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A SCIENTIFIC-METHODOLOGICAL ANALYSIS OF ENSURING THE COMPETITIVENESS AND EFFICIENCY OF SHIPPING CONTAINER LINES ON SEA ROUTES

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ABSTRACT

The research aims to develop a methodology to justify the feasibility of creating container shipping lines in Georgia under conditions of growing external negative influences.
To achieve this goal, the following objectives were set and solved in the work: an analysis of the factors that influence the competitive positions of container lines in the Southern Sea Route transport market was carried out; the main scientific approaches to the creation of national container lines were discussed; a scientific and methodological approach to the development of a Georgian transport container line has been proposed.

KEYWORDS

Port, Harbor, Shipping, Container, Maritime Transport

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Introduction.

At the present stage, one of the most important challenges of Georgia is to ensure sustainable development in the new political, social, and economic situation. According to the country's strategic development plans, Georgia should become the most important link connecting Europe and Asia shortly, which, in turn, is associated with the development of transport infrastructure.

Georgia has always been a country where shipping is an important factor for sustainable development. To this day, Batumi, Poti, and Kulevi successfully perform sea transportation processes, which is reflected in its functions as a transit country[1, 3]. Based on this, the country is looking to create a shipping container line that will be internationally competitive.

The Purpose of the Work.

The purpose of the work is to develop a methodology to justify the feasibility of creating container shipping lines in Georgia under conditions of growing external negative influences.

The maritime merchant fleet, unlike other types of transport, is associated with a constant active competitive struggle for success in the transport market, and this struggle has a centuries-old history from ancient times to the present day.

Main Part.

It is well-known that sea transport is the most cost-effective method of cargo transportation. It plays an important role in the transportation of international, both bulk and containerized cargo, which in turn is the main driving resource for the formation and development of multimodal transportation as a global phenomenon [2, 4].

Today, almost 100% of Georgia's foreign sea cargo is transported by foreign shipping companies, which is due to the fact that our country does not actually have a maritime fleet.

The winner in the maritime transport market is a company or the shipping line, which provides the most favorable transport environment for cargo owners: with the minimum route, and the minimum tariff, in terms of the reliability and rhythm of the delivery. This can be done by companies with the highest economic efficiency. Therefore, great attention is paid to improving the efficiency of transportation and all shipping companies do their best to improve it.

The economic efficiency of the investment project represents the compliance of the project with the requirements that reflect the goals and interests of the project participants, efficiency indicators are determined by the ratio of the effect results to the costs required to achieve this result [5, 6].

$$E = \frac{R-D}{D}, \quad (1)$$

where E – is the efficiency of the enterprise; R – the result of the activity of the enterprise; D – the costs of ensuring the activity of the enterprise.

The formation of shipping lines can be regarded as a kind of investment project, in which the constituent elements are sea vessels, port facilities, and handling equipment. They have general economic consequences, which are taken into account during the course of the project - during the formation and operation of the transportation line.

When considering the role and place of shipping companies in the sea transportation market, the commercial efficiency of a given project for cargo owners and carriers is evaluated first. In this case, cargo owners are primarily interested in the safety of transportation (delivery), the size of tariffs, and transportation time. All this also goes for the carrier, which is focused on minimizing costs of transportation, reducing its cost, and obtaining maximum profit. Both the carrier and the cargo owner are directly interested in minimum costs.

When determining the total cost of transporting cargo from the manufacturer’s warehouse to the customer's warehouse per ton-kilometer cost of cargo turnover, the costs of loading and unloading cargo by other types of transport are added to the costs of sea transport. In this case, the costs should be calculated by the formula

$$Э = \frac{Э_{del}(\ell_{del}+\ell_{tr})+\sum Э_{load-unload}+Э_{\text{cargo mov}}+Э_{wa}+Э_{wh}}{\ell_{mil}} + Э_{mov}, \quad (2)$$

where $Э_{del}$ - costs for delivery per ton-mile by auxiliary transport;

$\sum Э_{\text{load}-\text{unload}}$ - costs for loading and unloading;

$Э_{\text{mov}}$ - costs for cargo movement;

ℓ_{del} and ℓ_{tr} - distances, respectively, for delivery of cargo to the ship and transfer from the ship to the warehouse;

ℓ - shipping distances in miles.

