

# APPLICATION OF DIGITAL SOLUTIONS TO RAISE THE EFFICIENCY OF MARINE CONTAINER TRANSPORTATION, THE CASE OF COSCO GROUP

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## Abstract

At the moment, the global civilization witnesses a shift in technological priorities. The main trend of which is a move away from the mechanical-instrumental aspect of social development to digital technological development, which has an impact on the entire technological structure and brings about fundamentally new organizational forms of production and commercial structures. This situation is also typical for the modern transportation market, which manifests in the emergence of new business models developed by transport companies, raising efficiency in transport services and altering the cost structure of transport services. The article looks into the features of applying digital solutions in the transportation of goods using the case of COSCO Group. The author concludes that digital systems are currently especially relevant for the development of port infrastructure, as well as for monitoring marine container transportation, reducing the possibility of downtime, optimizing marine transportation routes, enabling firms to demonstrate better performance through the use of digital solutions.

## Keywords

Digital solution, cargo transportation, container transportation, transport industry, digitalization.

## INTRODUCTION

The current state of the global economy and trade is quite complex and unpredictable and largely depends on the uninterrupted operation of transport systems that ensure the delivery of goods and movement of passengers, contributing to the intensification of industrial production and business development. It is the modern transport system aimed at the efficient operation of the entire transport industry that is an important link in the added value chain, generating up to 27% of all expenses in the cost structure of goods and services. In this regard, raising the efficiency of transport systems is a vital task of modern economics and economy.

The issues associated with digital transformation in the transport industry have been addressed in recent years by Arifdzhanova N. [1], Volkova A., Nikitin Yu., Plotnikov V. [2], Gulyi I. [3], Erokhina E., Sotskova E. [4], Korznikov M. [5], Kuznetsov A. [6], Filatova E. [7], Yazkhanova Kh. [8] and others.

These authors comprehensively examined the application of digital technologies to solve, first of all, logistics transport problems.

Even though, in general, issues of transport logistics are quite fully and comprehensively discussed in the scientific literature, the problems of digitalizing transport industry are very relevant and require additional research. No less pressing is the issue related to the digitalization of marine container shipping, which generates 38.2% of global cargo traffic, boosting global trade and commodity exchange. The current epidemiological, economic and political situation, and higher risks associated with maritime piracy and military threats in the waters of the seas and oceans only increase the need to raise the safety and efficiency of marine container transportation. In this regard, the best practices of transport companies that have achieved significant success in digitalization seem to be a very important subject for analysis.

Therefore, the purpose of this article is to study the issues related to the application of digital solutions to improve the efficiency of container shipping using the case of COSCO Group.

## STATEMENT OF THE RESEARCH MATERIAL

At the moment, human civilization has entered a new stage of its development resulting from the fourth industrial revolution, which eliminates the boundaries between mechanical technologies, biological systems, and virtual digital space, creating fundamentally new technological solutions that are actively being introduced into various areas of human activity, shaping the preconditions for artificial intelligence, autonomous vehicles, 3D printing, nanotechnology, quantum computers to become a part of everyday life capable of ensuring a new quality of life and a new round of economic efficiency.

This revolutionary technological wave brings about systemic changes in the economy and business communications. At present influenced by the fourth industrial revolution, transport is undergoing changes, making it possible to raise the efficiency of the entire transport system and logistics.

Over the last few years, transport logistics has turned into one of the leaders in digitalization. It is perfectly suited for the use of AI-driven digital solutions and mathematical algorithms, and digital technologies that model the space of logical activity.

As a result, cargo delivery time is reduced, the operating life of transport systems and transport as such is increased, the fuel capacity of business is reduced, transport activities are further greened, and its financial and economic performance rises.



In general, we can say that further development of transport systems will be ensured by the achievements of digitalization, and those firms that make the best of introduced digital technologies will acquire significant competitive edge for the coming decades [9].

An important trend in the development of the transport industry, which directly affects the updating of the process approach to the management and digitalization of transport enterprises, is the use of container transportation technologies. Container transportation today is the most promising type of cargo shipment. At the same time, container transportation without a process approach and digital platforms as part of it is an almost impossible task [10].

The technology of container transportation itself is very promising, since it makes it possible to significantly simplify handling of the goods, standardize the capabilities of warehouses, and also create conditions for the development of marine transport which ensures marine shipment and is undergoing algorithmization, when each operation associated with the shipment of goods has clear regulations, timing, and implementation technology.

Moreover, the use of digitalization in this mode of transport makes it possible to optimize business processes: control the geographical parameters of cargo delivery, its condition, carry out the operation of carriers and port services as planned, minimizing the risks of downtime, overloading of lifting and transport mechanisms, excessive pressure on warehouses, and the events of force majeure [11]. At the same time, further development of marine container transportation is the most important factor in the modern image of world trade, which is becoming more and more predictable and more technologically advanced [12].

Meanwhile, it is necessary to understand that recent years have been hard for global trade and for the development of the transport industry as a whole. The COVID-19 pandemic, global political turbulence, missile attacks against ships in the geopolitical area of the Palestinian-Israeli conflict, sanctions, and restrictions on the vessels transporting Russian oil products have significantly reduced global economic activity, negatively impacting the volume of container traffic.

