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## Research on the Necessity of Linkage between Dalian Port and Yingkou Port Based on Service Supply Chain

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### Abstract

Both Dalian Port and Yingkou Port have their own advantages. The two ports should enter into a benign development track through cooperation, and use the complementary features of cargo types and structures in the Bohai Bay Inner Line and the economic hinterland. Through the transfer of goods between each other and the strengthening of the division of labor, the two harbors form a northern hub with its own characteristics, strong core functions, and the ability to share resources. At present, competition in the ports of the Bohai Rim region is fierce, and the two ports have only constant adjustments and studies. By adopting a cooperative strategy, they can better play their respective advantages and increase their competitiveness. Among the coastal port groups in Liaoning Province, Dalian Port and Yingkou Port are two ports with important strategic status. Both ports have their own unique resource advantages in the field of circulation services, and they are also hub ports with huge future development potential. Dalian Port and Yingkou Port are the main bodies of Liaoning coastal port groups and the main channels for import and export of goods in Northeast China. To promote further revitalization and opening up of Northeast China, all ports should coordinate with each other and develop in competition and cooperation. The new era of supply chain management is to adhere to the needs of customers and the market as the direction, and to play the flagship role of the core enterprises. Through the mode of cooperative competition and mutual benefit and win-win operation, modern technology and management methods are adopted to integrate all parties in the supply chain to form a complete network structure, eventually forms a strategic alliance with strong competitiveness.

### Keywords

Service supply chain; Dalian Port and Yingkou Port; port group linkage model; necessity analysis.

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### 1. Introduction

In 2009, the State Council passed the “Liaoning Coastal Economic Belt Development Plan”, which indicates that Liaoning’s development strategy of “turning to the sea” has risen to a national strategy. The competing relationship between Dalian Port and Yingkou Port directly affects whether or not Liaoning can truly turn to the sea. The rapid development of economic globalization has also promoted supply chain management thinking. The development of ports is facing unprecedented competitive pressures. In the past, the competition among ports has begun to change to the competition between the supply chains where the ports are located. The function of the port is no longer an isolated node in the transportation chain or a storage center, but exists as an important node in the supply chain. In 1999, at the United Nations Conference on Trade and Development (UNCTAD), the initial concept of the

fourth-generation port was proposed, it points out that the fourth-generation ports are those that are separated from each other in physical space, but are also linked through public operators or administrative departments. The fourth-generation port is transformed into a link on the supply chain based on the third-generation port function. Through the Hong Kong Airlines Alliance or the Hong Kong Consortium, the interaction between ports and ports and related logistics activities is realized. In order to meet the needs of the shipping market for differentiated port services, through the provision of refined operations and agile services, flexible ports are formed, which in turn facilitates the seamless integration of various links in the supply chain related to port activities. The most important feature of the fourth-generation port is the integration and cooperation of ports in different regions, so that the port's development has entered a new stage. The fourth-generation port is the main port of the international shipping center and the hub for resources to achieve global deployment.

## 2. Research on Linkage Models of Port Groups at Home and Abroad

A careful analysis of the development history of the world port group will reveal that the formation of the various port groups is roughly similar. Before the formation of the port group, the ports in the region were isolated from each other and lacked mutual connections. In order to compete for market share, they competed fiercely with other ports. As a result, port benefits declined and profits decreased. In the face of fierce competition, the port began to explore new modes of development and eventually chose a mode of port clusters that will lead to mutual cooperation and common development. Through strengthening the linkage between ports, jointly improving the port infrastructure, developing and learning new production technologies, establishing common service standards, and standardizing the use of flat rates, etc, the overall competitiveness will be improved and the company's revenue will be increased. The typical port group development model is the New York-New Jersey port group on the East Coast of the United States, the European port group, and the Tokyo Bay port group in Japan. In order to deal with the impact of economic globalization on the development of the international shipping industry, it is an inevitable trend for future port development to strengthen the cooperation and cooperation between ports to establish a group of ports[1].

