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АНАЛИЗ ОБЩЕСТВА КАК СОЦИАЛЬНО-ЭКОНОМИЧЕСКОЙ СИСТЕМЫ: ПРОСТРАНСТВЕННО-ТЕРРИТОРИАЛЬНАЯ ПРИРОДА, ФУНКЦИИ И ОСОБЕННОСТИ

Проведен анализ социально-экономической системы общества. Определены основные направления реформы децентрализации, схематично рассмотрены этапы формирования общин, выделены основные функции территориальных общин, разъяснено законодательную часть объединения общин. Проанализирован зарубежный опыт по созданию территориальных общин. Авторами предоставлено собственное определение общины как социально-экономической системы.

Ключевые слова: территориальная община, социальное развитие, ресурсное обеспечение, организационное обеспечение, административно-территориальная реформа.

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DEVELOPMENT OF THE METHODICAL APPROACH TO THE FORMATION OF A COMPETITIVE STRATEGY OF BILGOROD-DNESTROVSKIY SEA TRADING PORT

Розглянуто методичні аспекти формування конкурентної стратегії морського порту як регіонального транспортного вузла. Описано використання для цих цілей економіко-математичної моделі транспортної системи доставки вантажів від відправників до одержувачів через порти перевалки. Моделювання ринкового середовища дозволяє обґрунтувати структуру вантажообігу портів та їх спеціалізацію по видах вантажів. Наведено результати розрахунків контрольного прикладу для обґрунтування конкурентної стратегії Білгород-Дністровського морського торговельного порту.

Ключові слова: *конкурентна стратегія, морський торговельний порт, транспортна система, портова спеціалізація.*

1. Introduction

Competition as a rivalry for the best conditions for the production and sale of goods and services requires the continuous search and implementation of new technical, technological, marketing, management, organizational and psychological methods and investment funds aimed at satisfying the needs of customers and profit. [1] Ukraine seeks to take not the last place in export and import of the world by sea transport, so ports need to develop the right approach to competition with the neighboring ports and improve the efficiency of its services. High competitiveness of ports is primarily ensured by their market share in the structure of the sea port services of Ukraine. This

share is provided by technical and technological parameters of ports, as well as their accessibility to external and internal transport systems. Therefore, the formation of a competitive port strategy requires a systematic approach. The management of port resources within the whole transport system is a complex and urgent task, as it allows, through the synergy effect, to increase the efficiency of the entire transport process of delivering goods from senders to recipients.

2. The object of research and its technological audit

The object of research is the process of forming directions of increasing the competitiveness of ports, which is the result of the interaction of all elements of their production system and the external environment of providing port services.

The efficiency of the ports depends on external factors that are realized in the market of cargo distribution between ports and modes of transport, which gives ports a certain market position. This process involves all the internal resources of ports, the use of which the valley is regulated by the ratio of demand for them and their supply to the market. Thus, the formation of a competitive port strategy requires consideration of the balance of internal and external factors of their production activities and development. Isolated port reviews can't achieve the goal and is inadequate.

3. The aim and objectives of research

The aim of this work is determination of the measures to improve the efficiency of the port. To achieve this aim, the following tasks are defined:

1. To study of structure and dynamics of cargo processing.

2. To determine priority cargoes.

3. To analyze the volume of cargo turnover of ports as a share of cargo flows in the market of port services.

4. To develop methods of forming the volume of cargo turnover of ports using a mathematical model of cargo distribution between ports and modes of transport.

5. To optimize the use of sea ports resources within the transport system, which will allow create a competitive port strategy within the framework of the system approach.

4. Research of existing solutions of the problem

Author of the work [2] was the first who have formulated the notion of competition as a rivalry, which increases prices while reducing supply and reduces them with increasing supply.

Analysis the approaches to researching the activities of competitors allows formulate some general provisions:

– the techniques begin with warning procedures. This may be setting competitors' goals, collecting information, choosing competitors, etc.;

– the techniques include the analytical part. Each author analyzes certain aspects of competitor activity: current strategies, assumptions, opportunities [2]; establishment of strategies, assessment of strengths and weaknesses, possible reactions [3]; analysis of market share, assessment of financial stability [4];

– the result of the implementation of these techniques is:
1) in one case – an assessment of the reaction of competitors;
2) in the other – the choice of competitors, which should be attacked and which should be prevented;
3) in the third – the construction of a competitive market map.

