The Development Status of Ningbo Zhoushan Port’s Logistics and Its Development Countermeasure

Shiqi Huang
School of Management, Shanghai University, Shanghai, China
1540267134@qq.com

Abstract. The development level of port logistics partly reflects the comprehensive competitiveness of the port. Based on the latest development data of Ningbo Zhoushan port, combined with literature research, this paper analyses the development status of Ningbo Zhoushan port in terms of infrastructure construction, port collection and distribution network, information application, comprehensive logistics service scope and policy environment. In view of the limitation of developing port logistics in Ningbo Zhoushan port, this paper puts forward some countermeasures, such as optimizing the structure of port collection and distribution, speeding up the construction of port logistics information, optimizing the development system of port regional logistics, to furtherly improve the development level of port logistics in Ningbo Zhoushan port.

1. Introduction
With the increasing demand for international logistics services, the port functions are expanding and its importance is becoming increasingly prominent. The port plays an increasingly important role in the development of modern logistics. First, the port is the hub node and goods distribution center of the integrated logistics supply chain; second, the port is the best combination point of production factors to provide products for logistics services; third, the port has become the information center of logistics and has additional analysis and decision-making functions. Since its development, port logistics has realized the most basic traditional services such as loading and unloading, handling and storage, and has become a new growth point of port economic development by combining financial, insurance, information and other derivative value-added services. Therefore, based on the traditional functions of distribution, storage, transfer, loading and unloading, how to continuously expand port logistics service functions, optimize port resource allocation, and develop modern logistics, improve service efficiency and establish a comprehensive system of port logistics has become an important strategic measure for the port to seek long-term development and enhance competitiveness. The "one belt and one way" strategic planning focuses on the development of port logistics, and puts forward corresponding measures to promote the construction of port infrastructure and strengthen the informatization of shipping logistics. It also promotes the construction of port rear collection and distribution network, accelerate the establishment of a unified transport coordination mechanism, and promotes the effective convergence of international customs clearance, replacement and multimodal transport, that is, the "one belt and one way" strategy puts forward higher requirements for the existing logistics system, which require modern ports to further improve the service capacity of logistics center.
and improve the efficiency of regional logistics operation to adapt to the rising trend of port throughput under the new situation.

In the existing literature on the situation and countermeasures of Ningbo Zhoushan port logistics development, many scholars have studied it earlier, which is not completely in line with the reality of Ningbo Zhoushan port at this stage. Based on this and combined with the latest situation of Ningbo Zhoushan port, this paper makes further research on the logistics of Ningbo Zhoushan port. The rest of this paper is organized as follows. Section 2 expounds the connotation and development of port logistics. Section 3 elaborates the current situation of Ningbo Zhoushan port logistics. The development countermeasures of the system are put forward in Section 4. Finally, Section 5 summarizes.

2. Overview of Port Logistics

Port logistics is one of the main functions of the port, providing basic logistics services such as cargo loading and unloading, warehousing, traditional collection and distribution, as well as derivative value-added services such as port logistics investment and financing, and port logistics big data. This chapter will start from the connotation, main functions and intergenerational evolution of port logistics. Modern port logistics refers to the port based on hardware and software conditions, including the basic equipment of port logistics operation, the collection and distribution roads inside and outside the port, logistics information system and logistics policy support, highlighting the port cargo distribution function, storage and transportation function, circulation and transaction function, and integrating the port logistics industry with information technology, financial investment and financing services to develop a comprehensive logistics service system covering the logistics supply chain [1]. At present, port logistics also has the function of bonded port, i.e. port integrated logistics bonded area and free trade area [2].

Under the influence of the two common factors of port and logistics, the port logistics function has been continuously expanded, from the provision of cargo loading and unloading in port, storage and transportation to the combination of information technology, financial investment and financing, towards the goal of higher efficiency, lower cost, more humanized service, and gradually formed the three main functions of information processing, comprehensive logistics service, and bonded.

