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Research on Mutual Promote Development between Smart Port and Supply Chain

Meng Zhang

School of Transportation, Shanghai Maritime University, Shanghai 200000, China.

2823829094@qq.com

Abstract

Along with the advance of science and technology and the rapid development of information technology, artificial intelligence big data iot rise ceaselessly, the developing mode of port is also significant changes have taken place in the rapid change of port competition intensifies, profit margins have been reduced pressure of port industry in our country, port sustainable development have been bigger challenge, therefore, under the new situation, must accelerate the innovation of port, port construction out of the wisdom of leading technology trend, promoting the port service mode innovation is particularly necessary and urgent is the core of the supply chain nodes, is also the hub of logistics business flow traffic flows, the port has accumulated a large amount of data Complex wide network and huge logistics value, in the face of the diversification of demand the rapidness, port competition turn to port service chain competition, so the wisdom of port construction intelligent port and supply chain collaboration is particularly important in this paper, introduced through the wisdom of port simple introduction to the modern port service supply chain to analysis the relationship between the two, through the case analysis to further explore wisdom port and the relationship of the supply chain, and put forward reasonable Suggestions, make the port and supply chain coordination between wisdom and development hand in hand.

Keywords

Smart ports; Supply chain; Service chain.

1. Introduction

1.1 Research background and significance.

With the process and development of global e-commerce, most fields are gradually becoming modern and intelligent. As an important support in the transportation industry, the intelligent development of ports is certainly not slack off. Smart port, also known as "3E" port, is a product of the combination of digital technology, commercialized innovation and resource value innovation. It is excellent in port operation, open in ecosystem construction and continues to expand in innovative business of sustainable development.However, it is far from enough to adapt to the current ever-changing transport market just by relying on the operation of smart ports. Therefore, how to optimize the functions of smart ports and maximize their functions has become a subject that people need to study at present.

According to the investigation and study, the transportation process is an interlocking process, which is undoubtedly affected by the development of the supply chain due to more or less contact in the invisible. Supply chain refers to the flow and transmission of capital flow and information flow between related departments or business partners of an enterprise. In the whole process, it covers the procurement, design, packaging and payment of raw materials, which is a whole process of business.

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Supply chain management refers to the enterprise with minimal cost to meet the needs of its customers and clients, and relying on modern information management technology, the Internet communication technology in the full circulation of finished products such as process, all aspects of supervision, control, coordination and management, so as to realize the customer management during the whole of the real-time control of each subject, including suppliers, distributors, manufacturers, distributors and wholesalers, joint channel all internal resources for the integration of human and material resources, thus to promote the enterprise's operation and the circulation process.

So if wisdom port and closely with each other between the supply chain, port enterprises as the core of the supply chain to stand, and to carry out the work, management including the content of the cash flow and information flow, the upstream and downstream port of shipping, road transport enterprises, ship generation with forwarder and consignee and other nodes as an organic whole, and the requirements of the goods completely to the appointed place on time, this is the whole process of port supply chain. On the other hand, strengthening the management of supply chain can promote the further improvement and development of the port.

1.2 Research Contents.

This article through to the existing about the wisdom of port and the development of the supply chain literature consult and arrange, using the related theory foundation, not only has carried on the investigation and analysis about the present situation of ningbo port service supply chain, to build wisdom port of ningbo port, also has carried on the investigation of the current situation of combination of both, to further explore the current port and ningbo port will be wisdom that developing the supply chain bottleneck problem, aiming at the shortcomings of the current development situation and puts forward some countermeasures and Suggestions.The main research contents of this paper are as follows:

First: introduce the research significance and background of this topic;

Secondly, it compares the service supply chain with the traditional supply chain, and shows the relevant structure of the service supply chain. Finally, it briefly introduces the relationship between the two;

Third, through case analysis, in-depth understanding of this subject, through the current development process of ningbo Port smart port and service supply chain, analyze the specific advantages and disadvantages;

Fourth: draw relevant conclusions based on the empirical evidence, and put forward feasible Suggestions on the development factors affecting ningbo port service supply chain.

2. Literature review

2.1 Literature review of smart ports.

Different scholars have different opinions on the meaning of smart port. Zhang Mingxiang believes that smart port is the product of digital technology + business model innovation + resource value innovation.[1]Smart ports are "3E" ports, which mean Excel in port operations, Extend in the construction of ecospheres, and Explore in sustainable innovation businesses.According to Robben Cheng, smart port is not a simple technology application, but a multi-boundary and systematic port ecosystem reorganized through business model reform and development concept innovation, so as to achieve convenient and reliable customer experience, intelligent and reliable operation, efficient organization and supply chain collaboration, and open industry[2]

Business innovation, promote the improvement of port logistics chain efficiency, reduce trade costs and enhance reliability.On the function and characteristics of smart port, different scholars have different introduction. Liu Yong analyzed the current situation and background of the smart port, and explained its functions, significance and related technologies, hoping to build a smart port integrating vehicles, people, goods, port and ships.[3]He believes that smart ports are characterized by comprehensive perception, intelligent decision making, autonomous loading and unloading, and full

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participation. Wang Chao expounded the development trend of smart ports from three perspectives, including the changes of port terminals, service concepts and operation modes of relevant enterprises, the changes of automatic and intelligent internal processes and management functions of port terminals, and the changes of the functions of port terminals related service enterprises.[4]

