities in the profit of the enterprise.

The quality factor for the provision of services takes into account the time of service of vehicles (loading / unloading) per unit of cargo, the efficiency of customs and border control and the provision of services, the efficiency of logistics and the frequency of departures, punctuality and safety of cargo, the flexibility of the service, which is advisable to carry out using the method of expert assessments.

The level of pollution by the water transport enterprise of the surrounding territories and water areas characterizes the degree of pollution by the water transport enterprise of the surrounding territories and water areas with wastes of any nature. When assessing this indicator, according to the authors, it is necessary to take into account the presence of treatment facilities at the enterprise, which makes the work process environmentally friendly and more economical, since the treated wastewater is reused for household needs; the economically calculated consequences inflicted on the territory of presence.

The level of compensation for the consequences of pollution of the surrounding territories and water areas determines the sufficiency of measures and resources aimed at eliminating the consequences of pollution of the surrounding areas and water areas and the restoration of the eco-and biocenosis.

The level of environmental friendliness of the activity of the water transport enterprise is determined based on the degree of use by the water transport enterprise of alternative and renewable energy sources (solar panels, wind power plants, city power plants) and environmentally friendly fuels.

The multimodality coefficient shows the provision of a water transport enterprise with transport and infrastructure parameters / facilities.

The coefficient taking into account the processing and storage parameters of a water transport enterprise shows the ability of a water transport enterprise to transship, reload and store liquid, dry, containerized cargo and characterizes the efficiency of planning the level of workload, taking into account peak and / or seasonal loads on the enterprise.

The level of diversification of activities characterizes the level of implementation of functions in various areas of activity (for example, production and transportation), taking into account mobility (independence or attachment to the location) and outsourcing (the possibility of quickly transferring part of operations or attracting the necessary equipment to the activities of the enterprise). It is advisable to evaluate this indicator using the method of expert assessments.

4. Results

On the basis of the developed model, the authors diagnosed the level of competitiveness of water transport enterprises. For diagnostics, enterprises of various sizes, public and private, were selected, representing enterprises of the maritime industry of the Ukraine, the Odessa region were selected, providing processing, warehouse and other transport services, in particular: State Enterprise "Odessa Sea Trade Port", LLC "Transinvestservice", State Enterprise "Sea Trade Port "Yuzhny", State Enterprise "Sea Commercial Port "Chernomorsk". The main type of economic activity of enterprises is ancillary services to water transport and transport handling of goods. In generally, research data was collected for before war action beginning in the region (analysis include data from 2014 till 2021 year (last before war year)), so war situation have not influence on model evaluation.

For diagnostics developed model, information from open sources of information was used, in particular, publications of the Ministry of Infrastructure of Ukraine (2021), the Ministry of Environmental Protection and Natural Resources of Ukraine (2021), the State Statistics Service of Ukraine (2021), the Administration of the Seaports of Ukraine (2021), the State Service of sea and river transport of Ukraine (2021), data of statistical, financial and / or management reporting from the websites of the surveyed water transport enterprises for 2014-2020, as well as using the analytical online system "YouControl" (2021) and the Unified portal of public services "DIIA" (2021).

In the research, two surveys of experts of the transport industry of Ukraine were conducted. First of them determine of the weight of the individual components of the model, results of it are shown in the Table 3 column "the weight". The second, work name "Monitoring the level of competitiveness of water transport enterprises" in accordance with the methodology described above, supplemented the quantitatively calculated indicators. Summary table of calculations provided in the Table 3.

Unfortunately, due to the limited volume of the article, the authors cannot reflect the detailed calculations of each indicator, display the representativeness of the sample of experts and many other issues related to the practical application of the model. In this issue, it is necessary to take into account the scientific and methodological purpose of the article - to reflect the developed mathematical model. The substantiation of its practical advantage will be considered in subsequent works, including on the example of practical application in the EU.

However, on example of SE "Odessa STP" port, calculations are shown in Figure 2. and Figure 3.

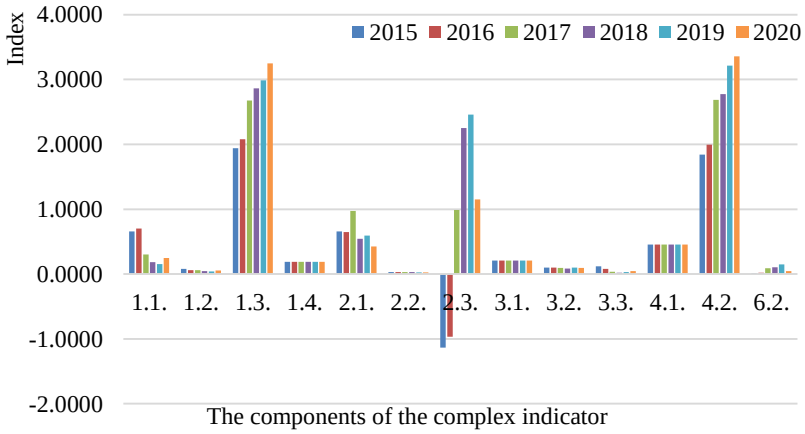

Figure 2. The dynamics of changes in the indicators of the components of the comprehensive indicator of competitiveness of SE "Odesa STP" (by authors)