The analysis of the structure and content, the wording and interpretation of the concept of «competition» allows to draw the following conclusions: the concept of «competition» proposed by various authors [3–7] does not fully meet the requirements of systemic and complexity. They characterize only one of the many aspects of competition established by and other authors, each in its field of research.

Almost all definitions regard the category of «enterprise competitiveness» as a constant value, but it, like many other economic categories, is not. In view of these shortcomings the following definition of the competitiveness of the enterprise is formulated [8]. The enterprise competitiveness means the complex characteristic (ability) of an enterprise that characterizes its ability at any time and within its competence to ensure its competitive advantages and profitability. It takes into account adaptation to constantly changing conditions of the internal and external environment, as well as favorably distinguish the enterprise from competitors and give market benefits of products or provided services.

Investigation of the competitiveness of sea ports [9] clarifies the definition of this category, as the characteristic of the port, which describes the market's compliance with the requirements of ports service users. It determines market positions (port market share) and prevents redistribution of the market in favor of competitors. From these positions it is proposed to assess the competitiveness of the port based on an integrated indicator that takes into account the complex port's potential in the dynamics of its development. A model of cargoes redistribution between ports is formalized [9], but it does not describe the characteristics of port resources and modes of transport for optimization the efficiency of their development. It is necessary to assess the competitiveness of ports as the ability of ports to perform services through the efficient use of their resources.

In [10], the competitive strategy of ports means a set of management measures and actions that provide competitive advantage. The tasks of forming a competitive strategy are solved in relation to the situation on the market, taking into account the set of external and internal factors influencing the competitiveness of enterprises. The priority factors influencing competitiveness are recommended: the quality of port services, the value of port services, port management, the information system, the psychological climate in the port, the relationship with related organizations, the competence of staff. In [10] it is considered the competitive environment of seaports. In [11] it is argued that in order to maintain competitiveness and integrate into the supply chain structures of major producers and distributors, the port should shift the emphasis from the sea front to the logistics center and develop it as a logistics center. However, the methodological aspects for the implementation of these provisions have not been developed.

In the work [12] it is assessed the operational efficiency of sea ports to reflect their status and identify their position in the existing competitive environment.

In [13] it is presented an analysis of the problems of coordination in the networks of inland ports, seaports and mechanisms for solving these problems. In [14], it is argued that private sector participation in the port industry can to some extent improve the efficiency of ports, which in turn will increase their competitiveness. In modern studies, an increasingly important role is assigned to ports as a regional transport hub, so their competitiveness should be managed by the government [15].

Consideration of ports in the system of all ports of the region or country requires a hierarchical, at the same time flexible, management system [16, 17], which is quite complex and is not the problem completely investigated. In this paper the task is developed methodological aspects of managing the competitiveness of ports based on the analysis of existing approaches.

5. Methods of research

A number of special methods are applied in the work that allows obtaining a quantitative assessment of certain aspects of the financial activity of the port. The horizontal analysis was applied in the process of comparing each position of port reporting with the previous period. The vertical analysis was applied in determining the structure of financial indicators with an estimation of the influence of various factors on the final result. Methods of economic-mathematical modeling are used for substantiation of design decisions.

6. Research results

The market share of the port in the structure of cargo turnover of all ports of the country points the level of port dominance in the market. The article proposes to start the formation of a competitive strategy by the calculation of market shares of ports and the establishment of priority competitors on the basis of separation from the whole complex of those that are in close proximity to the port or have a significant impact on its activities.

Table 1 shows the share of cargo turnover of ports of Ukraine. Table 1 shows that for some ports, the situation for 2015–2017 years has changed significantly. Thus, the share of the port of Yuzhny decreased from 33.6 % to 19.8 %. Port of Kherson reduced its share in the country's cargo turnover from 2.9 % to 1.3 % and went up to the higher place than the port of Berdiansk. Regarding the port of Bilhorod-Dnistrovskyi, in the last three years its share does not even amount to 1 % in total cargo turnover of Ukraine. From 0.5 % to 0.2 %, port of Bilhorod-Dnistrovskyi has reduced its turnovers.

In accordance with the obtained values of the ports of cargo turnover, their distribution in groups can be performed as follows: the total range of change of the particle is divided into 4 parts (Table 2).