1) The linkage model of foreign major port groups

(1) European port group

Europe has a unique advantage in its shoreline resources. There are more than 1,200 ports in more than 20 countries in the EU jurisdiction. During the development of ports in Europe, there have been incentives and disorderly competition among ports to compete for supplies. In order to avoid disorderly competition in the port, they will accelerate the joint development and management of ports in the EU region. In 1993, the European Union established the European Sea Port Organization (ESPO). Its main task is to promote the efficient, safe and sustainable development of the EU port system by influencing the formulation of public policies. In addition, it provides an effective platform for major ports to discuss major issues, adheres to market demand guidance, and strives to improve the convergence of maritime transport with inland shipping, railways and highways, establishes a comprehensive collection and transportation system, and strengthens coordination among local port management agencies, achieves the coordinated development of ports in the region.

The characteristics of the EU port linkage model are:

1. Emphasizing the legal status of the independent operation of the port, in order to ensure that the port can compete freely and does not participate in the day-to-day operation of the port;
2. To use the parliamentary approach to coordinate the interests of the ports and to ensure the interests of the ports in the port group through legal forms, such as sea and land multimodal transport and transportation safety;
3. Preside over and use technology and funds to support the establishment and research of special projects and statistics on port data in the region.

## (2) New York-New Jersey Harbor Group

The New York-New Jersey Harbor Group, located on the mouth of the Hudson River in the United States, was formed by the merger of New York Harbor and New Jersey Harbor, which belonged to different administrative regions, it is to avoid conflicts of interest and to break administrative divisions. Through the complementarity of resources to achieve the integration of the port development, relying on advanced management experience and superior geographical position, it has become the largest port group on the East Coast of the United States.

The characteristics of the US port management system are as follows: The port management authority is decentralized to the local government, and the administrative and financial rights of the port belong to the local government and are managed by the local government; and the separation of government and enterprises is realized. The federal government does not have a special port management agency. However, there are many institutions that can involve and affect the development of ports; multi-channel financing for the construction of ports, such as port revenue, corporate bonds, etc. The development model of the New York-New Jersey port group is characterized in that the unified Port Authority is responsible for the planning, construction and maintenance of ports and docks. Provide information systems for the development of port groups to ensure port group security and promote regional economic development. Through the issuance of bonds and the leasing of port facilities, the Port Authority will manage the remaining funds after deduction of basic expenses and use them to develop ports. The development of the port groups will enable them to operate autonomously and become self-financing.

## (3) Japan Tokyo Bay Port Group

Tokyo Bay Port Group consists of six major ports: Tokyo Port, Kawasaki Port, Yokosuka Port, Chiba Port, Yokohama Port, and Kisarazu Port. In the area stretching over 100 kilometers from the two wings of Tokyo Bay, there are numerous factories and ports, making it Japan's largest urban agglomeration and port industrial area. There are numerous ports in the Tokyo Bay area. In order to avoid vicious competition between ports, the Japanese government has conducted unified and coordinated management of ports in the area at the national level, by proposing the "Basic Conception of the Tokyo Bay Harbor Project", the division of labor within the region's ports will be integrated into an organic port group. The characteristics of the co-opetition between Tokyo Bay Port Group are: (1) Harmonization and coordination means that the Ministry of Transport and Transportation shall coordinate the development of the port group in a unified way, and the management authority of the port will be decentralized to local institutions; (2) Internal disputes and outreach, coordinated and coordinated by the Ministry of Transport, the development of misplaced ports based on different functions of their own ports, external adoption of uniform rates, policies, participation in international competition as a whole, and enhanced overall competitiveness; (3) Clear division of labor, each port determines its own port functions based on the layout of the port industry, avoiding excessive competition between internal functions due to the similarities in the functional structure, and eventually achieving the dislocation development of the port.

## 2) Domestic major port group linkage model

### (1) Double hub port group in the Yangtze River Delta

The port group in the Yangtze River Delta consists of Shanghai Port and the ports of Jiangsu Province and Zhejiang Province. There are such coastal ports as Shanghai Port, Ningbo Port and Lianyungang Port, as well as inland ports such as Nanjing, Zhenjiang, Hangzhou and Shaoxing. In recent years, due to the rapid development of regional economy, the rapid development of ports in the region has promoted the development of Shanghai Port and Ningbo-Zhoushan Port, the ports in the region have also turned from competition to cooperation. In particular, the integration of Ningbo Port and Zhoushan Port has enabled the two ports to merge into a world-class port. Shanghai Port's investment in the construction of large and small Yangshan Port is also a reflection of the linkage of ports in the region [2].

