

Analysis on the Development Trend of Smart Port

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Abstract

With the advent of the fourth global industrial revolution, high and new technologies such as Internet of things, sensors and information processing systems have been applied in the field of port logistics. In order to comply with this trend, some countries are gradually developing and applying intelligent port technology in the port industry. The construction of intelligent port will help to enhance the comprehensive strength of the port. At the same time, it will bring great improvement to the control of logistics cost and the overall efficiency of logistics. Starting from the development process of the port, this paper introduces the relevant concepts and structures of the intelligent port, and then expounds the development status of the intelligent port at home and abroad by reading relevant materials. According to the concept and research content of the intelligent port, this paper focuses on the analysis of the functions and characteristics of the intelligent port, and introduces the opportunities and challenges faced by the intelligent port, so as to provide reference for the future development of the intelligent port To provide the right basis for the healthy development of the port.

Keywords

Smart Port; Functional Characteristics; Construction and Development Trend.

1. Introduction

With the global economic integration and the rapid growth of international trade, the competition between ports is also gradually intensified. At present, a new round of scientific and technological revolution is rising, and the change of business model and the innovation of development concept become the inevitable move of modern port development. Through the deep integration of modern science and technology and port business, it is an inevitable choice for modern ports to win strategic initiative in the 21st century to build a smart port with comprehensive perception, efficient operation, safety and reliability, intelligent green, open and innovation. In a sense, smart port is a comprehensive reform involving port development concept, organization management, operation mode and value service, which has far-reaching influence. At present, the construction of China's smart port is also speeding up. This paper will analyze the current situation and strategy of foreign port construction combined with the relevant knowledge of smart port, and put forward the development trend of China's smart port according to the current situation of China's port construction.

2. Overview of smart port

2.1 Port development history

The first generation of ports: single type: (before 1970) single land sea connection point, manual operation, no commercial activities, no comprehensive transportation connection.

The second generation of port: expansion type: (1970-1980) industrial center + Commercial agglomeration + comprehensive transportation connection.

The third generation of ports: containerization: (1980-1990) globalization of container transportation, nodes of international trade network, integrated logistics centers and platforms, and electronic information exchange services.

The fourth generation of ports: Integrated: (1990-2010) the international shipping union was established, facing the global market, and the application of information and communication technology.

The fifth generation of port: intelligent: (after 2010) intelligent infrastructure and automation, efficient operation, sustainable development, safety and environmental protection.

2.2 Concept of wisdom

In the world intelligent transportation system conference held in 1994, the concept of intelligent transportation was put forward for the first time, that is, with the help of information, electronic control, communication and other technologies, it is comprehensively applied to the transportation management system under the promotion of Internet technology, so as to improve the intelligence of the system operation. In 2008, IBM put forward the concept of smart earth, that is, the physical infrastructure and information infrastructure should not be built separately, but should be a unified intelligent infrastructure, so as to make the relevant systems reach the standards of reducing regulatory risk, improving efficiency, more energy saving and more green. In the same year, the Chinese government also put forward a series of concepts, such as smart port and smart transportation. It plans to connect the Internet of things and the Internet by using sensing devices, network transmission, cloud computing and other means, so as to realize the organic integration of port production, life and physical systems.

2.3 Concept of smart port

As the hub of land and sea transportation, port is an important node of the entire port and shipping industry. It accelerates the international trade of goods, and also strongly supports the prosperity and development of urban and hinterland regional economy. It occupies an important position in international trade logistics transportation. The continuous development of the port puts forward certain requirements for the port production capacity and related indicators. Therefore, the port needs reasonable production plan, timely and accurate port information interaction system and safe and efficient control equipment to meet the needs of port operation and development. The port is developing towards intelligence, information and automation, and has begun to have a certain ability of data interaction and network sharing.