2.2 Literature review of supply chain.

Abroad first carries on the analysis of the logistics service integration Management model is Goran and Helge (1996), two scholars, but they did not explicitly put forward the definition of logistics service Supply Chain, the first explanation of the concept of logistics service Supply Chain is the Supply Chain Management, professional association Council of Supply Chain Management Professionals (CSCMP), in the 2000 research report:Logistics service supply chain is a process in which numerous logistics enterprises, including public ownership and private ownership, are involved together, and none of them has sufficient ability to control the whole process, let alone provide sufficient guarantee for the logistics service in the process.Appeared at home and abroad, many scholars from different angles on the connotation of logistics service supply chain was analyzed, and the ShenChengLin and Wang Bo analysis from the perspective of core enterprise, they think the logistics service chain is the integration of logistics service enterprises as a new type of supply chain core enterprise, logistics demand, its role is to provide a full range of logistics services.[5]Integrated logistics service enterprises generally choose appropriate functional logistics enterprises to serve the logistics demanders through the form of business subcontracting.From the perspective of resource integration, Cui Aiping used transaction cost theory, capacity theory and other methods to conduct a systematic qualitative research on the evolution mechanism, structural model, connotation nature and coordination mechanism of Logistics Service Supply Chain (LSSC).[6]From the perspective of capability integration, Gao Zhijun and Liu Wei et al. systematically describe the concept and structure model of logistics service supply chain by using qualitative analysis method on the basis of logistics capability research.[7]This paper analyzes the operation process and driving force of logistics service supply chain and the breadth and depth of logistics capability integration in logistics service supply chain, and puts forward that logistics service supply chain is a logistics capability value-added chain.Through the integration of logistics capability, nodal enterprises in the whole logistics service supply chain can achieve a win-win situation.Although the analysis point of view is different, but the basic connotation of the logistics service supply chain is agree on logistics resources integration and sharing, there is a core enterprise in logistics service supply chain to control the whole chain, thereby for the entire supply chain logistics, cash flow, service flow, information flow integrated management.

2.3 Literature review on the relationship between smart ports and supply chain.

In the existing literature, there are few studies on the promotion and coordination between smart port and service supply chain, and there are many separate studies on the two aspects.For the fifth generation of ports abroad, Notteboom and Rodrigue advocated that coastal and inland ports should integrate with the supply chain at a strategic level while expanding specific production and operation activities to provide customers with a wealth of alternative services.[8]Tea-woo Lee et al. proposed a theoretical model of port supply chain, described the composition structure of port supply chain, and believed that port enterprise is the core and consists of five elements. They applied supply chain theory to port supply chain, and established a network model of port supply chain.[9]Ross Robinson thinks port increasingly into the logistics and the reconstruction of value chain, as a factor of the value chain system, for the ship company and the first H party logistics service provider to spread value, to capture the value of their supply chain, and put forward the port - oriented value chain model, the ship company, customs, inland transport, freight forwarders, customers, warehousing and other enterprise integration to the port service value chain, at the same time points out that the port is port is an important part of the value chain, the port should be to improve its competitive advantage and service port's contribution to the value chain;[10]K.ichou and R.Gray believed that ports are complex and dynamic entities, which leads to different operation modes, organizations and strategies for port service supply chain, and proposed strategies for port horizontal and vertical integration.[11] Wayne

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K. Alley put the port in the port service supply chain to evaluate the port performance. Under this evaluation method, the port service providers use the service network to provide port services. [12]Marlow puts forward the concept of "lean ports" and believes that the formation of a port network can eliminate the waste of material and information in transportation and other logistics links.[13]

Domestically, Xi Ping, from the international Inland Port Research Institute of Xi 'an Eurasian University, put forward the concept of the fifth generation port from the perspective of port strategic development - joint venture parent port.[14]To combine the future ports in the super large port home ports with the international inland ports, branch ports and inland ports as the sub-ports for common development, joint operation and common prosperity of the sub-ports;Zhenhong, a professor from Shanghai Maritime University, proposed in his paper that the fourth-generation ports should deal with the differentiation of service demands. The service of ports is characterized by flexibility to meet the differentiation of market demands.[15]As a key link in the supply chain, the port should have the ability to actively play the role of organization and planning of the operation power in the supply chain, rather than passively playing the role of only providing services. Jin Rongli et al. expounded the basic connotation of the port service supply chain, constructed the port logistics specialty group model diagram based on the port service supply chain, and analyzed the practicality of the model.[16]Li Zhaokun pointed out that benefit distribution is the key link of port service supply chain coordination, and a reasonable benefit distribution mechanism among partners is conducive to the stable operation of port service supply chain, ensuring smooth cooperation process and rapid response to market opportunities.[17]

3. Overview of relevant concepts

3.1 Definition of smart port.

In 1994, the concept of intelligent transportation system was first proposed at the Conference of intelligent Transportation System. Port is a very important part of ITS, and more and more experts and scholars have carried out research and analysis on intelligent ports.Zhenhong believes that smart port is an innovative concept different from the traditional mechanized port.

