Application of E-commerce Platform in Dry Bulk Shipping: Supply Chain Perspective

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Abstract. With the increasing popularity of e-commerce platforms, integrating supply chain and e-commerce has become an important research topic. As a key component of supply chain logistics, dry bulk shipping has also begun to transform towards e-commerce platforms. However, the transformation resistance is relatively high due to the traditional ship-owner and cargo-owner transaction model. In response, some dry bulk shipping companies have started exploring the potential of e-commerce platform applications. This paper aims to provide an overview of the current situation and analyze the prospects of e-commerce platform integration in the dry bulk shipping industry from a supply chain perspective. The study will examine the benefits and challenges of e-commerce platform adoption in dry bulk shipping, the impact of platform integration on supply chain efficiency, and the potential implications for future industry development.

Keywords: E-commerce Platform, Dry Bulk Shipping, Supply Chain.

1. Introduction

The trend of e-commerce platform transformation is becoming increasingly apparent in the global supply chain, with the COVID-19 pandemic posing a significant challenge to the resilience and dynamic digital capability of the supply chain. Under this influence, the transformation of e-commerce platforms is accelerating. As a critical part of the supply chain, dry bulk transportation, which mainly transports production raw materials and energy, is subject to a long-standing ship-owner and cargo-owner transaction model and a dynamic range of market prices, which has resulted in slow progress in the transformation of e-commerce platforms in this sector.

While existing literature fully supports the positive effect of e-commerce platform transformation on the efficiency and resilience improvement of the supply chain, there needs to be more relevant literature to prove the specific relationship and current analysis between the dry bulk shipping industry and the transformation of e-commerce platforms.

Therefore, this paper employs a case study research method and focuses on COSCO Shipping Bulk Company, taking the "Chuanhuoyi" e-commerce trading platform developed by the company in recent years as the primary research subject. The paper aims to explain the impact of e-commerce platform transformation on dry bulk shipping, identify the existing problems in the current transformation process, and analyze and predict the future development direction.

2. Literature review

The supply chain has played an essential role in globalized trade in the past few years. And the need for supply chain resilience in the context of trade is highlighted by the test of the global pandemic. Combined with the increased popularity of e-commerce platform-based transformation in various industries, the relationship between e-commerce platform-based transformation of supply chains and supply chain resilience has been widely studied as an important reference basis for measuring the digital capabilities of today's enterprises.

Dubey et al. have demonstrated through research those dynamic digital capabilities, represented by digital agility and digital adaptability, have a significant, positive impact on supply chain resilience when combined with government effectiveness [1]. As one of the main applications of digital capabilities in the enterprise, e-commerce platforms are an important expression of how companies

can improve their digital agility and further consolidate their supply chain resilience. However, dry bulk shipping is subject to long-established trading patterns, and the conclusions generated by this research are not fully applicable to dry bulk shipping. But from the macro perspective of the supply chain, what is certain is that as platform-oriented business models expand rapidly, the performance and sustainability of e-commerce platforms that integrate upstream supply and downstream demand become increasingly important [2].

The e-commerce platform, Liu highlights the advantages of e-commerce data analysis platforms over general management information systems, as they can select suitable data analysis and processing algorithms for users [3]. The design goals of e-commerce data analysis platforms include creating a system platform for acquiring and processing multiple data and information, building an e-commerce data processing function, and ensuring good performance. The study emphasizes the importance of advanced technology in processing and analyzing large amounts of data information and the need for the platform to have a seamless connection between data platforms of various modules. The findings provide valuable insights into the design and implementation of e-commerce data analysis platforms.

According to the recent global pandemic, combined with the dry bulk shipping industry, Jin et al. analyze the impact on Chinese shipping and ports since COVID-19 [4]. Changes in network efficiency and connectivity were analyzed in the context of the failure of key waypoints. It is found that the size of China's international liner shipping network expanded during the pandemic, with more routes clustered at fewer hub ports. Clustering at fewer hub ports. However, overall connectivity and connection strength still decreased. At the same time, the epidemic outbreak caused fluctuations in container volumes and mismatches in vessel capacity availability. Gavalas et al. have a study arguing for the impact on shipping stocks and the Baltic Index under COVID-19, using a market model event study approach to examine how quickly and comprehensively shipping markets react under volatility [5]. It can be found that the response of dry bulk shipping to market volatility is highly differentiated across regions. The COVID-19 pandemic has also disrupted supply chains and increased dry bulk shipping industry uncertainties. Qi et al. investigate the impacts of integration between e-commerce platforms and suppliers on supply chain resilience, moderated by suppliers' product flexibility [6]. Their data analysis from a Chinese e-commerce platform finds that integration in information sharing, joint planning, and logistics cooperation positively impacts supply chain resilience. In contrast, procurement automation has the opposite effect.