The traditional port logistics is only a simple transport hub, which provides a single logistics service such as cargo loading and unloading, storage and so on. It lacks an integrated port logistics center and cannot effectively manage the entire port logistics chain. With the development of port generation, the function of port logistics has been extended and expanded. In terms of the characteristics of port services, integrate all links of port logistics chain, provide various logistics value-added services and flexible services; in terms of informatization, implement informatization management, and develop from limited electronic data exchange (EDI) contact to a logistics information platform to realize the data sharing of relevant stakeholders in the port and hinterland. Combined with the intergenerational development stage of port, the function and production characteristics of port logistics are shown in Table 1.
Table. 1 function and production characteristics of intergenerational port logistics

| Function | First generation port | Second generation port | Third generation port | Fourth generation port |
|----------|-----------------------|------------------------|-----------------------|------------------------|
|          | Transportation hub, cargo handling and storage | Transportation hub, goods transfer; port industrial center | Port industrial center and transport hub; international trade base; multimodal transport and logistics center | Global resource allocation hub, port logistics resource planning |
| Production characteristics | Goods flow, simple sub service | Goods flow, joint services, value-added services | Information flow of goods, multiple services of sub transportation, sub allocation and whole process transportation, high value-added services | Full range, all-round and multi-level high-end port logistics services |

3. Current situation of port logistics development of Ningbo Zhoushan Port
To some extent, the comprehensive competitiveness of the port is affected by its logistics operation efficiency. Efficient port logistics will have a strong economic penetration and synergy effect on the port economy.

3.1. Gradual improvement of port logistics
In terms of the deepwater coastline resources of the port, the planned coastline is 449.4km, of which the deepwater coastline of the port is 384.9km long. The coastline with a depth of more than 15m is 200.7km, and of more than 20m is 103.7km. In terms of berth composition, Ningbo Zhoushan port has 150 large-scale deep-water berths above 10000 tons, 89 large-scale and extra large-scale deep-water berths above 50000 tons. The resources of large-scale and extra large-scale deep-water berths are abundant, and the length of productive wharf and the number of deep-water berths above 10000 tons are increasing year by year. In terms of port throughput, by the end of 2018, the cargo throughput has exceeded 1 billion tons for two consecutive years, ranking first in the world, and the container throughput has reached 25 million TEUs, ranking third in the world, as shown in Table 2. In terms of port anchorage, Ningbo port has 15 anchorages, among which 5 are above 100000 tons; Zhoushan port has 55 anchorages, among which 23 are above 100000 tons. In the port area, the introduction of private capital to jointly invest in the construction of operational infrastructure of port logistics, expand storage capacity, and better provide value-added services derived from logistics, such as port Logistics Park.

Table. 2 Throughput of Ningbo Zhoushan port (2012-2018)

| Year | Container throughput (10000 TEUs) | Year on year growth% | Cargo throughput (100 million tons) | Year on year growth% |
|------|-----------------------------------|----------------------|-------------------------------------|----------------------|
| 2012 | 1617                              | 14%                  | 7.44                                | 7.2%                 |
| 2013 | 1735                              | 7.3%                 | 8.1                                 | 8.9%                 |
| 2014 | 1945                              | 12.1%                | 8.73                                | 7.8%                 |
| 2015 | 2063                              | 6.1%                 | 8.89                                | 1.8%                 |
| 2016 | 2156                              | 4.5%                 | 9.18                                | 3.3%                 |
| 2017 | 2461                              | 14.1%                | 10.1                                | 10%                  |
| 2018 | 2509                              | 1.9%                 | 10.84                               | 7.3%                 |
Data source: Ningbo Zhoushan Port Group official website

Based on the above analysis, Ningbo Zhoushan port has obvious advantages in terms of terminal infrastructure and port logistics scale, which are reflected in port throughput, equipment operation capacity and logistics service system. The port area has the Berthing Capacity of global large ships, a complete comprehensive cargo handling system and supporting facilities [3]. Its relatively complete port logistics infrastructure can improve the port cargo circulation scale and handling efficiency, shorten the cargo collection and distribution time, reduce the logistics operation cost of the whole port, and thus improve the port logistics development level.

3.2. Initial scale of port logistics collection and distribution network

The port collection and distribution network is the material basis of the port logistics development of Ningbo Zhoushan port. Apart from the high efficiency of loading and unloading, the port terminal should also have a high accessibility collection and distribution network, including the port evacuation channel in the port area and the transportation channel in the hinterland outside the port [4], so as to realize the "door-to-door" transportation speediness of the whole logistics. In the port road collection and distribution network, Ningbo Zhoushan port container cargo mainly through the Beilun road network to achieve cargo distribution. The existing road network and planned road network of Beilun District high-speed collection and distribution highway basically form a "four horizontal and two vertical" main port distribution framework. The bearing capacity of the whole line network is relatively complete, which will greatly improve the collection and distribution capacity of Ningbo Zhoushan port, reduce the logistics transportation cost and improve the efficiency of logistics operation.