Port "wisdom" is based on modern infrastructure equipment, the advanced information technology and automation technology such as GPS, GIS, RFID, AIS through the network connection is applied to the port logistics operation, transportation, service and port management, powered by port transport organization of service innovation, to improve the system and mechanism, laws and regulations, standards, specifications, development policy as the guarantee, port resources optimization configuration can be implemented at the higher level, on a higher level to meet multi-level and agile, high quality port transportation service requirements,It is a new type of modern port transportation featuring intelligent production, intelligent management, flexible service and strong guarantee, and can provide high safety, high efficiency and high quality service for modern logistics industry.[18]The goal of building a smart port is to achieve an intelligent collection and distribution system through the innovation of information technology and business model, promote the efficient operation of goods flow, business flow, information flow and capital flow in the trade ecosystem, reduce the cost of comprehensive social logistics, and better liberalize and facilitate service trade.

3.2 Main features of smart ports.

Port "wisdom" is based on modern infrastructure equipment, with cloud computing, big data, Internet, mobile Internet, a new generation of information technology such as intelligent control and port transport business depth integration as the core, powered by port transport organization of service innovation, to improve the system and mechanism, laws and regulations, standards, specifications, development policy as the guarantee, port resources optimization configuration can be implemented at the higher level, on a higher level to meet multi-level and agile, high quality port transportation service requirements, with production of intelligence, wisdom, services, flexible management, powerful guarantee new modern port transportation forms such as distinctive features.[19]

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There are mainly six features:

First, efficient organization and effective cooperation of supply chain: it has a strong ability to integrate resources of maritime logistics chain, and forms a closely connected cooperation system with stakeholders.

The second is the ecosystem strategy of sharing economy: considering both the port's own interests and the overall optimization of supply chain, integrating the port and waterway ecosystem resources, highlighting the openness and sharing of resources as well as the close cooperation of participants, so as to achieve the optimization of the system.

Third, stable and intelligent operation: through the application of digital, automatic and intelligent technologies, stable and intelligent operation and control can be achieved, so as to improve the efficiency and safety of wharf operations and reduce operating costs.According to the collected perception information, the corresponding decision objectives can be determined, and decisions can also be made on the growth process, production plan and land use events, as well as autonomous management and order issuing.

Fourth, open business innovation: with strong innovation cognition, absorption and application ability, to achieve technology, service model, business model innovation.

Fifth, information and technology for connectivity: Relevant parties shall establish an information sharing mechanism to realize connectivity among all parties through advanced digital technologies.According to the needs of the operation process, the relevant staff can use Internet sensing technology to comprehensively perceive each link of the production and the specific location of the staff, and realize the on-site Internet, remote transmission network and data integrated management.

Sixth, convenient and reliable customer experience: attach importance to the service experience of terminal shippers and maritime logistics chain participants, and provide convenient and reliable services for all parties.[20]

3.3 Port service supply chain and traditional supply chain.

Service supply chain refers to a network chain structure in which service integrators (usually core enterprises) realize value-added services by controlling the capacity flow, capital flow and information flow of member enterprises in the service supply chain. Its structural members include service integrators, functional service providers and customers (manufacturing and retail enterprises). Its structural model is shown in Figure 1 below.[21]

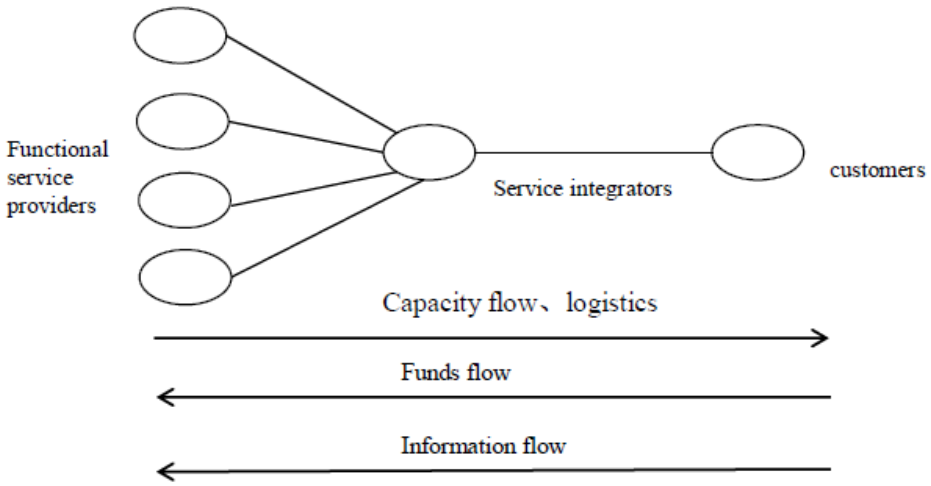

Fig. 1 Structural model of service supply chain

With the increasing importance of the port status and the continuous expansion of functional requirements, the port has long been transformed from a freight distribution center into a global

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resource allocation center, and has become the convergence center of commodity flow, information flow, technology flow and capital flow, and the port service supply chain has also emerged.