On the basis of port infrastructure, smart port combines the Internet of things, sensors, decision analysis and other technical means. Through the comprehensive planning and innovative utilization of information technology, it realizes the interconnection among people, things and ports, realizes the optimal allocation of port resources, the coordination and linkage of various functional modules and the transmission and sharing of information of various units, and finally forms a smart port. It is a modern port with intensive technology, continuous innovation, green and low carbon. The core of smart port is thorough perception, extensive interconnection and deep information mining, so as to realize the seamless connection of various resource elements and the collaborative linkage of various functional modules of the port, and finally realize the intelligent, safe, convenient and green development of the port.

2.4 Connotation of smart port

Smart port deals with port business, production scheduling and resource allocation in an information-based way. Its "wisdom" is mainly reflected in comprehensive perception, loading and unloading automation, intelligent operation, innovation of logistics service mode, extensive interconnection and sustainable development of the port. Therefore, the connotation of smart port can be summarized as follows:

- (1) The construction of smart port will be based on the modernization of port infrastructure. Through the optimization and integration of logistics infrastructure, information facilities and port equipment with the port transportation function, and the promotion of the construction of digitalization, informatization and standardization of network transmission of port infrastructure, this will become the basic condition for the construction of port information system and decision-making.
- (2) The core of smart port construction is the comprehensive integration of smart technology and port business, and the interconnection and coordination of information and resources. Through the application of Internet of things and other information technology, the real-time management of people and things in the port can be realized. Furthermore, through data mining, cloud computing and intelligent application, the optimal allocation and decision optimization of production resources can be realized, and the coordination and optimization integration of all aspects of port production can be realized.
- (3) Innovation promotes the development of smart port. The construction of smart port not only needs the continuous innovation of technology, but also the transformation of production relations and the whole supply chain. Besides facilities and technology, port innovation should also focus on the whole transportation supply chain system including upstream and downstream enterprises, including international procurement, international distribution, bonded logistics, multimodal transport, logistics finance and other value-added services.
- (4) Sustainable development is the direction of smart port development. The construction of the port should deal with the game between environmental benefits and economic benefits. Through the establishment of an effective management mechanism, the application of energy saving, environmental protection and other technologies, while improving the operation efficiency and economic benefits, try to reduce energy consumption, improve environmental benefits, and promote the sustainable development of the port.
- (5) The construction of smart port is a multi-directional complex system plan. The construction of smart port should include the construction planning of terminal automation facilities and their layout, the reasonable dispatching and distribution of collection and distribution system, the establishment of information system and the interconnection of big data. Only by coordinating the construction of smart port in many aspects can the intelligent level of the whole port be improved.

2.5 Composition of smart port

Based on the research of connotation, according to the development of modern port service and technology, combined with the demand of port development, the basic composition of smart port can be analyzed from three dimensions of port function, theory and technology. Figure 2 shows the 3D analysis of the port. Combined with the theory, this paper describes the influence of port logistics, port service supply chain and other theories on port production and operation, which is mainly reflected in the extension of port function, the change of port from passive service provider to organizer and promoter of supply chain activities, and the influence of technology development, that is, the integration, optimization, flexibility and agility of logistics services. Therefore, the composition of smart port can be divided into the following six aspects.

2.5.1. Infrastructure and equipment

Port facilities are not only the basis of port production, but also the basis of port intelligence. The intelligent construction of port facilities can include the automation of mechanical equipment and the development of port infrastructure informatization.

2.5.2. Operation and management

The intellectualization of port operation and management refers to that the port management department improves the intellectualization level of port operation management and decision-making through intelligent technical means, including the intellectualization of port operation of loading and unloading and handling, as well as the intellectualization of personnel management, safety management, equipment management and administrative management.

2.5.3. Logistics services

The intelligent logistics service is based on the port service platform, which provides not only the traditional freight business, but also other multi-functional and integrated comprehensive logistics services for individuals or enterprises. Intelligent logistics service brings port flexibility, security, efficiency and professional goods circulation business.