In the dry bulk shipping industry, Sun et al. study propose a win-win strategy for liner slot sales under two sales channels, based on a two-stage game model that considers the overselling behavior of liner companies [7]. The strategy's success depends on several factors: the demand gap between high- and low-demand seasons, allocated capacity, and unit compensation cost. The study's findings provide valuable guidance for academic research on contract mechanisms for shipping e-commerce platforms and the practical selection of container slot sales strategies to achieve long-term goals.

The current study fully supports the positive effect of e-commerce platform-based transformation on supply chain building. The importance of digital adaptability and agility for dry bulk shipping is also proven. Based on the supply chain perspective, e-commerce platform-based transformation for dry bulk shipping has yet to be thoroughly studied. The specific direction and application of e-commerce platform transformation in dry bulk shipping remain to be proven. Therefore, this paper will present the following specific problem definition for this deficiency.

Combined with the previous literature review, there are still some research gaps in the e-commerce platform-based transformation of dry bulk shipping. The overall digital informatization development of the supply chain is undoubted and well-discussed. This article will address the following issue: (1) A new dry bulk shipping model combined with e-commerce platforms. (2) The diverse use of e-commerce platforms in dry bulk shipping. (3) Prospects for transforming e-commerce platforms in the dry bulk industry.

3. Case Description

As an important sub-category in supply chain logistics, dry bulk shipping with coal, gravel, iron ore, and other major transportation cargoes, its tariff, volume, transportation cycle, and transportation network are closely linked with regional power generation, heating, and engineering construction. Due to the above nature, dry bulk shipping is usually under the influence of the government. This characteristic is especially evident in China, where central state-owned enterprises largely dominate dry bulk shipping, which carry out comprehensive coordination and management of large volumes. Therefore, COSCO Shipping Bulk Company is a typical and valuable research case to study the current situation of e-commerce platform applications in dry bulk shipping.

COSCO Shipping Bulk Company is a large state-owned shipping enterprise mainly engaged in bulk cargo transportation, and the scale of dry bulk cargo transportation is the first in the world. In response to the transformation of the e-commerce platform, COSCO Shipping Technology Company, a subsidiary of the company, has developed Guangzhou Zhenhua Aviation Technology Company, a direct subsidiary of the coastal-specific business. Guangzhou Zhenhua Aviation Technology Company has developed an e-commerce platform product: Chuanhuoyi trading platform, which service for Chinese coastal dry bulk shipping at present, and the main business model of this platform is to take Chuanhuoyi as the online aggregation platform, run the fixed-load demand according to the platform, and carry out ship cargo matching operation according to the principle of competitive preference, and take market cargo and charter-in ship as the main body of offline transaction.

Regarding the construction of the Chuanhuoyi platform, up to now, the platform functions have covered: (1) ship cargo tray release, (2) intelligent ship cargo matching, (3) online contract signing, (4) online tracking of voyage execution, (5) online cargo tray bidding. The main functions still under construction or being improved include the automatic release of pre-empty vessel pallets, third-party payment service modules, etc.

4. Analysis of the problems

Depending on COSCO Shipping Bulk Company's scale in China's coastal and global bulk shipping, the attempt of the Chuanhuoyi platform in dry bulk shipping e-commerce platform is highly representative.

4.1. A new dry bulk shipping model combined with an e-commerce platform

As mentioned, the traditional dry bulk shipping trading model is based on offline aggregation between shipowners and cargo owners. Dry bulk shipping companies of various scales have their internal integration resources, managed discretely with different volumes of bulk carriers in the market; cargo owners also have their integration shipowner resources. This traditional trading model has a high degree of market freedom. Still, in today's increasingly unstable global supply chain environment, there are problems such as inefficient overall integration and low efficiency of information exchange. Due to the COA contracts required for dry bulk shipping, the issues will be analyzed in two parts, before and after the contract is signed, using the contract signing as the boundary.