The first part consists of leaders (ports of Odessa and Yuzhny), the second part consists of ports above the average market share («Chernomorsk», Mykolaiv), the third part consists of ports below the average market share (Mariupol, Izmail, Kherson, Oktyabrskiy) and the fourth part consist of outsiders – 5 ports, the largest share of which has the port of Berdiansk.

Table 1

Distribution of occupied shares of the market by years among ports of Ukraine for the period 2015–2017, %

Seaports	2015	2016	2017
Odessa	17.689	19.166	10.985
Yuzhny	33.587	29.828	19.837
«Chernomorsk»	11.931	12.101	7.246
Mariupol	6.211	5.771	2.921
Izmail	3.336	4.313	2.070
Mykolaiv	15.370	17.021	10.260
Kherson	2.858	2.818	1.348
Berdiansk	3.077	2.885	0.951
Reni	0.627	0.738	0.381
Olvija (Oktyabrskiy)	4.778	4.963	3.069
Ust'-Dunay	0.016	0.019	0.011
Bilhorod-Dnistrovskyi	0.495	0.351	0.184
Skadovsk	0.026	0.025	0.007
Total	100	100	100

Table 2

Distribution of ports of Ukraine by classification groups

Port classification groups according to market volumes			
1 group	2 group	3group	4 group
19.83–10.99 %	10.26–7.25 %	3.07–1.3 %	0.95–0.007 %
Odessa, Yuzhny	«Chernomorsk», Mykolaiv	Mariupol, Izmail, Kherson, Oktyabrskiy	Reni, Berdiansk, Skadovsk, Bilhorod-Dnistrovskyi, Ust'-Dunayskiy

Other ports occupy very low values of occupied market shares, including Bilhorod-Dnistrovskyi, Reni, Skadovsk, Ust'-Dunayskiy.

In the process of development of a competitive strategy of the port, it is expedient to allocate the goods which have the greatest weight in the structure of cargo turnover of the port. Such goods for port of Bilhorod-Dnistrovskyi in 2016–2017 years are timber cargoes (89.61–59.15 %) and grain (1.28–10.61 %). From Table 3 it is possible to see that ports of Kherson, Chernomorsk and Yuzhny may serve as the most significant competitors of the port of Bilhorod-Dnistrovskyi for timber cargoes. But the share of port of Bilhorod-Dnistrovskyi for timber in the general structure is rather significant and overwhelming (67.76 %).

Table 3

Distribution of timber cargoes market shares among the ports of Ukraine by years, %

Seaports	Volumes, thousand tons		Structure		Growth of particles
	2016	2017	2016	2017	
Bilhorod-Dnistrovskyi	336.72	222.91	67.76	67.76	0
Kherson	41.19	39.75	8.29	12.08	3.79
«Chernomorsk»	51.179	57.73	10.30	17.55	7.25
Yuzhny	67.86	8.59	13.65	2.61	−11.04
Total	496.95	328.98	100.00	100.00	–

The development of mixed traffic has added a new direction to inter-port competition. In accordance with the general strategy of the logistic concept, all transportation from the place of origin of the cargo base to the final destination has become under the responsibility of one carrier (the operator of mixed freight), which projects the route, including transshipment points.

As a result of these changes, the competition between ports has entered the international level. Thus, the main factor in the competition of the port is not only the quality of port services, but its accessibility to internal transport systems, the development of cross-border rates of practice. In practice this means that the shipping company can choose the port of call not because it provides the cheapest services, but on the basis of a comprehensive analysis of the entire route of the carriage. It may turn out that a port with a high payment service is better because of the advantages of further internal transport or sea transportation from this port [18].

The paper proposes a systematic approach to substantiate the competitive strategy of a seaport using an economic-mathematical model of cargo distribution between ports in the process of forming freight delivery schemes from senders to consumers, which is generally presented in [19, 20].

Mathematical model of the problem in the general form:

(1) – target function for minimum transport and port costs:

$$Z = \sum_i \sum_k \sum_p R_{ikp} \cdot X_{ikp} + \sum \sum \sum R_{kjp} \cdot X_{kjp} \to \min, \qquad (1)$$

where R_{ikp} – the cost of delivering one ton of cargo p from port k to region i; R_{kjp} – cost of delivery of cargo p from area j in the territory of Ukraine to port k; X_{ikp} – the volume of cargo transportation of the name p between region i and port k; X_{kjp} – the volume of cargo transportation of the name p between port k and area j.