2.5.4. Innovative service

For the smart port, its vitality is the continuous innovation of technology and management. In order to make the port develop continuously, a smart port needs to provide more services as far as possible to meet the demand of port business growth.

2.5.5. Information service

As the core part of the supply chain, port needs to be well interconnected with other parts to make the information flow of the whole supply chain. Therefore, an efficient information exchange system is needed to ensure the information flow. To realize the efficient flow of port information can better coordinate the port business and improve the overall service level of the port.

2.5.6. Port sustainable development

The sustainable development of port is the core of port competitiveness. For smart port, in addition to advanced technology, operation management and service, it also needs to develop new energy technology, automation equipment, energy saving technology and other advanced technologies, and reduce environmental pollution, soil pollution, air pollution, water pollution treatment and port waste recycling through port operation, so as to realize the sustainable development of the port.

2.6 Smart port system structure

2.6.1. Information perception terminal

The sensing terminal mainly relies on the Internet of things technology, which is composed of various sensors and sensor gateway. It is responsible for identifying objects and collecting information. RFID is the most important and commonly used technology. RFID can use radio frequency technology to identify the desired target and obtain data from the target. Its working condition is not interfered by the external environment, even in a very bad environment can still complete the work, without human intervention.

Information perception terminals are installed in various operation sites of the port, such as terminal loading and unloading, port logistics, ships, storage yards, collection and distribution vehicles and other facilities, which are responsible for automatic perception and collection of ships, goods and working status information. After the information collected by each perception terminal is integrated through the port intranet, it can be released on the dedicated port management information platform and port public information platform through the Internet.

2.6.2. Information database and comprehensive processing system

The purpose of port information comprehensive processing is to share, publish and support decision. Due to the numerous functions of the port, the port information is also very large and complex. In this case, the mode of distributed processing can be adopted. That is to say, information statistics should be carried out in each department of the port, and sub information databases should be established, such as port terminal operation information database, yard storage operation information database, cargo service information database, etc. It can not only reduce the workload, but also make the data processing more efficient. After classification, all the information will be summarized. In this way, we can first use the small sub information database to collect all the disordered and irregular data, and then use the comprehensive information processing system to analyze and process the collected information. Finally, all the data will become a unified standard form, providing the basis for the upper level to carry out business inquiry, statistics, analysis and decision-making.

2.6.3. Information release and sharing platform

Including port public information platform and port management information platform. We can learn all the information of the port through the port public information platform, which can make the port more transparent and open. Port public information platform is generally connected with port related banks and insurance financial service institutions, production enterprises and trade enterprises. Port management information platform is an operational platform, through the port management information platform can find the problems in the port, and through the operation to change these error information to make the port more perfect. The port management information platform is generally connected with the port management departments such as customs, MSA and Transportation Bureau, as well as shipping companies, shipping agents, freight forwarders and other related service enterprises. Through the information platform, we can achieve efficient supervision and services, and easily carry out standardized and electronic international trade and e-commerce, so as to reduce the operation process, improve the efficiency of customs clearance, reduce transaction costs, increase trade opportunities, and enhance port services.

3. Research status of ports at domestic and abroad

3.1 Domestic research status

The concept of "smart port" involves the research field of many domestic scholars. At present, there are many references on the technology, equipment and operation of domestic smart port. In "three demonstration areas - Smart port" (2020), pan Liya elaborated on Tianjin Port's intelligent technology innovation, deep integration of intelligence and production, building smart port brain, building port and shipping big data service and operation and innovation collaborative platform. This paper puts forward the idea of building a national artificial intelligence innovation and Development Experimental Zone. In "development of smart port design concept and related construction content" (2018), Wang Chao discussed the development of smart port from the defects of existing technical architecture and integrated design, the change of port terminal, service concept and operation mode of related enterprises, the change of internal process and management function of port terminal Automation and intelligence, and the change of function of port terminal related service enterprises. The understanding of development trend refers to the defects of existing technical architecture, and puts forward a new design idea of wharf intelligent and automation system architecture after integrated design thinking. It is found that only by redesigning the port production management system on the basis of fundamental reform can we develop a unified operation cloud platform to meet the needs of all parties. This paper expounds the changes that the development of algorithm will bring to the service and operation of port terminal, and puts forward some suggestions for the construction of smart port.