Efficient online ship and cargo matching. The long-term internal integration of shipowners and cargo owners on the resources already in their possession has led to a high degree of interdependence between the two parties under the established cooperative relationship. In the case of high demand for freight orders, there is often a need for more ship and cargo information, ships without cargo or cargo without ships, etc.

When matching cargo with ships on e-commerce platforms, it is important to understand the characteristics of the goods and the adaptability of the vessels, which is closely related to the cost and performance of dry bulk shipping. For example, when choosing the size and type of ships, the volume and weight of the goods and the loading capacity and fuel efficiency of the vessels need to be considered to ensure the effectiveness of cargo-ship matching. Additionally, understanding the

relationship between ship size and shipping costs can help e-commerce platforms control costs and improve shipping performance when selecting vessels. Therefore, when matching cargo with ships on e-commerce platforms, the experience of dry bulk shipping can be used as a reference to achieve more sustainable and efficient transportation through scientific and reasonable cargo-ship matching and cost control. In e-commerce platforms, matching cargo with appropriate vessels is critical for efficient and cost-effective transportation. The characteristics of the goods, such as volume and weight, need to be considered to ensure that they are compatible with the loading capacity of the selected vessels. In addition, the adaptability of the vessels, including their size and fuel efficiency, should also be considered to ensure the effectiveness of cargo-ship matching. This is consistent with the principles of dry bulk shipping, where vessel size and type are selected based on the characteristics of the goods to be transported.

Furthermore, understanding the relationship between ship size and shipping costs can help e-commerce platforms control costs and improve shipping performance. The findings of previous studies on dry bulk shipping have shown that vessel size significantly impacts shipping costs and its components, including operating capital and fuel costs. Therefore, e-commerce platforms can use this knowledge to select cost-effective vessels with better fuel efficiency, which can lead to cost savings and improved transportation performance.

In summary, the experience of dry bulk shipping can provide valuable insights for e-commerce platforms when matching cargo with ships. By considering the characteristics of the goods and the adaptability of the vessels and by controlling costs and improving fuel efficiency, e-commerce platforms can achieve more sustainable and efficient transportation [8].

The main businesses currently covered by the Chuanhuoyi platform are taken as the object of study: coastal market cargo business and coastal charter-in business.As shown in Figure 1, the platform first carries out the information entry and integration of the registered users of the platform, i.e., ship owners and cargo owners. It presents the demand data of both sides online. The basis of this function lies in the large-scale bulk shipping fleet of COSCO Shipping Bulk Company and a large number of cooperative cargo owners' resources. After compliance, the platform carries out public registration and qualification certification, which can be incorporated into the platform system. The information about the ship and cargo that the platform can obtain includes (1) basic information about the ship: and ship specification, (2) basic information about the cargo: cargo name, cargo specification, cargo planned loading, (3) basic information about loading and unloading port: loading and unloading port name, loading and unloading port draught, and the main terms of the transaction contract after the contract between the two parties of the transaction takes effect.

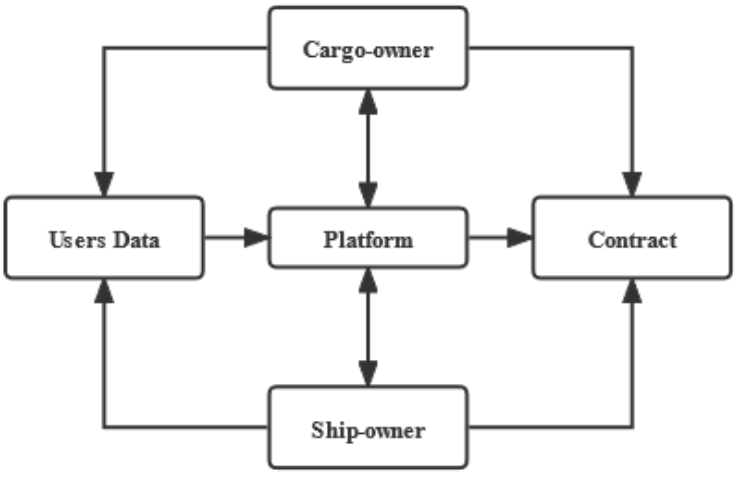


Figure 1. Chuanhuoyi Platform matching method

Efficient information exchange in the framework of dry bulk shipping. The development of Internet technology has promoted the rapid development of the e-commerce industry, and its market turnover has been growing year by year. Over decades of development, the e-commerce industry has experienced a shift from a crude management model to a refined one. Unlike other industries, e-