The Yangtze River Delta region is one of the regions with the highest density of coastal ports in China. At present, it has formed a port group structure with "above sea ports as the center, Ningbo-Zhoushan Port, and large and small Yangshan Ports as two wings, and ports along the Yangtze River as deep [3]." In order to maximize the overall benefits of the port group and realize the dislocation development of the ports in the region, the ports of the Yangtze River Delta region mainly exhibit the following characteristics in the linkage process:

1. The country continues to issue policies to promote cooperation in port cooperation in the Yangtze River Delta region

The State Council and the Ministry of Communications have repeatedly issued development plans to guide the development of the port groups in the Yangtze River Delta from the policy side, and thus ensure the coordinated development of the Yangtze River Delta port group. In the end, a regional port group system with a "scientific layout, reasonable structure, and distinct structure" was formed.

2. Local governments actively build a development platform for port groups

The port management departments in the Yangtze River Delta region have actively explored effective management systems and mechanisms by jointly establishing a port management coordination mechanism and development promotion platform, which helps to optimize the regional transportation system, promote the integration of regional ports, and speed up the construction of Shanghai International Shipping Center.

3. Port companies have started mergers and acquisitions through capital alliances to realize the dislocation development of ports

As the main players of independent competition in the market, port companies in the Yangtze River Delta region have adopted mergers and acquisitions through capital infiltration, and have promoted the coordinated development of ports in the region through the establishment of joint ventures.

(2) Pearl River Delta Capital Infiltration Port Group

Many ports in the Pearl River Delta region, such as Guangzhou, Shenzhen, Zhuhai, and Zhongshan, have facilitated the rapid development of the export-oriented economy in the Pearl River Delta region through favorable geographical location, convenient trade conditions with Hong Kong and Macau, and geographic and transportation advantages.

Due to the dense concentration of ports in the region, intensive competition between the various ports is unavoidable, both in terms of navigational services and sources in the hinterland. The fierce competition has led to the serious construction of duplicated ports in the Pearl River Delta region. The division of labor between the ports is not clear. They have only considered their own development and have not formed a port group with a reasonable level. In order to solve the problem of vicious competition among ports in the region, the Pearl River Delta Region took the form of a capital body, and Hong Kong's port companies contributed to share the ports in the region. Through the form of joint investment and co-construction management, while introducing capital and advanced management experience, it also regulates the development of all ports into the overall development plan of the port clusters of the Pearl River Delta[4]. At present, the Pearl River Delta region has formed Hong Kong as an international shipping center, and Guangzhou Port and Shenzhen Port have become regional hub ports. Other ports have supplemented the development pattern. Through the joint capital approach, Each port carries out specialized port construction according to its own characteristics, forming a well-structured and misplaced port group structure, so as to ensure that it not only can exert the advantages of each port, but also improve the overall competitiveness.

The development of the port group in the Pearl River Delta has several features: The development of port groups in the region is rapid, and the ports within the port group are dislocated according to their own advantages. Various supporting facilities related to port functions are relatively complete. Therefore, although the ports within the Pearl River Delta port group are very close to each other geographically, due to the clear functional positioning among the ports, a patchwork development

level is formed and the port functions do not overlap, thus ensuring the rational development and utilization of port resources. It can also ensure that all ports fully realize their advantages and achieve rapid development.

### 3) Domestic and foreign port group linkage experience summary

Through the analysis of the domestic and foreign port group linkage model, it can be summarized as three typical models: local-led; national-led and association-led. No matter which mode, the purpose is to avoid vicious competition between ports, rationally plan the development of shoreline resources, and realize the scale effect by exerting its own advantages. Summing up the currently successful port group linkage model, there are mainly the following experiences that Dalian Port and Yingkou Port can draw upon in the linkage process.