The railway transportation network of Ningbo Zhoushan port is mainly distributed in the direct economic hinterland of Zhejiang Province and the indirect hinterland cities of Jiangsu, Anhui, Jiangxi and Fujian [5]. In terms of water transport channel, Ningbo Zhoushan port is rich in inland river resources, with 20 coastal and Yangtze River lines and 32 port branch lines [6], respectively. In terms of inland waterway construction, it actively promotes the construction of container inland river transport channel with three-level waterway as the main channel.

3.3. The expanding application scope of port logistics informatization

The in-depth combination of port informatization and port logistics is conducive to improving the service efficiency of port logistics for the main body of port enterprises, and then improving the efficiency of the whole port logistics supply chain. On this basis, the breakthrough of big data, cloud computing and other information technology can realize the connection and sharing of logistics resources of each main body in the port logistics supply chain, and have a positive impact on the port logistics. At present, the relatively mature logistics information platform of Ningbo Zhoushan port includes Ningbo E-port platform and Ningbo Port EDI center, which mainly provides entry-exit customs clearance business and electronic data transmission business of relevant documents. At the same time, Ningbo Zhoushan port rail sea intermodal business is actively combining the Internet of Things and big data technology to initially establish the rail sea intermodal logistics information system, covering 11 rail sea intermodal lines. All logistics and transportation data, including every link of container from ship to train, have realized data sharing and monitoring, and the business operations such as sea rail intermodal transport have realized informatization and networking.

3.4. Gradually expanded comprehensive service scope of Port Logistics

The comprehensive service of port logistics includes basic logistics service and derivative value-added service, among which derivative value-added service is the key to realize the innovative development of port logistics. Today's ports can't only rely on traditional logistics services such as loading and unloading, handling and transportation to realize the sustainable growth of port profits, but need to develop new businesses such as port logistics finance, logistics insurance and logistics financing on the basis of improving traditional logistics services, extend the value chain of port logistics, and
promote the new development of port logistics. Ningbo Zhoushan port actively introduces insurance investment business in the development of port logistics. Meanwhile, port industry and logistics park enterprises begin to contact port logistics finance. Many domestic banks also start to introduce port supply chain logistics business and develop new financing methods such as financing leasing. All of these improve the value connotation and scope of Ningbo Zhoushan port logistics, and further promote the development of its port logistics.

3.5. Continuous improvement of port logistics policy environment
Port logistics policy programs the overall implementation steps for the development of port logistics and provides financial support, which is the soft environment for the development of port logistics. In 2017, the notice of the Ministry of communications on carrying out the smart port demonstration project proposed to establish the smart port logistics demonstration project in the field of port logistics, including innovating the port operation mode, improving the port logistics information system, and promoting the open sharing and interconnection of information. The "2019 smart port conference" is an in-depth discussion on innovation to promote the smart and green port from the aspects of artificial intelligence, blockchain, time and space big data, unmanned driving, etc. The state and society attach great importance to the development of port logistics in Zhoushan port, and analyze the future development trend of port logistics from the perspective of macro strategy, including port logistics service innovation, intelligent port construction and logistics informatization, so as to properly guide the development of port logistics industry.

4. Development countermeasures for port logistics of Ningbo Zhoushan Port
According to the current situation of Ningbo Zhoushan port logistics development, this chapter puts forward countermeasures from three aspects to break through the bottleneck of port logistics development and further enhance the comprehensive competitiveness of Ningbo Zhoushan port logistics.

4.1. Optimize the port collection and distribution structure
The imperfect collection and distribution system of port logistics will affect the improvement of port logistics competitiveness and reduce its logistics service efficiency. Among them, the collection and distribution structure refers to the transportation volume undertaken by various collection and distribution modes, which leads to different adaptability through different proportion of transportation volume, thus affecting the comprehensive operation efficiency of port logistics.

In order to optimize the current collection and distribution structure of Zhoushan port in Ningbo, we should not only rely on the distribution and transfer of traffic volume to adapt to the railway and water transport goods, but also start from the supply of the collection and distribution system to achieve a relatively appropriate collection and distribution structure. Specifically, it includes two aspects: one is to improve the port's collection and distribution infrastructure, including the expansion of wharf berth, transportation road inside the port, yard behind the port and warehouse functions; the other is to invest funds to increase the scale of logistics collection and distribution facilities outside the port, including the accessibility of various transportation modes, hub stations and transportation road networks, especially the construction of railway and water transportation. In addition, we should improve the service quality of port collection and distribution management, promote the cross system and cross process cooperation of all departments of port logistics supply chain, so that the goods are not limited in the whole process of transportation, so as to reduce the logistics transportation time and corresponding logistics costs.