Port service supply chain is a multi-node and multi-level supply chain structure with service providers (warehousing, transportation, loading and unloading, customs clearance and other enterprises), ports and customers, which is supported by information technology and established long-term and stable cooperative relations between ports and service providers and customers. Different from the traditional supply chain, the port service supply chain has no manufacturing link. The following table 1 makes a detailed comparison between the traditional supply chain and the port service supply chain:

Table 1 Three Scheme comparing

Project	Port service supply chain	Traditional supply chain
The business process	Liner companies and port enterprises Logistics (including handling)	Manufacturing companies (Manufacturing and assembly)
Objectives of the business process	Shipper: Speed, safety, cost Liner Company: reduced port time Port enterprises: make use of port resources	Reduce the cost
Product characteristics	Invisible, perishable, many kinds	Tangible, kind is more unitary
The stability of	Relatively weak	higher

As for the network structure of the port service supply chain, its process is shown in Figure 2 below:

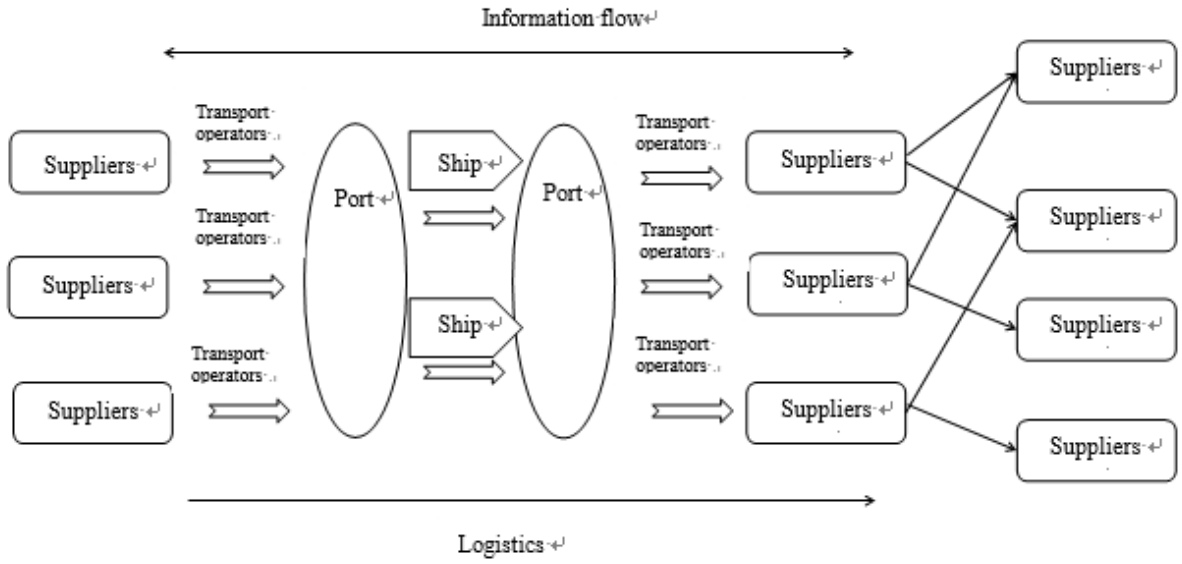

Fig. 2 Flow chart of port service supply chain

3.4 Relationship between smart ports and service supply chain.

Smart port is a natural product after informatization has developed to a certain level. In order to build smart port better and faster, we need to promote the development of service supply chain, and use information technology and intelligent technology to transport, store, load and unload and act as agent of the port. The links such as distribution and information processing are organically combined to improve the intelligent level of the port, optimize the resource allocation and operation scheduling of the port, and finally provide a better comprehensive service with complete functions to meet the needs of customers.The reference of port service supply chain plays a great role in promoting the construction of smart port.

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(1) For the port itself, coordinate the activities of each nodal enterprise in the whole supply chain, improve the coordination of the supply chain through the organic integration of logistics service providers, and effectively realize the profit maximization.It can realize the purpose of organically integrating the smart port logistics service providers, improving the service quality of port logistics and increasing the core competitiveness of port logistics enterprises.

(2) For the port alliance, it can maximize the overall benefits of the supply chain by establishing partnerships with all members of the supply chain, forming a community of interests, implementing resource expansion and complementary advantages, and reducing the time and cost of whole-process logistics.

(3) The construction of supply chain financial information platform and the realization of effective port supply special financial service system are the highlights of smart port construction.With the development of big data and Internet +, the combination of industrial Internet writing and finance has become an irresistible trend.Based on the loan logistics, business flow, information flow and capital flow under the development situation.The smart port development model can advocate the application of emerging technologies such as the Internet of Things and cloud computing to port supply chain financial business, and establish supply chain financial information platform, so as to explore new economic growth points.Port supply chain finance is the integration of port logistics and financial business to provide logistics enterprises and financial institutions in the supply chain with the whole process of commodity circulation services.By using trade and logistics transaction scenarios and establishing special financial information platform, online village can be realized, integrating capital flow, building credit system, upgrading financial leasing services and other financial services with controllable risks.The port supply chain jinduji pingbaiyang plays the role of supervising loans and shares the trends of loans with financing enterprises in real time, so as to strengthen the risk control and management and ensure the risk control.Smart ports should focus on developing innovation and exploration of port supply chain finance, expanding port service functions, and establishing financial ecology with port characteristics.

(4) Improve the efficiency of port operations.By using information technology such as RFID, GPS, can realize the terminal operation and logistics management services, let data sending, conversion, transmission and tracking of electronic, digital, intelligent port management system, reduce the number of goods turnover time, greatly improved the production efficiency, to meet the requirements of customers, the ship, compared with the traditional supply chain, the port supply chain coordination and helps in the supply chain enterprise internal relationships, reduced the goods in the port of time, rapid market response, improve the operational efficiency of the port.