commerce is a web-based and online platform marketing model, so the sources, types, and volumes of the mobile user and consumer data are very large. In this environment, it is essential to accurately judge and process the information of mobile users and online consumers. Therefore, more efficient information exchange is necessary for applying e-commerce platforms in dry bulk shipping [9].

As shown in Figure 2, after the contract comes into effect, the process operated by the platform includes firstly, the platform involves determining the voyage assignment and establishing contact with cargo owners through the platform. Next, cargo owners can confirm the loading port with charterers and appoint a loading agent via the platform. Then, the voyage order is issued to the master through the platform, and the shipper arranges cargo preparation. During the empty load voyage, the platform can monitor the voyage's progress. Once the vessel arrives at the loading port, the berthing loading plan and vessel arrival time can be confirmed with the ports and shipping agents through the platform, and the loading operation can be tracked using the platform. After loading the cargo, cargo owners can confirm the unloading port with charterers and appoint a loading agent via the platform. The reload voyage can be monitored using the platform. Once the vessel arrives at the unloading port, the berthing unloading plan and vessel arrival time can be confirmed with the ports and shipping agents through the platform. The unloading operation can be tracked using the platform. Finally, the end of discharge and leaving port and berth marks the completion of the voyage in dry bulk shipping on an e-commerce platform.

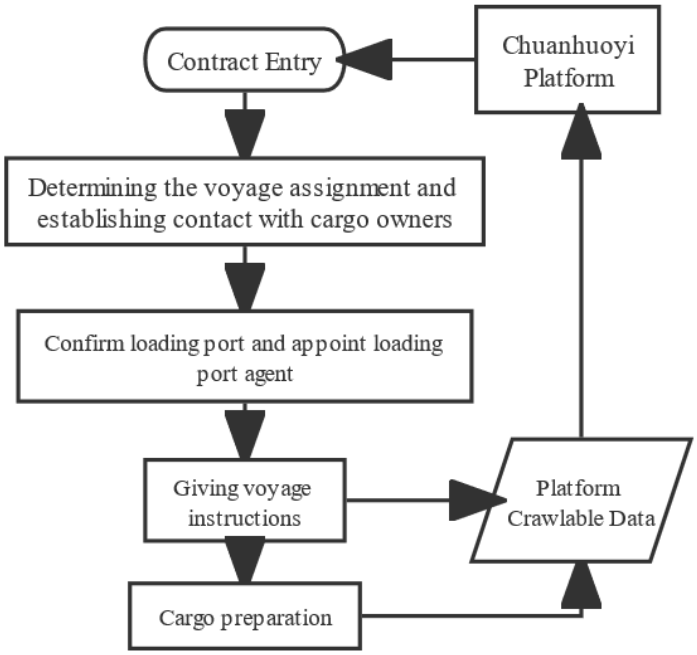


Figure 2. Platform voyage scheduling pre-flow.

Chuanhuoyi platform tracks the whole process after the COA contract is signed between the two sides of the transaction, covering all the processes under the framework of dry bulk shipping. The data is disclosed on the platform so that the shipowner and cargo owner can complete the transportation process tracking during the contract. The platform acts as an agent to save the loading and unloading port operation process and improve overall transaction efficiency and reliability.

4.2. The diverse use of e-commerce platforms in the field of dry bulk shipping

The previous section concentrated on the basic functional use of an e-commerce platform in dry bulk shipping. Nowadays, the functions of e-commerce platforms are constantly enriched, and the progress of cross-industry functional complementation and integration is becoming more complete with the development of e-commerce platforms. The use of e-commerce platforms is wider than ship and cargo matching and more efficient information interaction. Still, it is reflected in multiple perspectives, with an overall development trend of cross-field and full process coverage. This part

will elaborate on the planning and attempts to expand the use of e-commerce platforms in the dry bulk shipping industry, designed by the Chuanhuoyi platform at this stage.