#### (1) Strengthen shoreline resource management and achieve intensive development of shoreline resources

Port groups are generally formed in densely populated areas. Due to the large number of ports in a relatively small area, there is often a cross in the hinterland supply, and the shoreline resources are scarce and non-renewable. Therefore, it is necessary to scientifically plan the development of shoreline resources, optimize the allocation of port resources, avoid the waste of shoreline resources caused by the repeated construction of ports, and plan and develop according to the characteristics of each port, construct a distinctly and dislocationally developed port cluster to ensure the intensive development of shoreline resources.

#### (2) Take a variety of cooperation methods to ensure that all parties can benefit

In the process of port building a group of ports, the port of cooperation can be either a domestic port or a foreign port. The port can either form a port alliance or a port alliance. From the examples of successful regional ports at home and abroad, it is not difficult to see the various reasons brought about by the joint development of ports: It can expand the scale of the port and enhance the profitability of port companies; build capital pressure on port companies and increase investment returns; coordinate the balanced development between ports and improve the use of ports; invest in improving port infrastructure and improving port service quality.

#### (3) Weakening the boundaries of administrative divisions and strengthening mutual division of labor

The linkage between ports is not only a need for the port to avoid vicious competition and increase profits, but also a need for the port companies to respond to the new changes in the international shipping market. The port groups at home and abroad have obvious location advantages and industrial cluster advantages in the process of integration. Therefore, if the port wants to achieve greater development, it must break the restrictions of the existing administrative divisions and coordinate the behavior of local governments through economic laws to avoid them. Because of their own short-term interests hinder the interaction between the ports in the region. In coordinating the relationship between the hub port and the feeding port, we must ensure the status of the hub port and give full play to the role of feeding the port, and through the development of a reasonable port group development plan to achieve the intensive use of shoreline resources, promote the coordinated development of the port group as a whole, and form economies of scale in the complementary dependence.

### 3. Analysis of the Necessity of Linkage between Dalian Port and Yingkou Port

Judging from the current state of competition, both Dalian Port and Yingkou Port have their own advantages, but blind development will be unfavorable for themselves, blind competition will only give opportunities to other ports in the Bohai Bay area. Opposite cooperation is the best choice for both. Between the two ports, Hong Kong should establish a coastal port group and enhance its competitiveness by exerting the effect of Hong Kong-Hong Kong linkage.

(1) The linkage between the two ports is a requirement for Dalian to build an international shipping center in Northeast Asia. Building Dalian into an international shipping center in Northeast Asia is not

only an objective requirement for the development of shipping in Liaoning Province, but also conducive to the development of Liaoning coastal port groups. The integration of port group resources is an important manifestation of supply chain management thinking in port development, and also an important way for the evolution of the fourth generation of ports. The so-called integration of port group resources is a form of organization and coordination. Separating the functions within the port that are related to each other but separate from each other, and the partners that carry the common mission outside the port but have their own independent economic interests, are integrated into a logistics demand system that serves to include transportation. This is an important way for the port to realize the transformation of the growth mode. It is also an important guarantee for the proper integration, rational planning, and full utilization of port resources within the region. It is an effective method to exploit the advantages of the port portfolio.

The construction of an international shipping center requires not only the port hardware facilities, but also the soft environment support such as shipping service quality and information level. All these requirements relying on a single port is difficult to support. It must be supported by the surrounding ports and developed through a hub port and multiple auxiliary ports. Dalian's construction of an international shipping center requires Dalian Port to increase cooperation with its neighboring ports, especially with Yingkou Port. And once the shipping center is established, the scope of its services will not only be limited to itself, but also have a good role in the development of the surrounding ports.

(2) The linkage between the two ports is a need to respond to the fierce competition of internationalized ports and build a competitive port group.