(5) Promoting regional economic development.To promote the development of port integration and port logistics, seize a larger market share of the logistics supply chain, comprehensively improve the service level and comprehensive competitiveness of port logistics enterprises, and drive the rapid development of the port-neighboring industry and the surrounding regional economy.

So, we must strengthen the construction of port logistics information platform of service supply chain, effective strengthen information exchange each node enterprises in supply chain, realize the exchange, optimize the allocation of resources, thus providing the overall performance of port logistics supply chain and the quality of services to realize the rapid development of port logistics supply chain and mature and perfect.

4. Case Analysis---Take Ningbo-Zhoushan Port as an example

4.1 Status Analysis.

4.1.1 Overview of Ningbo-Zhoushan Port.

Ningbo port is located in China's east coast and the confluence of the Yangtze river "golden waterway", the Yangtze river economic belt and the eastern coastal economic belt type "T" crossed the Yangtze river delta region, faces the Pacific on the east, in our country's economy is in an

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important strategic position, is China's major coastal ports and important hub of national comprehensive transportation system, also is an important part of Shanghai international shipping center, is the core of the Yangtze river economic belt service carrier.Figure 3 shows the layout of Ningbo Port.

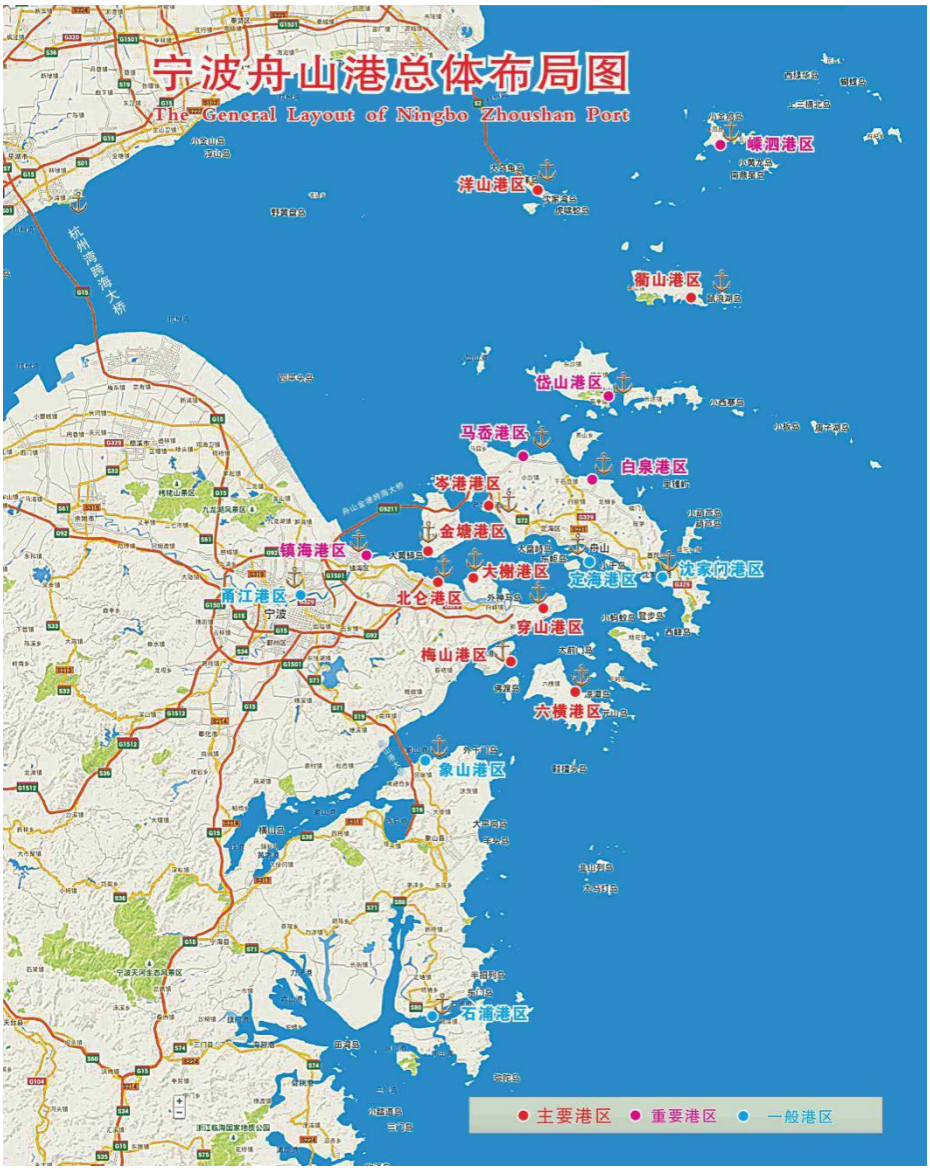

Fig. 3 Overall layout of Ningbo Port

Since the substantial integration of Ningbo and Zhoushan ports in 2015, the comprehensive strength has increased greatly.At present, Ningbo-Zhoushan Port has a total of 419 production berths of ton-class and kiloton, among which 162 are deep-water berths, with a total length of 71.5 kilometers and a comprehensive navigation capacity of 800 million tons.Among them, Zhoushan has a total of 183 production berths of kiloton class and kiloton class, including 57 deep-water berths, with a total port length of 30.8 kilometers and a comprehensive navigation capacity of 380 million tons. There are 243 shipping routes covering major shipping networks around the world.[11]In 2017, the cargo throughput of Ningbo-Zhoushan Port exceeded 1 billion tons, ranking first in the world for nine consecutive years.According to data from the National Bureau of Statistics, In 2017, Ningbo-Zhoushan Port handled 720 million tons of goods and 25.97 million teUs of containers, ranking the fourth in container throughput in the world.By the first half of 2019, it has completed the cargo throughput of

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557.96 million tons, ranking first in China. Table 2 shows the cargo throughput and container throughput of Zhoushan Port in Ningbo over the years.