Optimize transaction contracts through an e-commerce platform. Contracts are an essential part of dry bulk shipping. A voyage contract contains all the key information about a dry bulk voyage from the beginning to the end. As mentioned in section 5.1.1, the matching of vessels and cargoes performed by the e-commerce platform is based on the contract between the two parties to the transaction. With a qualified and compliant contract as a prerequisite, the specific business execution at a later stage will retain its reference. Therefore, the contract is one of the foundations of dry bulk shipping, and optimizing dry bulk shipping contract through the advantages of e-commerce platforms such as online and standardization is one of the key multi-dimensional applications of e-commerce platform-based transformation in dry bulk shipping.

In mainstream dry bulk shipping contracts, most contract terms are form clauses. Here the form clauses can be directly converted to electronic format in the e-commerce platform, thus enhancing the efficiency and standardization of contract generation. This is the most direct way to optimize dry bulk shipping contracts by e-commerce platform transformation. However, the central clause part of the contract still needs to be fully unified. These include ship form, laydays, shipping exchange, demurrage, and freight payment clauses. These main clauses, which cover key information of dry bulk shipping contracts, are subject to the traditional offline trading model, with high diversity and low standardization. Benefiting from the transformation of the e-commerce platform, more efficient and standardized key terms become possible. The integration of information resources on the platform online and more efficient communication with customer groups have accelerated the promotion of form contracts drawn up by COSCO Shipping Bulk Company. Among the key forms, COSCO Shipping Bulk Company and Chuanhuoyi platform focus on two major key forms: demurrage clause and freight payment clause in the form contract.

Dry bulk shipping is characterized by more disturbing factors in the industry and more volatile market prices. And the contract, as a credential binding both parties to the transaction, is particularly vulnerable to macro industry fluctuations. Optimizing trading contracts by e-commerce platform can ensure the efficiency of information exchange and market information transparency in the contract formulation stage and guarantee the feasibility of contracts before signing. Contract terms are moving towards uniformity, and the increasing popularity of form terms guarantees the standardization of contracts. With the intervention of the third-party e-commerce platform, the above optimization effectively guarantees the implementation success rate of the trading contract in the contract implementation stage. It facilitates long-term cooperation among ship owners, cargo owners, and e-commerce platforms in dry bulk shipping.

Online cross-industry resource integration. The application of an e-commerce platform in dry bulk shipping is limited to the fundamental functional aspects and expands on the essential functions. E-commerce platforms have the function of efficient information interaction across regions, narrowing the distance between industries; today, with most industries shifting their operational processes online, e-commerce platforms also provide a wide space for cross-industry common operations. E-commerce has become the dominant economic form in the current era, and its flow is increasing with the continuous development of Internet technology. To effectively promote its scientific and all-round development, it is crucial to understand and improve its supply chain financial profit model for increased profitability. This study highlights the importance of supply chain finance and financial management in the e-commerce industry [10]. At present, the dry bulk shipping industry is actively exploring the possibility of additional functions of an e-commerce platform while consolidating the supply chain of the port and shipping industry.

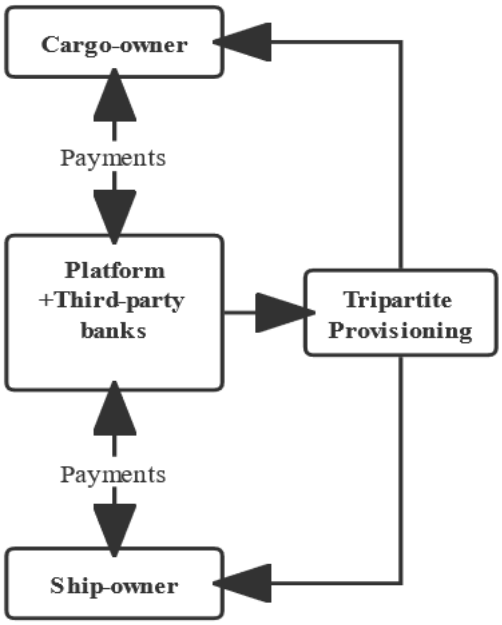


Figure 3. Online payment system for large sums of money on the shipping platform.