(2) – limitations on the export (or import) of offshore areas to the transshipment ports for each region and that cargo type p:

$$\sum_k X_{ikp} \le Q_{ip}, \forall i, p, \qquad (2)$$

where Q_{ip} – volumes of freight traffic by kind of goods p and regions of the world i.

(3) – limitations on the throughput capacity of the transshipment ports to (time budget):

$$\sum_i \sum_p t_{kp} \cdot X_{ikp} \le T_k, \forall k, \qquad (3)$$

where T_k – the time budget of port k (working hour); t_{kp} – labor intensity of cargo p at the port k (working-hour/ton).

(4) – limitations on the satisfaction of demand for goods in areas in the country j and cargo type p:

$$\sum_k X_{kjp} \le G_{jp}, \forall j, p, \qquad (4)$$

where G_{jp} – the volume of freight traffic by kind of goods p and the internal production areas j.

(5)–(6) – balance conditions that the volume that the goods delivered is equal to the volume of the exported cargo for each port k and the cargo type p:

– for imported cargoes (P_+):

$$\sum_i X_{ikp} + Q_{pk} = \sum_o X_{kjp} + X_{pk}^{fin}, \forall p \in P_+, k, \qquad (5)$$

where X_{pk}^{fin} – the final quantity of cargo p left in the port k in the end of the period under consideration; Q_{pk}^{in} – initial quantity of cargo p, located in the port k;

– for export cargoes (P_-):

$$\sum X_{ikp} + X_{pk}^{fin} = \sum X_{kjp} + Q_{pk}^{in}, \forall p \in P_-, \qquad (6)$$

where X_{pk}^{fin} – the final quantity of cargo p left in the port k in the end of the period under consideration; Q_{pk}^{in} – initial quantity of cargo p, located in the port k.

(7) – conditions of nonnegative variables:

$$X_{ikp} \ge 0, X_{kjp} \ge 0, X_{pk}^{fin} \ge 0. \qquad (7)$$

For the test case reporting for ports in 2017 was used. The main competitor of the port of Bilhorod-Dnistro-vskyi (BDSP) is the port of Kherson (KhCP), the main cargo of its cargo turnover. The largest share in the structure of the cargo turnover of BDSP is forest and grain cargoes. Therefore, for example, two ports (BDSP and KhSP) and two types of cargo (forest, grain) are selected.

According to the data in 2017, 263 thousand tons of timber cargos and 480 thousand tons of grain were exported at berths of ports of Bilhorod-Dnistrovskyiand Kherson. The actual distribution of cargo over the ports of overload is given in Table 4.

Table 4

The structure of the control example's ports cargo turnover, thousand tons

Cargoes	BDSP	KhSP	Total
Timber cargo	223	40	263
Grain	40	440	480
Total	263	480	743

Formulation of the problem of distributing cargoes between ports (control example). It is known that: timber cargo ($p=1$) and grain ($p=2$) are transported through transshipment ports of the BDSP ($k=1$) and KhSP ($k=2$) for export from the areas j ($j=1$; 2; 3) on the territory of Ukraine in the amount of G_{jk} (ths. tons) cargoes:

1) timber $G_{11}=100$ (first area), $G_{21}=100$ (second area), $G_{31}=63$ (third area);

2) grain $G_{12}=160$ (first area), $G_{22}=160$ (second area), $G_{32}=160$ (third area).

These cargoes are intended for overload in ports with subsequent shipment to importing countries ($i=1$; 2). Overloading is carried out at universal transshipment complexes (UTC) in BDSP and KhSP, the budget of which is T_1(BDSP)$=50$ (thousand norm-hours), T_2(KhSP)$=50$ (thousand norm-hours). In KhSP there is also an elevator (E) for grain reloading. The budget time of the elevator in the reporting period is T_3(HTMP)$=50$ (thousand norm-hours). The volumes of sea transportations are Q_{ip} (ths. t) cargoes:

1) timber $Q_{11}=100$ (region 1), $Q_{21}=163$ (region 2);

2) grain cargo $Q_{12}=200$(region 1), $Q_{22}=280$(region 2).