Table 2 Cargo throughput and container throughput of Ningbo-Zhoushan Port

Year	Cargo throughput (tons)	Container throughput (10,000 teu)
2018	108439	2635.08
2017	100933	2461
2016	92209	2157
2015	88929	2063
2014	87346	1945
2013	80978	1732
2012	74401	1617.48
2011	69393	1471.9
2010	63300	1314.7

The development of Ningbo-Zhoushan Port from a river port with a berthing capacity of only 3,000 tons to the world's largest port is not only due to the 40 years of reform and opening up in China, but also inseparable from the integration practice of Ningbo-Zhoushan Port since the beginning of the 21st century.

4.1.2 Status quo of Service supply chain of Ningbo-Zhoushan Port.

After entering the 21st century, the competition between ports gradually evolved into the competition between supply chains in which ports participated.At this point, the port enterprise integration of various kinds of service providers (including freight forwarders, shipping companies, ship generation, loading and unloading, processing, transportation, warehousing, customs clearance, distribution, information, finance and business services, and other enterprises), through the control of the logistics, information flow, business flow, cash flow, create value for customers, and form the port service supply chain. As for the current situation of ningbo-Zhoushan port service supply chain, this paper will elaborate from four aspects of logistics, information flow, business flow and capital flow.

(I) Logistics status quo

(1) Port logistics resources are abundant, and terminal facilities and equipment are advanced.At present, Ningbo-Zhoushan Port has a total of 419 production berths of ton-class and kiloton, among which 162 are deep-water berths, with a total length of 71.5 kilometers and a comprehensive navigation capacity of 800 million tons.

(2) Port logistics network is perfect and node layout is reasonable.At present, Ningbo Zhoushan Port has 243 shipping routes covering major shipping networks around the world, trading with more than 600 ports in more than 100 countries and regions. 15 inland "waterless ports" have been set up, 46 cities with sea-rail combined transport have been opened, and the annual volume of container sea-rail combined transport has exceeded 600,000 teus.

(3) Large amount of port logistics and high efficiency of port operation.According to the latest data of the Ministry of Transport, by the first half of this year, The cargo throughput of Ningbo-Shan Port has reached 557.96 million tons, ranking first in China, with a year-on-year growth of 5.5%.The container throughput reached 13.91 million teU, second only to Shanghai, with a year-on-year growth of 4.7%.

At present, the port logistics industry is relatively developed, Ningbo through the continuous improvement of the collection and distribution network system, ningbo port shipping logistics service radius has been expanding, the scope of the port economic circle has been expanded from the province, outside the province to the middle and upper reaches of the Yangtze River cities.In recent years, the container throughput and cargo throughput of Ningbo Port have grown rapidly, and the added value of modern logistics industry, which is mainly the port logistics industry, accounts for far more than

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10% of THE GDP. It can be seen that the port, as an important maritime infrastructure, has greatly promoted the development of Ningbo's economic level.

Based on the rapid development of the emerging forms of port and shipping logistics in Ningbo, the port information service of Ningbo has been at the forefront of the country, and the fourth Party logistics platform, Ningbo Shipping Exchange, Ningbo Bulk Commodity Exchange and Ningbo Port logistics information platform have been successively built.Ningbo's "one-stop" shipping service has also been gradually improved, and the port management service level has been significantly improved.It can be seen that the development status of port and waterway logistics industry presents a strong service capability, but it still has many shortcomings.Port logistics park construction lags behind, for example, the market main body, auxiliary industry brand competitiveness is not strong, the high-end, ports and logistics industry development is relatively lagging, to boost the construction of the port economic circle, it needs the transformation and upgrading, take advantage of the platform to innovation, strengthen the construction of seamless docking of multimodal transport system and system integration of information system, etc.

(II) Current situation of information flow

In recent years, Ningbo - Zhoushan Port continues to promote the construction of intelligent port.The influence of the public information platform is gradually increasing, and the information construction is in a leading position in China.

It application has been significantly improved, and new business forms are emerging.Ningbo smart port, electronic port and Sifang logistics construction in the leading position in the country.Build port EDI (Electronic data Interchange) platform to realize coordinated operation of port production business;The functions of the e-port platform are constantly improved to realize the electronic exchange of various documents and documents in international trade.The information integration capability of Four-party logistics has been significantly enhanced to realize extensive interconnection of port logistics such as container vehicles, hazardous chemical vehicles and intelligent gates. A number of "Internet +" logistics platforms, represented by "Tiedai.com", have developed rapidly and their resource integration capabilities have been significantly improved.High-end shipping services represented by shipping exchanges have made breakthroughs. "maritime silk road index" has been included in the outline of the country's 13th five-year plan and is a key construction project of the country's "One Belt And One Road".[22]

(III) Current situation of business flow

With the rapid development of e-commerce, Ningbo has cultivated and developed e-commerce platforms for ports, trade, bulk commodities and other vertical industries. By 2015, the total import and export volume of cross-border e-commerce has reached 8.14 billion yuan.