3.2 Current situation of domestic smart port facilities

The construction of smart port demonstration project in China has achieved fruitful results. A number of safe, efficient, intelligent, convenient and collaborative smart port terminals have been initially built

3.2.1. Port operation automation

The fully automated wharf brings the wharf construction to a new height. At present, Qingdao port, Xiamen port and Shanghai Yangshan Deep Water Port Phase 2 have been built with automatic terminals. Port operation automation will greatly increase work efficiency and reduce operation cost.

3.2.2. Port land transport business collaboration

The operation efficiency of terminal and truck fleet can be improved by means of truck ID card verification and appointment. Xiamen port and Tianjin port adopt the appointment system of container truck vehicles, which effectively improves the transportation efficiency of container truck fleet and the operation efficiency of port terminal; Qingdao port realizes the gate release by verifying the ID card, which improves the safety and efficiency of port collection and distribution.

3.2.3. Information big data sharing

Now more and more port enterprises use big data to search information. Electronic business documents, data flow at any time, whenever a query, real-time data will be searched. This will not only save time and effort, but also increase operational efficiency. In the past, enterprises often lost a lot of business opportunities in "fighting alone", and the sharing of data will greatly increase business opportunities. This is conducive to the formation of joint ventures among enterprises to achieve a win-win situation.

3.2.4. Application of new technology

Each port actively promotes the application of new technologies such as Internet of vehicles, Internet of things, big data, Beidou, blockchain and 5g. Establish a big data cloud computing center to lay a solid foundation for the construction of smart port. After a long time of testing and trial operation, China's Beidou system has been fully competent for some daily work. Through the application of new technologies such as Internet of vehicles, big data and Beidou, we can accurately locate the real-time position and running status of vehicles, which provides powerful help for customers to query the status of goods orders.

2.3 Research status abroad

The development level of foreign smart ports is relatively high, and most of them are in the middle and high stage of the port development process, that is, the self construction of the port system and the self driving stage of the port environment. This paper selects Singapore port and Rotterdam port for research, deeply analyzes the development mode and characteristics of its smart port, and summarizes the new development trend of its smart port.

3.3 Research status abroad

As a well-known port with cutting-edge technology in the world, the development level of Singapore's smart port has always been in a leading position. In recent years, the port of Singapore takes port operation automation and intelligence as an important starting point, and actively carries out the exploration and practice of smart port in the aspects of safe and reliable port operation, interconnected information service, convenient and reliable customer experience, etc. At present, in terms of terminal automation, Brazil banrang terminal of Singapore port has realized the yard automation operation through the application of unmanned Rail Gantry Crane. In terms of interconnection, the EDI network system (portnet) of Singapore port has basically realized data, information, information sharing and interconnection, providing information services such as shipping and ship dynamics, and automatic customs clearance services such as dangerous goods declaration, port application and departure forecast; it is connected with Tradenet to realize "two networks integration", forming a government department, port and shipping department Convenient and smooth information communication platform among enterprises, freight forwarding companies and logistics companies. In addition, the port of Singapore also proposes the "next generation port 2030 (NGP 2030)" strategy to cope with the increasingly fierce global port competition. The strategy takes the construction of the fourth generation container port Tuas intelligent port as the core, and creates a stable, efficient and sustainable future port through the integration and application of new generation technology. Today, the second stage of construction of port of Tuas has begun. The new port of Tuas will use intelligent technology and new technologies such as construction, management and operation, and adopt multiple sets of automation systems, such as automatic guided vehicle system, quayside bridge automatic maintenance system, wharf automation system, automatic site crane, intelligent video analysis system, etc., to realize the highly automatic operation of wharf Intelligent. After completion, Singapore port will become a super modern, highly automated and intelligent intelligent logistics center, and a super port complex integrating port shipping, port industry, shipbuilding and other port businesses in the region.