In addition, operating costs of marine transport, respectively per ton-mile and per ton are determined using the formulas:

$$Э_{t-m} = \frac{1}{\ell}\left(\frac{C_{stay}}{F_{load.}} + \frac{C_{stay}}{F_{ship.}} + \frac{C_{stay}\cdot t_{dch}}{\varepsilon\cdot Q_{cap.}} + \frac{C_{stay}\cdot t_{stay}}{\varepsilon\cdot Q_{cap.}}\right) + \frac{C_{daily}}{\varepsilon\cdot V_{cargo} Q_{cap}} + \frac{\text{daily}}{V_{bal.} Q_{cap}} \quad (3)$$

$$Э_{t} = \frac{C_{stay}}{F_{load.}} + \frac{C_{stay}}{F_{ship.}} + \frac{C_{stay}\cdot t_{sch}}{\varepsilon\cdot Q_{cap.}} + \frac{C_{stay}\cdot t_{stay}}{\varepsilon\cdot Q_{cap.}} + \frac{C_{stay}\cdot \ell}{\varepsilon\cdot V\cdot Q} + \frac{C_{tran.}\cdot \ell_{bal.}}{V_{bal.} Q_{cap.}}, \quad (4)$$

where C_{stay} - daily costs of maintaining the ship during the stay, which are determined according to the formula:

$$C_{stay} = C_{daily} + C_t^{stay}, \quad (5)$$

where C_{daily} - daily costs of maintenance, which are independent of the time of transport operation;

C_t^{stay} - fuel costs during the stay;

$C_{mov.}$ - daily costs of maintaining the ship during the movement, which are determined according to the formula:

$$C_{mov.} = C_{daily} + C_t^{mov.}, \quad (6)$$

where $C_t^{mov.}$ - fuel costs during the movement.

The efficiency of ship routes directly depends on the costs of the shipping process and the added value of the products obtained in the production process. An in-depth analysis of costs and cost of shipping on sea transport is given in [8, 9], where the classification of frequently used costs is discussed. According to this classification, expenses are divided into 4 basic groups:

1) Operating costs associated with the day-to-day operation of the ship. It includes crew maintenance, supplies, maintenance of the vessel, administrative expenses of the management, and insurance costs;

2) The costs of the route depend on the volume and direction of shipments. It includes port charges and charges for passing cargo through the navigation channels;

3) The costs for loading and unloading operations, including costs for loading, storing, and unloading cargo. They are considered especially necessary for operators;

4) The capital costs associated with covering the costs required for the purchase of the vessel. They depend on the choice of location, construction, methods of financing the investment, and so on.

The above costs are considered the basis for calculating the cost of shipping. They determine the commercial efficiency of a shipping company's operation, and ultimately their competitiveness in the shipping market.

The operating costs can be calculated as the sum of the following main components:

$$R_{oc} = R_{cm} + R_{inv} + R_{rap} + R_{ins} + R_{nav} + R_{adm} \quad (7)$$

where R_{oc} - are the operating costs; R_{cm} - costs for crew maintenance; R_{inv} - inventory carrying costs; R_{rap} - repair and maintenance costs; R_{ins} - the costs of insurance for ship; R_{nav} - costs for navigation; R_{adm} - administrative and management costs.

The costs for the route are divided into fuel costs, port charges, tugboats, etc.

$$R_{cr} = R_{fc} + R_{port} + R_{ser} + R_{cha}, \quad (8)$$

where R_{cr} - the costs for the route;

R_{fc} - fuel costs for the main engine and auxiliary mechanisms;

R_{port} - port charges;

R_{ser} - costs for ship's agency service and for using the tugboats;

R_{cha} - charges for passing cargo through the channels.