Liu et al., the research reveals the relationship between banks' internal environment, policies, and dry bulk market conditions through China's GDP growth, constructing a new framework for shipping finance decisions [11]. The model predicts that a less active policy, combined with China's GDP growth, will decrease bank lending. In the shipping market, extreme variations in revenues, operating expenses, and asset values make the financing decisions of shipping banks particularly difficult. This prediction reflects the complex economic environment facing the dry bulk shipping industry today. It highlights the feasibility and importance of integrating financial services in dry bulk shipping based on the functionality of an e-commerce platform. With the current construction progress of the Chuanhuoyi platform, this platform is working on creating additional services that combine modules such as finance, insurance, and information. The basis of function realization, based on the e-commerce platform, provides real-time financial information public. Synchronized market information, at the same time to ensure information sharing, the Chuanhuoyi platform also launched related financial services. The financial service to the Chuanhuoyi platform as the main body, through the review of the initial user registration qualification, determines the user credit limit by the platform joint third-party banks to provide payment services, which is constructed as an online payment system for large sums of money. These have developed platform additional services, are dependent on the e-commerce platform through information integration, and advance the user information knot network. The online payment system as shown in Figure 3. Based on the network, the introduction of additional functions across industries becomes possible. However, due to the relatively closed process of dry bulk shipping, the current degree of cross-industry development is limited. The increasingly improved transformation of e-commerce platforms is believed further to expand the industry possibilities of dry bulk shipping.

4.3. Prospects for the transformation of e-commerce platforms in the dry bulk industry

Combined with the previous problem analysis, it can be found that at this stage, the e-commerce platform's transformation in the dry bulk shipping field has taken shape. In the basic function of dry bulk shipping informatization, online, and scale, the application of an e-commerce platform has a perfect function structure. The dry bulk industry is still exploring in depth in terms of multi-discipline and cross-industry comprehensive applications. This part will focus on the further outlook of combining the e-commerce platform and dry bulk shipping field.

Further, build and improve the platform joint business circle. Due to the business model of dry bulk shipping, the e-commerce platform in the field of dry bulk shipping needs to be operated by three parties, namely shipowners, cargo owners, and platforms, in collaboration. Therefore, building

the joint operation circle of the platform is very important. Combined with the analysis in part 5.1.1, it can be found that collaborative consultation of three parties is needed in the ship-cargo matching stage before contract signing. At present, the e-commerce platform of the dry bulk industry still needs to be fixed, such as a small user base and lag in data information exchange. These problems still lead to low accuracy of ship and cargo matching and low efficiency of contract signing. Therefore, building a joint business circle to consolidate the platform is especially important. A more affluent user base and more efficient data exchange structure will be the key to the joint operation circle with closer relationships and broader fields in the future. It is one of the development trends of e-commerce platforms in dry bulk shipping.

Support leading enterprises to build a platform for sharing resources and capabilities. Industry leaders often lead industry trends. Especially in the dry bulk shipping industry, capacity and cargo are generally distributed more concentrated, generally concentrated in large shipping companies and freight forwarding companies. This is why COSCO Shipping Bulk Company, the largest company in dry bulk shipping, is chosen as a case study for this paper. And this sub-problem will discuss the future leading trend of the leading dry bulk shipping company in the transformation stage of the e-commerce platform.

From the supply chain perspective, the leading dry bulk enterprises will explore more possibilities for e-commerce platform-based transformation. Play the leading role of industry leaders, form industry alliances, and promote the deep integration of SMEs into the supply chain while expanding the positive impact of e-commerce platform-based transformation. Meanwhile, as far as SMEs are concerned, it is also important to support leading enterprises in building a platform for sharing resources and capabilities. The joining and support of SMEs can further expand the user base and improve the network of dry bulk industry grouping while further amplifying the positive role of e-commerce platforms at the terminal, such as enhancing the breadth of industry user data and guaranteeing the accuracy of data analysis. The joint efforts of leading enterprises and SMEs can more fundamentally utilize the e-commerce platform to enhance the dry bulk shipping industry's risk prevention and control capability.