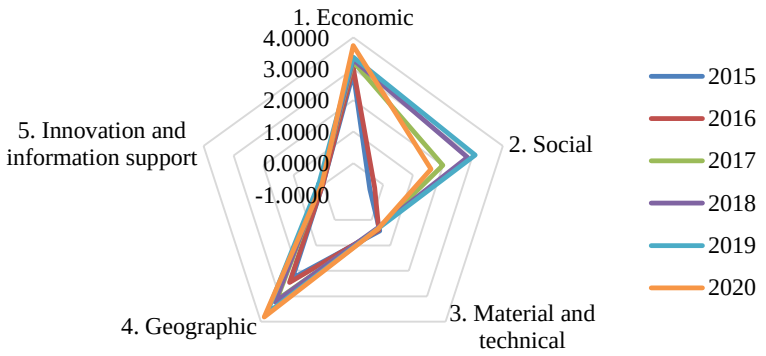

Figure 3. The dynamics of changes in the values of the main components of the comprehensive indicator of competitiveness of SE "Odesa STP" (by authors)

Comparison of competitiveness all ports in Odessa region is shown in Table 3.

Table 3. Estimated average values of the components and their indicators of a complex indicator of the level of competitiveness of water transport enterprises, taking into account the weight value

Components and indicators	**The weight**	**SE STP Yuzhny**	**LLC TIS**	**SE Odessa STP**	**SE SCP Chernomorsk**
1. Economic	0,125	6,399	5,473	3,256	2,727
1.1. Level of profitability	0,25	0,448	0,452	0,374	0,261
1.2. Degree of attracting investment funds	0,25	0,057	0,118	0,058	0,063
1.3. Share of enterprise in terms of freight turnover	0,25	5,358	4,493	2,635	2,298
1.4. Coefficient of enterprise value	0,25	0,536	0,410	0,189	0,105
2. Social	0,125	6,813	7,834	1,461	3,566
2.1. Level of wages	0,333	0,738	0,672	0,640	0,363
2.2. Level of job provision	0,333	2,753	3,580	0,029	1,913
2.3. Level of labor productivity at enterprise	0,333	3,322	3,583	0,791	1,290
3. Material and technical	0,125	0,854	0,811	0,362	0,540
3.1. Coefficient taking into account the parameters of berths	0,333	0,333	0,331	0,209	0,216
3.2. Level of workload	0,333	0,195	0,187	0,097	0,069
3.3. State of the material and technical base of enterprise (capital productivity)	0,333	0,325	0,293	0,056	0,255
4. Geographic	0,125	4,930	4,624	3,102	7,833
4.1. Share of the territory of enterprise in the volume of the territory of the place of presence	0,333	0,017	0,185	0,456	0,005
4.2. Coefficient of integration of enterprise into the international and transboundary transport space	0,333	4,913	4,439	2,646	7,828
5. Organizational and managerial	0,125	N/D	0,020	0,071	N/D
5.1. Level of the administrative and financial burden of the profit of enterprise	0,333	N/D	0,020	0,071	N/D
Comprehensive indicator of the level of competitiveness of enterprise		18,996	18,762	8,253	14,666

Summarizing the research carried out, we can say that the most competitive seaport of the studied enterprises is the SE "STP "Yuzhny", which is close to LLC "TIS". It should be noted that the last place is taken by the SE "Odessa SCP", behind the SE "SCP "Chernomorsk".

Mathematically, the absence of some data does not affect the overall result, given the low proportion of these indicators. Mathematically, unstable leadership position of the SE "STP "Yuzhny" is determinate by leadership in 3 (form 5) groups of indicators.

In the process of research, it was established that it is necessary to increase the level of competitiveness of water transport enterprises in the Odessa region. In particular, in order to increase the level of competitiveness of the SE "Odessa Sea Port", it is advisable to develop access roads from all sides of the port and its components. Considering that the port is located on the territory of a city of regional significance, automobile access roads are especially important, which during seasonal periods are filled with large-sized and large-capacity vehicles and create not only traffic jams, but also damage the road surface. It is also important to create an additional railway entrance with the accompanying development of nearby stations. In view of other ports of the Odessa region, it is advisable to reconstruct the port's berths and carry out dredging works. All this will ensure the development of the enterprise and the full use of all available capacities, in particular, the container terminal. Taking into account the territorial location of LLC "TIS" in the space of SE "STP "Yuzhny", it is advisable to build / reconstruct highways connecting these enterprises with neighboring cities.

It should be noted that for all the studied water transport enterprises of the Odessa region, it is necessary on an ongoing basis to optimize the port areas to obtain not only additional sources of funding, but also the possibility of creating production facilities on their territories, which will not only reduce the cost of production by reducing costs for its transportation, but will also provide additional cargo volumes for the ports themselves. However, to carry out such optimization of territories, it is necessary to attract potential investors on the basis of public-private partnership, which can be realized by introducing a free economic zone on the territory of ports, as, for example, in Poland, Georgia and other countries, which allows entrepreneurs to use all the advantages of functioning in the territories port.

5. Conclusion

The developed model, including the main and additional components and indicators, will allow diagnosing the level of competitiveness of water transport enterprises, taking into account their specialization, in particular the type of economic activity, the organizational form of the entity, the size of the enterprise, the type of work performed and services provided and other features, which will contribute to identification of weak points of the enterprise, which need to be paid attention to and improve, potential opportunities and reserves, their rational use for effective adjustment of the strategic and operational plans for the development of enterprises.

The presented model, taking into account the high assessments of the application in Ukraine, is being prepared to assess the competitiveness of a number of European ports in the Baltic Sea Region.

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