Through comprehensive platforms such as "cross-border purchase", Ningbo cross-border e-commerce enterprises are constantly developing and expanding, and the e-commerce orders of import and export trade are also constantly increasing.The latest statistics from Ningbo Customs show that in the first half of 2017, Ningbo Customs approved 12.545 million import declaration forms from cross-border trade e-commerce enterprises in Ningbo Bonded area, with the value of goods worth 2.18 billion yuan, up 28.4 percent and 19.2 percent year on year respectively.The port and waterway enterprises in Ningbo lack effective connection and have not yet formed a complete system.There are more than 150 shipping enterprises in Ningbo, and private small and medium-sized enterprises account for more than 90%.The above-mentioned small and medium-sized shipping enterprises pay little attention to social affairs, industrial affairs, other people's affairs and social responsibility. The problems they pay attention to are all recent and personal, and the phenomenon of distrust and non-cooperation between each other is more common.The above-mentioned contradictions and conflicts among small and medium-sized shipping enterprises are increasing day by day, which makes the traditional single-operator business model unable to meet the current orders of e-commerce activities. The above problems will only lead to the loss of customers in the end.Port enterprises maintain the traditional labor-intensive operation mode, which greatly increases manpower and time input and

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hinders the flow of goods.Although most of Hong Kong airlines have established their own online platforms, the platform information is not unified and the utilization rate is low.In the state of different statistical platforms, different data standards and lax statistical models, the massive data of Ningbo Port's aviation industry is divided and dispersed in the closed loop of institutions or enterprises, which does not constitute big data. The overall development pattern of Ningbo Port's aviation industry is "small, scattered and weak".

(IV) Current situation of capital flow

With the rapid development of financial service institutions, the role of online financing platforms has become increasingly apparent, and businesses in shipping finance and trade finance have also been gradually developed.

4.1.3 Construction status of Smart port of Ningbo-Zhoushan Port

The construction of smart port is not limited to the construction of smart information interaction platform, but a comprehensive service system with integrated and innovative functions extended based on the information platform to realize the integrated sharing and collaborative response of resources, information, capital, logistics and commerce within the port economic circle. Port "wisdom" is put forward for harbour city economic development has brought new opportunities, ningbo - zhoushan port as "area" initiative in the important foreign trade port, port economy under the new normal economic transformation and upgrading, need to push the port infrastructure, information system, operation mechanism, and the wisdom of the harbour city economic development decision-making, so as to effectively improve the port operation efficiency, reduce cost and promote lingang industrial transformation and harbour city economic development.As early as in 2010, put forward the construction of green port wisdom, after years of exploration, ningbo - zhoushan port port construction of wisdom have begun to pay off, basically established on the basis of the Internet technology and modern Internet technology of five harbour city information system, and continuously explore and develop the introduction of a new intelligent facilities, improve the port service ability and service level.

At present, in the aspect of Internet of Things technology application and information system construction, various smart port construction hardware facilities have been combined with port operation. Remote sensing communication technologies such as GPS and GIS are comprehensively applied in container dispatching management and logistics dynamic monitoring.In terms of intelligent transportation and handling equipment, the basic information surrounding the operation of smart port includes EDI logistics information system, production and operation system, ship management system and container management system. The establishment of these information systems will provide certain guarantee for the overall coordinated construction of Ningbo - Zhoushan Port smart port.With the improvement of basic information system and the application of more intelligent facilities and equipment, Ningbo-Zhoushan Port will greatly improve its own service capacity, which is of great significance to reduce operating costs, improve logistics efficiency and expand the port hinterland.

On the other hand, the exploration of "Internet + smart Port and navigation" has achieved initial results. Ningbo Port, based on the basic information platform, has basically realized the overall control of the shipping industry within the scope of the port economy, gradually combined the development of the shipping industry with the modern Internet economy, and promoted the Internet of the shipping industry in port and city.Online booking platform, online freight evacuation platform were set, such as the southeast logistics enterprises are developing port of day online platform, set the query rate, online booking, real-time transactions, and other functions into an organic whole, will further promote shipping services to realize intelligent, informatization construction, big data and cloud service technology is adopted to improve the comprehensive integration analysis to establish industry information distribution platform is also plays an important role in the building of the port of ningbo - zhoushan port wisdom layout.

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4.2 Bottleneck of smart port service supply chain.

Facing the fierce competition in the shipping market, many ports begin to attach importance to port service supply chain management. Although the integrated Ningbo Port has been significantly improved in port throughput and other aspects, there are still some problems in the development of its port service supply chain, which restricts the development and construction of Ningbo-Zhoushan smart port and affects the construction process of port and waterway logistics system.