With the application of supply chain management in port development, the ports have changed their development strategies and no longer emphasize that they are "logistics centers". Instead, it is transformed into a node in the supply chain that the port participates in, and the ports enhance their competitiveness through the Hong Kong Airlines Alliance or the Hong Kong Consortium. In order to truly build a port group that is internationally competitive, coastal port groups in Liaoning need not only to maintain creative and rational competition in ports within the region, but also to strengthen cooperation between ports and avoid vicious competition. At present, both Dalian Port and Yingkou Port are vigorously developing the container business. Large container terminals and deep-water berths have been completed and put into operation. The competition between the two ports has become increasingly fierce. In this situation, Dalian Port and Yingkou Port must be developed in a coordinated manner. Dalian Port should have a wide water depth, many routes, and Yingkou Port should be able to take advantage of the proximity to the Shenyang economic circle. Rationally positioning the development plans of the two ports and realizing the linkage between the two ports can only bring into play the functional advantages of Dalian Port and Yingkou Port, enhance the comprehensive competitiveness of the two ports and enhance the overall competitive position of Dalian Port and Yingkou Port.

(3) The linkage between the two ports is also a requirement. With the increasing popularity of supply chain management ideas, this is exactly the requirement for the development of fourth-generation ports, which are mainly container transport. At present, the competition for the Northeast Asian International Shipping Center includes not only ports in the Bohai region but also ports in Japan and South Korea. Judging from the current development status of coastal ports in Liaoning Province, no matter whether it is the port of Dalian or the port of Yingkou, it is impossible for a single port to form strong competition. This requires Dalian Port and Yingkou Port to strengthen their cooperation with each other, with Dalian Port as the center, coordinate the relationship between the two ports, and cooperate in competition to form a competitive situation. To eliminate the vicious competition in the disorderly competition between the two ports, enhance the competitiveness of the two ports and obtain an overall superior position.

(4) The linkage between the two ports is also a need to achieve high-efficiency development. The joint development of Dalian Port and Yingkou Port is conducive to breaking the similarities of the two

hinterland's economic hinterland, similar port functions, and similar shipping requirements. To improve the homogeneity of inefficient competition between the two ports, reduce repetitive investments, and avoid vicious price wars, we can allocate more limited resources to more important ports, reduce the waste of shoreline resources, optimize the overall allocation of resources, improve the advantageous development capabilities of Dalian Port and Yingkou Port through the complementary advantages and functional differentiation of the two ports, enhance the competitiveness of ports, and eventually reach Dalian Port and Yingkou Port win-win situation.

#### **4. Feasibility Analysis of Implementing Harbor Linkage in Dalian Port and Yingkou Port**

The co-opetition of ports is essentially a kind of cooperation game. The future development trend of ports is container transportation. The joint action of ports is to realize the complementarity of ports in the region and enhance the overall competitiveness of ports, it is not only an inevitable requirement for the development of the port, but also the basis and prerequisite for the joint development of the ports in the region to establish the Hong Kong alliance. Yingkou Port is one of the fastest-growing ports in China's coast. It has the potential to catch up with Dalian Port in terms of throughput. In the process of development, Yingkou Port will give up some of its own interests and obey the construction planing of Dalian International Shipping Center in Northeast Asia. Whether the relationship between the two ports can be transformed from a "competition" game to a "competition game". What kind of tactics will be adopted during the game will depend on whether the benefits obtained after the implementation of linkage between the two ports are greater than those under the complete competition between the two ports. This problem cannot be concluded by theoretical analysis alone. Therefore, we establish a model to analyze the feasibility of joint development of ports.

In the actual economic life, the most fierce competition often occurs between those ports where geographical space is close and whose functions are basically the same. The competition between Dalian Port and Yingkou Port in the container business is a typical example. In particular, the leap-forward development of Yingkou Port in recent years has intensified the competition among the two ports, especially the container business. If Dalian Port and Yingkou Port want to establish and maintain competitive advantages in this fierce competition, they will only be able to increase the investment in port construction. Looking at the development of Dalian Port and Yingkou Port in recent years, the two ports are basically in a state of disorderly competition. If the competition between the two ports is not contained, it is possible to slip into the situation of vicious competition. In the future, based on the theory of game theory, we will explore the cooperation between Dalian Port and Yingkou Port on the basis of cooperation and solve the differences between the benefits of the two ports in adopting a competing development strategy and competitive strategies, and demonstrate the feasibility of joint development of the two ports.

#### **Acknowledgements**

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