As the largest trading port in Europe and the world's information port, Rotterdam is also at the world's leading level in the exploration and practice of smart port. At present, in terms of terminal automation, the \$4 billion maslekdi phase II project has been put into operation. The terminal adopts fully automatic terminal technology and remote control ship shore crane. In terms of interconnection, the

port community system (portbase) of Rotterdam port provides customers with one-stop logistics information exchange services, as well as multi-modal transport planning tools (inlandlinks), so that customers can quickly and effectively match their needs of multi-modal transport services. In addition, the port of Rotterdam also put forward the strategic vision for port development in 2030, including port collection and distribution system, logistics service, investment and financing environment, space resources, ecological environment, port industry city integration, human environment, innovation ability, policy environment, etc. This paper analyzes the key factors of regional economy and other ten aspects, and outlines the technology roadmap of "smart port" in the future based on the global port development trend. In recent years, Rotterdam port has gradually strengthened the application of digital technology and the construction of port ecosystem, focusing on improving port operation efficiency, improving port collection and distribution system, innovating port value chain services, promoting international trade facilitation, strengthening the integration of port and city, and deeply promoting port green and sustainable development.

3.4 Experience and Enlightenment of foreign smart ports

3.4.1. Vigorously improve the intelligent level of port operation

Rotterdam port has always been concerned about the improvement of port handling efficiency and intelligent level. Through the application of modern information technology, automation technology and intelligent mechanical equipment, it greatly improves the intelligent level of port operation. At the same time, through big data, Internet of things, intelligent control, intelligent computing and other technical means, we will strengthen the automation and integrated control of the whole process of wharf frontier horizontal transportation operation, yard operation, road entrance and exit. Singapore port is no exception. It pays special attention to the improvement of productivity driven by science and technology. In recent years, it continues to promote the automation and intelligent construction of terminals. In the planning and construction of Tuas new port, we actively explore the scenario application based on data analysis, digital twin, AI and other emerging technologies. In addition to the layout of 5g communication network and smart grid in the port area, the next generation port modeling and Simulation Center (c4ngp) is also used to analyze the port operation data, so as to obtain the optimal scheme for improving the port productivity.

3.4.2. Pay attention to the application of modern information technology

Rotterdam port is committed to promoting the process of port digitization, focusing on the application of modern information technology and artificial intelligence technology to improve port operation efficiency and service level. One is the interconnected information platform portbase system, which promotes the efficient operation of government departments, shipping companies, logistics enterprises, financial and legal service institutions. The second is the multi-modal transport planning tools (inlandlinks), which enables customers to quickly and effectively match their needs of multi-modal transport services. Singapore port is no exception. It is committed to promoting the process of port informatization and improving port operation efficiency and service level with the help of advanced information technology. In recent years, Singapore port has integrated port logistics data resources and carried out infrastructure construction, customer service and other applications based on big data, such as: the establishment of port and shipping maritime incident identification system based on big data; actively building the next generation of ship traffic management system (next gen VTMS); and the development of JIT system (zero inventory management mode)

3.4.3. Vigorously promote green and sustainable development of port

The port of Rotterdam attaches great importance to the ecological environment and sustainable development of the port, and vigorously promotes the development of the port in the direction of low carbon, energy saving and green environmental protection. We have implemented the strategic plan of "transformation of transportation mode", optimized the port collection and distribution system, guided the transformation of road transportation mode to clean transportation mode such as waterway and railway, and reduced road traffic congestion and environmental pollution. The first is to establish a ship pollution emission control area to greatly reduce the carbon dioxide emissions in the port area.