5. Conclusion

The transformation of e-commerce platforms is the transformation trend of many industries today. Although the transformation of the e-commerce platform of the dry bulk shipping industry starts late and resists more, it still develops a mature system under the drive of leading enterprises. At present, the domestic dry bulk shipping e-commerce platform led by the Chuanhuoyi platform can already realize the transformation of digitalization and phantomization of essential functions in dry bulk shipping transactions. And many leading enterprises of dry bulk shipping have designed further plans, the future e-commerce platform-based dry bulk shipping will cover more functions and industries, achieve higher transaction and transportation efficiency, and enhance the digital capability and elasticity of the whole dry bulk supply chain.

This paper takes the Chuanhuoyi platform of COSCO Shipping Bulk Company as a case study. It mainly discusses the development status and prospects of e-commerce platform transformation in the dry bulk shipping field under the supply chain perspective. It mainly analyzes the new transaction mode of dry bulk shipping under the transformation of the e-commerce platform and elaborates on the multi-dimensional application scenarios of the e-commerce platform in the dry bulk shipping industry by combining the contract and cross-industry development of dry bulk shipping; the last part looks forward to the development trend of e-commerce platform in dry bulk shipping. Previous studies have demonstrated the positive impact of digital capabilities and digital agility on supply chain resilience and illustrated the need to increase dry bulk supply chain resilience in the face of the global pandemic. The transformation of the e-commerce platform has become an immediate need for the future development of dry bulk shipping.

Meanwhile, there are still many research areas for improvement in this paper. Firstly, this paper adopts COSCO Shipping Bulk Company for the case study, which is the largest company and has the special enterprise nature of Chinese central State-owned enterprises. Therefore, the transformation measures of the e-commerce platform carried out by this company are not fully representative of the dry bulk shipping industry; secondly, the main business scope of the Chuanhuoyi platform as the main subject of the case study is coastal dry bulk shipping in China at present, and it is not representative for other dry bulk shipping in the global scope. The business scope and shipping orders are undertaken for other global dry bulk shipping e-commerce platforms, and the type of customers served is limited. Overall, this paper's problem analysis and limitations will provide some references for new research.

References

[1] Dubey, R., Bryde, D. J., Dwivedi, Y. K., Graham, G., Foropon, C., Papadopoulos, T.: Dynamic digital capabilities and supply chain resilience: The role of government effectiveness. International Journal of Production Economics, 108790 (2023).

[2] Shan, H., Bai, D., Fan, X., Shi, J., Li, Y., Yang, S. Enabling roles of integration and resilience for sustainable supply chain performance: an empirical study on China's E-commerce platforms. Applied Economics, 1 - 15 (2023).

[3] Liu, T.: Research on the Design of E-commerce Data Analysis Platform. In 2021 2nd International Conference on E-Commerce and Internet Technology (ECIT) (pp. 121 - 125). IEEE, (2021).

[4] Jin, L., Chen, J., Chen, Z., Sun, X., Yu, B.: Impact of COVID-19 on China's international liner shipping network based on AIS data. Transport Policy 121, 90 - 99 (2022).

[5] Gavalas, D., Syriopoulos, T., Tsatsaronis, M.: COVID – 19 impacts on the shipping industry: An event study approach. Transport Policy 116, 157 - 164 (2022).

[6] Qi, Y., Wang, X., Zhang, M., Wang, Q.: Developing supply chain resilience through integration: An empirical study on an e-commerce platform. Journal of Operations Management (2022).

[7] Sun, H., Lam, J. S. L., Zeng, Q.: The dual-channel sales strategy of liner slots considering shipping e-commerce platforms. Computers & Industrial Engineering 159, 107516 (2021).

[8] Bernacki, D.: Assessing the link between vessel size and maritime supply chain sustainable performance. Energies 14 (11), 2979 (2021).

[9] Shang, L.: Innovative ideas for promoting information management in e-commerce enterprises. In 2020 5th International Conference on Mechanical, Control and Computer Engineering (ICMCCE) (pp. 1791 - 1793). IEEE, (2020).

[10] Jia, M.: Research on Supply Chain Finance Profit Model Based on E-commerce Platform. In 2021 2nd International Conference on E-Commerce and Internet Technology (ECIT) (pp. 117 - 120). IEEE, (2021).

[11] Liu, J., Li, Z., Sun, H., Yu, L., Gao, W.: Volatility forecasting for the shipping market indexes: an AR-SVR-GARCH approach. Maritime Policy & Management 49 (6), 864 - 881 (2022).