Regardless of these circumstances, container shipping market players strive to raise their own efficiency, realizing that amid the severest conditions for countries and peoples, it is marine transport that can solve global problems of humanity, such as the problem of hunger and economic inequality. In this regard, the world's leading transport companies specializing in container shipment are moving from a general theoretical awareness of the importance of using digital technologies to their practical use in operations.

One of the examples of increased capacity for processing and transportation of containers with a direct impact on the global transportation market can be the operations of China Ocean Shipping Group Company (COSCO Group), a Chinese company with headquarters in Shanghai [13], one of the global leaders in marine container transportation. It is one of the ten largest operators on the global container shipping market, transporting up to 180 million tons of cargo annually.

Understanding the need for digitalization, COSCO Group is actively collaborating with the multinational technology consortium Global Shipping Business Network (GSBN), headquartered in Hong Kong, with stakeholders from eight major shipping lines and global terminal operators, including COSCO. In early May 2023, GSBN collaborated with COSCO to promote a paperless cargo clearance solution at Chongqing Dry Port, resulting in a significant reduction in the administrative process from 1-2 days to 4 hours. This innovation brought significant savings to the company in administrative and management costs, as document and transaction processing costs accounted for 20% of the company's total transportation costs.

According to the report by GSBN and COSCO Group, this result was achieved by optimizing the former electronic office using the blockchain infrastructure.

Further cooperation between GSBN and COSCO Group involves the digitalization of all transactions that are currently recorded on paper. Apart from that, COSCO's digital transformation provides solutions such as electronic bill of lading, which can extend to inland bill of lading and many other further workflows associated with the activities of seaports and inland dry ports.

Moreover, using the advances of digitalization the company solves problems associated with the costs of "paperwork" given the significant volume of correspondence that ensures the contractual activities of the COSCO company. This activity is associated with the routine processing of paper bills of lading, their delivery from the consignor to the consignee generating significant financial costs - the cost of sending one bill of lading can reach up to \$100, and given their volume, reaching hundreds of thousands of copies, these expenses are quite impressive.

In addition, the use of the latest document management technologies makes it possible to reduce transaction costs by shortening the delivery time of documents, which happens almost in real-time. The company also uses blockchain technology which protects documents from unauthorized tampering, ensuring trade secrets and preventing manipulation of settlements under contracts.

These solutions were tested in practice when transporting containers on the China-Slovenia route. As a result, it was determined that the use of digital solutions can reduce document management costs by 15%, which is a very considerable figure given the volume of documents in the COSCO company [14].

Equally important for the operations of COSCO is technological warehousing and distribution of cargo flows through a global network, which reduces costs and simplifies the management of container transportation.

The company's innovative solution is the development of a digital twin of the port which will be deployed on the laptops and mobile phones of COSCO company representatives in different ports of the world. Special applications will track the movement of vessels and ships, containers, inland vessels, as well as trains and trucks. This system is driven by artificial intelligence which integrates all port processes, processes information, and issues recommendations for managing cargo traffic.

In its cooperation with ports, COSCO is actively promoting the idea of integrating artificial intelligence systems and various sensors that read and transmit data. For instance, in the port of Qingdao, COSCO together with the port administration installed sensors to process information on meteorological and hydrological data. With their help, those responsible for the operation of the port and COSCO, the container shipping operator, determine the most favorable time to enter the port. This optimization of port operations reduces the time a vessel spends in the port by approximately an hour, which constitutes a significant saving for COSCO.

Another type of smart sensors are digital dolphins. This type of device, which is attached to buoys, determines the occupancy of different mooring terminals and provides information about the status of operations in the port. Their task is to facilitate transshipment. Their specific feature is the ability to self-learn and update [15].

At the present level, COSCO actively uses in its operations the services of various digital platforms, providing intermediary services to shipowners and charterers in the payment of port dues, in particular, COSCO has invested in and is the actual owner of the digital platform DA-Desk, which acts as an intermediary between shipowners/charterers and agents in ports [16].

This digital solution enables creating data banks on all global trends in the development of sea container transportation, monitor changes on this market on an hourly basis, considerably improving analytical potential of COSCO, facilitating fast tactical and strategic decisions, focusing on objective static data and qualitative analytics [17].

Moreover, this system ensures end-to-end management of the port fee collection process, relieving shipowners and charterers of related operational tasks. Users pay fees in the system using DA-Desk's extensive tools. The system ensures not only timely payment, but also the provision of relevant information to all parties. Customers are offered daily bank reconciliation and account statements. All transactions are constantly monitored and recorded. Users receive more accurate estimates of payments and advances.

COSCO plans to develop a service that allows online calculation of the time required for ships and vessels to approach the port, which will enable masters to choose the optimal speed of approach to the port and thereby reduce fuel consumption and waiting time at the roadstead. Port authorities, in turn, will be able to significantly raise the efficiency and accuracy of vessel movement planning in port waters and mooring operations. At the same time, port dispatchers, analyzing the situation, can correctly coordinate ships and vessels, identify weak points and ineffective unloading processes [18].

## CONCLUSION

Thus, at present, we witness ongoing changes in container shipping caused by trends in civilizational development, which are characterized by the move away from the mechanical-instrumental aspect of the society development to digital technological development and it has an impact on the entire technological structure of this market. As a result, it leads to new business models for transport companies raising the efficiency of transport services. In general, digital systems are currently especially relevant for the development of port infrastructure, as well as for the control of marine container transportation, reducing the possibility of downtime, optimizing sea transportation routes, when firms using digital solutions are able to achieve better performance.

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