The level of fuel consumption depends primarily on the capacity and type of the ship's power plant, its technical condition, the type and quality of fuel, as well as on the engine power capacity factor. The volume of fuel consumption also depends on the condition of the ship hull and the ship's operating speed [10, 11, 12, 13, 14, 15, 16].

Shipping companies and their associations have created many technical, technological, and organizational structures that allow us to maximize the efficiency of transportation and to maximize the interest of both the cargo owner and the carrier.

In addition to the capabilities of individual companies, organizational mechanisms (conferences, alliances, etc.) are also used to increase efficiency and competitiveness. Joint efforts are used to put pressure on competitors and to suppress outsider companies.

The choice of a company's strategy depends on the state of a specific base, a specific route, the company's internal capabilities, its strengths and weaknesses. All reliable companies, including shipping ones, use SWOT analysis, develop a strategy, and use the methods proposed by scientists [17, 18].

There are various schemes for mutually beneficial integration of shipping companies, their groups and alliances - the so-called horizontal integration. There is also and effectively works vertical integration - the unification of shipping companies with ports. In this case, vertical integration is implemented in two ways: 1- when shipping companies are integrated with the port of departure or supplier; 2 - when a shipping company is integrated with the ports of destination or consignees.

Based on the analysis, it can be said that shipping companies use various methods of analyzing the efficiency of maritime transportation. A wide range of various technical, technological, and organizational measures are being developed that will allow us to increase the efficiency of transportation and ensure the competitiveness of shipping companies.

As our research, presented in the paper [1, 2,3, 4], has shown, the volume of cargo handled at Georgian ports decreased in 2020. The reason for this was the COVID-19 pandemic that was spreading around the world.

Due to the outbreak of the Russia-Ukraine war in 2022, the cargo volumes were rearranged from the Northern Transit Corridor to Georgia. This led to an increase in the overall quantity of goods handled in the seaports of Poti and Batumi.

Research shows that in recent years, the previously unexpected factors of the external environment, international and political, have had a significant impact on Georgia's transport projects, and the economically profitable projects have been suspended or closed.

Under these conditions, the traditional assessment of the feasibility of opening a sea shipping container line should probably be supplemented with an integral factor of competitiveness of its attractiveness:

$$K_f = K_{ma} + K_{cl} + K_{cc} + K_{clc}, \quad (9)$$

where K_{ma} - factor of market attractiveness, which is determined as the relationship between the supply and demand in the cargo market;

K_{cl} – container availability rate in shipping;

K_{cc} - the possibility factor of using containers in cabotage transport;

K_{clc} – the possibility factor of using the client's containers.

If K_f is greater than 1, then the shipping container line is attractive to customers.

K_{cl} may take the following values:

0.1 - if the shipping line uses containers located in the port;

0.1 – If the shipping line uses containers placed at railway stations for further delivery to the customer;

0.2 – If the shipping line uses containers located in dry hubs (auto terminals) for further delivery to the customer

0.3 – If the shipping line uses containers it owns, by first selling those containers to the customer.

If some of the specified conditions are satisfied, the values are summed up and may reach a maximum of 0.7 - indicating an enhanced diversity of the line.

K_{cc}, K_{clc} - may take the value of 0, that is, it is impossible to use containers (client containers) for cabotage transport; and 1 customer's containers may be used for cabotage transport.

Conclusions

1) The analysis of the current state of the maritime transport market and the existing approaches to assessing the competitiveness of the sea shipping container lines conducted during the research revealed the need to introduce a more flexible approach to efficiency assessment through step-by-step optimization;

2) The study of cargo-container transportation base of the ports of Georgia showed that factors of the external environment, which were practically unconsidered previously (international and political) have a significant impact on the transport projects of Georgia;

3) In order to assess the feasibility of opening a container shipping line, we have developed an integral competitiveness coefficient of its attractiveness.

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