It is known the norms of labor intensity of cargo handling for each cargo and each port t_{kp} (norm-hours/t). Also it is known the cost of delivery by sea C_{ikp} and handling C_{kp} of goods in ports ($R_{ikp} = C_{ikp} + C_{kp}$), and the cost of delivery to ports by rail (UAH/t) from each area to each port (C_{kjp}), which are given in Table 5. Set the initial quantity of cargo in the BDSP of forest 10 thousand tons and grain 5 thousand tons; in the KhSP of the forest 10 thousand tons, grain 20 thousand tons. It is necessary to determine the optimal plan for transportation to a minimum of transport and ports costs.

The control parameters Xi in the model (8)–(26) have following meaning:

– the variables X1÷X8 denote the volumes of transportation by sea and the volume of overload in the ports;

– the variables X9÷X20 denote the volumes of transportation by rail;

– the variables X21÷X24 denote the volumes of the final quantity of cargo (timber or grain) in the ports of transshipment of BDSP and KhSP, which remain at ports at the end of the period.

Table 5 shows the source data and the actual distribution of goods between the ports of the BDSP and KhSP.

The structure of Table 5 has four blocks. In the first block there are eight variables X1÷X8, which describe the transportation by sea and transshipment in ports. In the second block all cages are forbidden, because the task is not allowed transportation by land transport to regions of the world. The fourth block includes variables X9÷X20 and describes all variants of delivery of goods to the ports by rail. The third block characterizes the transshipment ports: the initial quantity of goods Q_{pk}^{in} and the variables X21÷X24, which represent the volume of the final quantity of cargo (timber or grain) in the ports of transshipment of BMTS and KhSP remaining in ports at the end of the period. In each cell of the first and fourth blocks are located: the values of the variables Xi, the cost of delivery in the variant Ri (and=1÷20), labor intensity of cargo handling ti ($i=1÷8$).

Mathematical model of the control example for numerical data:

(8) – target function for minimum transport and ports expenses:

$$Z_{min} = 8.3 \cdot X1 + 11.5 \cdot X2 + 18.3 \cdot X3 + 17.5 \cdot X4 + 7.5 \cdot X5 +$$
$$+ 8.4 \cdot X6 + 16.5 \cdot X7 + 16.0 \cdot X8 + 3.5 \cdot X9 + +10.0 \cdot X10 +$$
$$+ 6.2 \cdot X11 + 2.8 \cdot X12 + 7.5 \cdot X13 + 7.1 \cdot X14 + 11.0 \cdot X15 +$$
$$+ 7.4 \cdot X16 + 4.0 \cdot X17 + 7.8 \cdot X18 + 5.8 \cdot X19 + 10.5 \cdot X20. \quad (8)$$

(9)–(12) – limitations on the export of transshipment seaports to world regions:

$$X1 + X2 = 100, \quad (9)$$
$$X3 + X4 = 200, \quad (10)$$
$$X5 + X6 = 163, \quad (11)$$
$$X7 + X8 = 280. \quad (12)$$

(13)–(15) – limitations on the throughput capacity of the transshipment ports:

– port of Bilhorod-Dnistrovskyi – at universal transshipment complexes UTC:

$$0.1 \cdot X1 + 0.007 \cdot X3 + 0.11 \cdot X5 + 0.07 \leq 50; \quad (13)$$

– port of Kherson – at universal transshipment complexes UTC:

$$0.13 \cdot X2 + 0.13 \cdot X8 \leq 50; \quad (14)$$

– port of Kherson in elevator:

$$0.044 \cdot X4 + 0.044 \cdot X6 \leq 50. \quad (15)$$

Table 5

Actual distribution of cargoes between the ports of Bilhorod-Dnistrovskyi and Kherson