In terms of logistics, port shoreline resources are wasted. Due to the declining capacity, part of shoreline resources in Ningbo-Zhoushan Port are used in deep water and shallow water, part of the special dock and public dock are scattered, and the operation areas of different goods are separated, so the overall efficiency of the port is low.The port logistics scale is limited and the function of each logistics node needs to be improved. Port enterprises are weak in value-added services and have a single development model. Although there are many logistics enterprises in Ningbo and Zhoushan with rich business functions, these business functions are often provided by different enterprises scattered, and few enterprises can provide whole-process, integrated and comprehensive logistics services.The expansion mode of logistics enterprises is still based on simple expansion of labor and capital input, but has not formed a growth mode driven by information, technology and knowledge.

In terms of information flow, supply chain node enterprise information level is limited, especially freight forwarding, customs clearance and other aspects; The degree of information sharing and information utilization is not high. At present, ningbo and Zhoushan have established multiple information platforms, but the information sharing between each platform is very difficult, and each platform is isolated, unable to provide an integrated information service for customers.In addition, each information platform simply stores, transforms and transmits the acquired information resources instead of mining the information resources in depth, so it is difficult to develop a series of value-added services with these resource information.

In terms of business flow, compared with Shanghai port, Ningbo-Zhoushan Port is short of leading foreign trade enterprises, and there are few large enterprises with integrated international trade service function, which also hinders the smart construction process of the port to a certain extent.Due to the late establishment of some large trading clubs in Ningbo-Zhoushan, the agglomeration role of trading platforms has not been fully brought into play, and its influence in the whole country is relatively limited.Despite the rapid development of conference and exhibition industry in Ningbo, compared with metropolitancities such as Shanghai, the level and influence of exhibition is in a inferior state. The level of e-commerce in Ningbo-Zhoushan Port still has a great room for improvement, and it lacks leading enterprises with certain brands and influences.

In terms of capital flow, the degree of specialization of shipping finance and related institutions is relatively low, and there is a lack of specialized institutions focusing on shipping finance, which makes it difficult to provide an overall solution for the port service supply chain.Shipping finance, logistics, financial products is single, relative to the trade finance business, ningbo, zhoushan shipping finance and logistics financial business development is still in a stage of spontaneous emission, services mainly related to ship the purchase of traditional financial business, such as, port construction financing has not yet formed systematic and specialized products, it is very difficult to provide personalized and value-added of shipping financial and logistics solutions.[23]

4.3 Suggestions on cooperation between smart port construction of Ningbo-Zhoushan Port and port service supply chain

Under the background of the implementation of "One Belt And One Road" initiative, ningbo - zhoushan port, as an important node port, is an important maritime hub for foreign trade. Therefore, in the construction of smart port, it is necessary to define its own positioning, bring development resources and power with location advantages, and promote the interactive development of port city economy with the construction of smart port.At present, ningbo - zhoushan port although has achieved preliminary results in the wisdom of city construction, basic perfect information system, intelligent infrastructure gradually formed network, but in the long run, the construction of global

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integration has not been formed, are difficult to coordinated development through the service supply chain, this paper puts forward Suggestions for port construction from the following four aspects.

(1) Enhance the capacity of allocating port and waterway services resources and expand port logistics services.We will vigorously develop modern shipping business systems, including shipping finance and insurance, ship trading and leasing, shipping brokerage, and maritime arbitration, promote the clustering of shipping market factors, and build regional shipping factor allocation centers and port and waterway logistics service centers. We will further synergize our cooperation with the Baltic Index and expand the application scope and influence of the Maritime Silk Road Index.

(2) Promote service innovation based on "global supply chain node" cities.Ningbo-zhoushan port is an important international trade port in China, an important distribution center for domestic and international trade, and a global supply chain node city in the "One Belt And One Road" layout. Ningbo-zhoushan port should establish the development concept of "supply chain + innovation" in the construction of smart port."Supply chain" refers to as a global business node city, ningbo - zhoushan port has the important status in the international port logistics, with the help of Internet, sensor network, intelligent technologies such as cloud computing strengthening links with the global trade in each subject, achieving global supply chain on a variety of business flow, logistics, capital chain and information flow, combining the "four circulations", to promote the new development of trade in ningbo - zhoushan port, and as the power of the development of ningbo - zhoushan port."Innovation" is refers to the surrounding "supply chain node city" development strategy, with the aid of wisdom platform to implement trade, logistics, finance and other comprehensive services innovation, transformation services, such as port logistics USES to promote financing, international leasing, trade agent, tourism and other diversified industrial layout and the service innovation, standing in the perspective of the customer, with global business concept to depth value-added service innovation.

(3) the port economy to promote service industry transformation with wisdom, from the point of port economy development, promote economic transformation is necessary, therefore, ningbo - zhoushan port development should be around wisdom ports, wisdom and smart port logistics industry development, and make intelligent communication service, big data and cloud computing services, and the wisdom e-government development, to promote the overall port economic and effective coordination of supply chain.[24]

Accelerating the informatization of large enterprises, implementing cloud software service projects for small and medium-sized enterprises, promoting the informatization level of large port service supply chain nodal enterprises, popularizing the application of standardized information software, and carrying out informatization demonstration projects.We will guide and encourage small and medium-sized enterprises to use cloud software services to improve the level of informatization. Improve the supply chain information platform, to promote information sharing and information synchronization to promote the public information platform and port information system, shipping logistics enterprise information system, government supervision, market of e-commerce platform, interconnection, the port and the owner, shipping logistics companies, regulators, and to realize the seamless docking with the Shared data, build up a comprehensive information network covering the whole process of port service supply chain.

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