4.2. Speed up the informatization construction of port logistics
Port logistics information is the technical guarantee for the port to provide comprehensive logistics services. An efficient port logistics information operation system can achieve the speed of obtaining the main information of each link of the port logistics supply chain, integrate the port logistics
resources, and improve the logistics efficiency. At present, Ningbo Zhoushan port logistics informatization lacks integration construction, which can be improved from three aspects.

First, take the form of "Internet + port logistics" to realize the effective operation of cargo logistics, information flow and capital flow, and to transform to intelligent port. The core of Internet + is integration, that is, information integration and utilization of big data. Ningbo Zhoushan port should make effective use of big data, rely on the port logistics chain, and build a public information sharing platform for intelligent port logistics, that is, a logistics information platform that needs collaborative operation to achieve real-time docking among members of the supply chain [7]. Specifically, it is to promote the close integration of information industry and port logistics industry, including the Internet of things, and make use of modern information technology of automation, informatization, networking and intelligence to realize data sharing among port authority, financial enterprise, shipping company, port agent enterprise, station operation company and other relevant units, as shown in Figure 1.

![Figure 1 port logistics operation system of Ningbo Zhoushan port](image)

(Based on the framework of port logistics supply chain)

Second, Ningbo Zhoushan port has established many logistics information platforms at present, but the involved subjects and the functions of logistics information platforms are relatively single. Therefore, Ningbo Zhoushan port should build a port logistics operation system with the participation of all parts of the port logistics supply chain. Through the shared port logistics information resource platform and deep-seated data mining and analysis technology, it can speed up the information transmission speed of port logistics related enterprises, improve the overall operation efficiency of port logistics, and at the same time, to realize the data sharing of port enterprise logistics resources.

Thirdly, it is necessary to speed up the application of port intelligent cargo processing equipment, such as automatic scanning equipment, radio frequency equipment and intelligent loading and unloading crane, so as to improve the application rate of automation, gradually cover the basic business links of the port, improve the level of port automation operation, and avoid hindering the improvement of port logistics competitiveness due to low logistics efficiency [8].

4.3. Optimize the development system of port regional logistics

Up to now, the integration of Ningbo Zhoushan port has obvious advantages and achieved remarkable results, but there is still a big gap from the real integration. The port logistics resources of Ningbo port and Zhoushan port need time to be integrated, and the integration still needs efforts to promote the development of port logistics.
Ningbo Zhoushan port should promote the effective connection of port main business and port logistics, form port logistics chain, and coordinate the development of inward logistics and outward logistics, so as to realize the control and value-added of the whole logistics supply chain. On the one hand, it is necessary to integrate and plan the internal resources of the port and speed up the integration process; on the other hand, it is necessary to coordinate the vertical and horizontal links in the development process of the port logistics, that is, to achieve the sustainable development of the port logistics through the deep development of the external environment of the port logistics. For example, Ningbo Zhoushan port authority can rent part of the land or management power of the port to attract the port logistics enterprises Capital investment, joint development of port logistics resources, collaborative operation, improve the overall operation efficiency of port logistics. For example, Ningbo Zhoushan port authority can lease part of the port's land or management power, attract the investment of port logistics enterprises, jointly develop port logistics resources, and cooperate in operation to improve the overall operation efficiency of port logistics.

5. Conclusion

This paper makes a systematic summary of the connotation, main functions and intergenerational evolution of port logistics, and studies the current situation of port logistics development of Ningbo Zhoushan port. On the whole, the port logistics of Zhoushan port in Ningbo has a good development status. It has developed well in port logistics infrastructure, port collection and distribution system, port informatization, port logistics comprehensive service capacity and port logistics policy environment, and it is in the forefront of the development competitiveness of large-scale ports. However, the development of port logistics of Ningbo Zhoushan port is still restricted by some factors, such as the imperfect collection and distribution system, and the insufficient data sharing in all links of port logistics supply chain. Therefore, this paper puts forward specific solutions to the existing main port logistics development problems of Ningbo Zhoushan port from three aspects: port collection and distribution structure, port logistics information construction and port regional logistics development system, in order to enhance its comprehensive competitiveness of port logistics.

The research results of this paper have certain reference significance for the further development of port logistics in Ningbo Zhoushan port, and there are certain limitations in the writing process. For example, the limitation of space cannot make more detailed analysis and expansion on the countermeasures affecting the development of port logistics, and the latest statistical data cannot be obtained accurately, etc., the future research work will be constantly modified and improved.

Acknowledgments
The author wish to thank referees for helpful comments that strengthened this paper.

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