Regions of the world i cargoes p	BDSP	KhSP	area1		area2		area3		Q_{ip} T_k
	UTC	UTC elevator	timber cargo	grain	timber cargo	grain	timber cargo	grain	
Region 1 timber cargo	R1=8.3 x1=60 t1=0.1	UTC R2=11.5 x2=40 t2=0.13	–	–	–	–	–	–	100
Region 1 grain	R3=18.30 x3=10 t3=0.07	elevator R4=17.5 x4=190 t4=0.044	–	–	–	–	–	–	200
Region 2 timber cargo	R5=7.50 x5=163 t5=0.10	UTC R6=8.4 x6=0 t6=0.13	–	–	–	–	–	–	163
Region 2 grain	R7=16.5 x7=30 t7=0.07	elevator R8=16.0 x8=250 t8=0.044	–	–	–	–	–	–	280
BDSP Q_{pk}^{in} X_i	Timber cargo $Q_{11}^{in}=10$ x21=20	grain $Q_{12}^{in}=5$ x22=5	3.5 x9=100	6.2 x11=20	7.5 x13=90	11 x15=20	4 x17=43	5.8 x19=0	T₁=50
KhSP Q_{pk}^{in} X_i	Timber cargo $Q_{21}^{in}=10$ x23=0	grain $Q_{22}^{in}=20$ x24=20	10 x10=0	2.8 x12=140	7.1 x14=10	7.4 x16=140	7.8 x18=20	10.5 x20=160	T₂=50 T₃=50
T_k, G_{ip}	50	50;50	100	160	100	160	63	160	–

Note: source data of the control example.

(16)–(21) – limitations on the transport of goods from areas in the territory of Ukraine to the ports:

$$X9 + X10 = 100, \tag{16}$$

$$X11 + X12 = 160, \tag{17}$$

$$X13 + X14 = 100, \tag{18}$$

$$X15 + X16 = 160, \tag{19}$$

$$X17 + X18 = 63, \tag{20}$$

$$X19 + X20 = 160. \tag{21}$$

(22)–(25) – the balance conditions that the volume of the delivered goods equals the volume of the exported cargo for each port and the type of cargo:

$$X1 + X5 + X21 = X9 + X13 + X17 + 10, \tag{22}$$

$$X3 + X7 + X22 = X11 + X15 + X19 + 5, \tag{23}$$

$$X2 + X6 + X23 = X10 + X14 + X18 + 10, \tag{24}$$

$$X4 + X8 + X24 = X12 + X16 + X20 + 20. \tag{25}$$

(26) – the conditions of nonnegative variables:

$$Xi \geq 0, i = \overline{1;24}. \tag{26}$$

In the optimal plan the delivery of cargos has completely exported from districts of suppliers through the trading sea ports of Bilgorod-Dnestrovsky and Kherson and satisfied all the needs of the importing regions of the cargo (Table 6). The analysis of the optimal distribution of cargoes between ports is shown in Table 7. As a result of optimal distribution of cargoes between ports timber cargoes are all overloaded in BMSP, and grain cargoes are processed in the KMSP.

Port transshipment complexes have reserves of production capacity: 45 % of BDSP, 60 % – KhSP. In the optimal plan, there is an increase of the time budget for transshipment of cargo in BDSP by 3.62 % and in KhSP the grain elevator with a 4.5 %, while the universal complex for timber cargo processing in KhSP is not used.

The control example shows that the optimal plan reduces the expenses in general in the delivery system of cargoes. This confirms the efficiency of port specialization by kind of cargo as the main factor in increasing their competitiveness.

In the control example the effect in the system of enterprises is achieved by saving costs from transportation and handling of cargoes in the amount of 1010 thousand UAH. It can be concluded that the use of the system approach allows obtaining the synergy effect in achieving the optimal strategy of competitiveness of the port infrastructure of the region (Table 8).

Table 8

Optimal and fact expenses of ports and modes of transport, thousand UAH

Cargoes	The expenses of maritime transport				The expenses of rail transport		Total
	Total		Including the ports				
	BDSP	KhSP	BDSP	KhSP	BDSP	KhSP	
Total plan	2383	7660	684	405	1584	2892	14519
Total fact	27119	7934	610	516	1541	3335	15592
The whole change	–336	–274	74.5	–627	+43	–443	–1073
Plan by types of transport	10043		1089		4476		14519
Fact by type of transport	10653		1125.5		4612		15324
Change by type of transport	–610		–36.5		–400		–1010

With the optimal schemes of transportation by sea, there is a reduction in expenses by 610 thousand UAH, in transportation by rail the expense's reduction is 400 thousand UAH. In general, in the ports there is a slight reduction in costs of 36.5 thousand UAH, but at the same time the volume of cargo flows change only by the structure, which should be beneficial to the ports, as it confirms the effectiveness of their specialization by type of cargo [21].

7. SWOT analysis of research results

Strengths. The strength of this study is the use of an economic-mathematical model that allows to obtain new information about competing ports, their optimal cargo turnover and calculate the synergistic effect for the entire transport system.

Weaknesses. The weak side is that the model does not take into account another criterion, which minimizes the time of delivery of goods.

Opportunities. The methodology allows consider a lot of factors affecting the competitiveness of ports and in case of their change it is possible repeat the calculations to form a competitive strategy in the mode of the current planning and operative monitoring of the results.

Threats. Threats to the results of the conducted studies are that the conditions

Table 6

The optimal plan for cargo distribution between the ports of Bilhorod-Dnistrovskyi and Khersonskiy

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X21	X22	X23	X24
Value	100	0	0	200	163	0	20	260	10	25	10	0
Variables	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20
Value	100	0	0	160	100	0	0	160	63	0	40	120

Table 7

Actual and optimal cargo turnover of ports and time spent on transshipment

Indexes	BDSP			KhSP		
Cargo turnover, thousand tons:	optimal plan	fact	% of change	optimal plan	fact	% of change
– timber cargo	263.0	243	117.9	0	40	0
– grain	20.0	40	50	460	440	104.54
– total	283	263	107.6	460	480	95.9
Time, spent on transshipment (UTC/elevator), norm-hours	27.7	26.73	103.62	20.24/-	19.36/5.2	104.5/-
Use rate	0.55	0.53	103.8	0.40	0.38	105.3

of the formation of schemes for the cargoes delivery are of an uncertain nature, therefore, in order to increase the reliability of calculations, it is necessary to analyze the production and financial risks of the ports.

8. Conclusions

1. Calculations of the structure and dynamics of the share of each port in the total cargo turnover of the ports of Ukraine for three years with the aim of determining their competitiveness. The grouping of ports by their shares has been performed.

2. As priority cargoes of the sea trading port of Bilhorod-Dnistrovskyi, timber and grain cargoes are considered, the nearest competitor is the sea trading port of Kherson.

3. To determine the optimal volume of cargo turnover, it is proposed to use a mathematical model for the distribution of cargo flows between ports and modes of transport. The proposed mathematical model is a multifactorial linear model of mathematical programming. It uses the control parameters – the volumes of sea and continental cargo transportation passing through the sea trading ports of the Black Sea basin of Ukraine. The model allows to take into account the balance of cargo flows in relation to the resources of port capacities and to determine the use of the production capacities of ports on the basis of their optimal structure of cargo turnover. The model is fairly simple, but at the same time adequate to the transport process. Due to these reasons, it is well adapted to the realities of practical activities of enterprises of the sea transport complex and can be implemented on a computer.

4. A systematic approach to this task allows to develop a competitive port strategy depending on the demand and supply of port services. In the condition of resource deficit, a competitive strategy may be associated with the development of ports. In the condition of shortage of cargo flows, the strategy of ports is aimed at saving financial and industrial resources.

5. This approach allows planning and efficient use of the resources of both ports and modes of transport, which is proved on the basis of a control example of the distribution of timber and grain cargo between the sea trading port of Bilhorod-Dnistrovskyi and Kherson. Cost saving with optimal schemes of cargo delivery through these ports confirms the efficiency of specialization of ports.

The method of modeling the entire transport system for the delivery of cargoes through the sea ports of transshipment can be the basis of state management of the competitiveness of regional seaports in Ukraine.

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РАЗРАБОТКА МЕТОДИЧЕСКОГО ПОДХОДА К ФОРМИРОВАНИЮ КОНКУРЕНТНОЙ СТРАТЕГИИ БЕЛГОРОД-ДНЕСТРОВСКОГО ТОРГОВОГО МОРСКОЙ ПОРТА

Рассмотрены методические аспекты формирования конкурентной стратегии морского порта как регионального транспортного узла. Описано использование для этих целей экономико-математической модели транспортной системы доставки грузов от отправителей до получателей через порты перевалки. Моделирование рыночной среды позволяет обосновать структуру грузооборота портов и их специализацию по родам грузов. Приведены результаты расчетов контрольного примера для обоснования конкурентной стратегии Белгород-Днестровского морского торгового порта.

Ключевые слова: конкурентная стратегия, морской торговый порт, транспортная система, портовая специализация.

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