The second is to implement the inland water transport incentive plan, and give economic subsidies to the inland water transport ships that meet the specifications. Third, the freight train between Rotterdam port and Germany has been opened to increase the proportion of sea rail combined transport. At present, the proportion of water transfer in Rotterdam port is more than 50%, and the Inland River Collection and distribution volume also accounts for more than 20% of the total. At the same time, Singapore port attaches great importance to port low-carbon energy saving and green environmental protection, and integrates the requirements of environmental sustainable development into port planning and construction, so as to promote the port to better integrate into the urban operation system. In recent years, in line with the trend of low-carbon and green development, we have vigorously promoted the application of LNG fuel and constructed the world's largest LNG marine fuel filling port. At the same time, the port of Tuas under planning and construction will directly adopt the highest standard and mature green technology to make it a sustainable green and intelligent port.

3.4.4. Innovating port logistics chain coordination service

Rotterdam port implements the free port policy, attaches great importance to the function of port logistics node and logistics chain hub, pays attention to all-round port logistics value chain services, and promotes the efficient organization and collaborative operation of port logistics chain. For example, the port community system is built based on digital technology to integrate different logistics supply chains and work networks (such as inland terminal, harbor terminal and inland transportation) into a clear and coordinated system, so as to improve the integrated service level of port logistics chain. At the same time, with the help of e-service platform, integrate all participants in the "European portal service" network, and retain the source of goods through information value-added services. In addition, Singapore port also attaches great importance to the function of port logistics hub and logistics network node. For example, the EDI network system (portnet) of Singapore port has basically realized data, information, information sharing and interconnection, providing information services such as shipping and ship dynamics and automatic customs clearance services such as dangerous goods declaration, port application and departure forecast; it is connected with Tradenet to realize "two networks integration", forming government departments, port and shipping enterprises and freight forwarders A convenient and smooth information communication platform between logistics companies.

4. Opportunities and challenges for smart port

4.1 Opportunities

(1) The Party Central Committee with the core of general secretary Xi Jinping attached great importance to port development. Since the "one belt, one road" eighteen, Xi Jinping has visited the port for many times, and put forward "to achieve" four first-class "and serve the" one belt and one road "construction service." we must aim at ten thousand miles, strive to build a world-class intelligent port and green port ". the economy must develop, the country is strong, and transportation is especially strong. " A series of important instructions, such as "new chapter of the road", place great expectations on the port development in the new era, point out the development direction and provide fundamental guidance.

(2) The state has issued a series of policies to promote the development of smart ports. 2019 is a leading and landmark year for the development of smart port. In 2019, the CPC Central Committee and the State Council issued the "outline for building a transportation power", the Ministry of transport and other nine ministries and commissions jointly issued the "guidance on building a world-class port", the Ministry of transport and other seven ministries and commissions issued the "guidance on vigorously promoting the high-quality development of the maritime industry", and the Ministry of transport issued the "outline for digital transportation development planning". A series of policy documents provide guidance for the development goal, development mode and development path of smart port, and effectively promote the construction and development of smart port.

(3) Port integration forms regional resource advantages. With the development of provincial port group integration mode (such as Shandong Port Group, Zhejiang port group, etc.) and trans regional integration mode (such as Shanggang group, merchants port), the regional integration of port group is basically completed. The management mode of port group operation will be more conducive to the top-level design, unified planning and construction of regional smart port, which will bring new development opportunities for the construction of regional smart port

(4) The new generation of information technology is further applied. Beidou, 5g, blockchain, cloud computing and other new generation information technologies are bringing new changes to the development of smart port. They play a scientific and technological force in the application scenarios of unmanned driving, logistics tracking, port scheduling, electronic documents, and release the potential energy of science and technology for the development of smart port.

4.2 Challenges

4.2.1. Market environment challenges

The international trade situation is not optimistic. In the face of the new development direction with domestic large circulation as the main body and domestic and international double circulation promoting each other, all ports should face the difficulties, continue to promote the construction of smart ports, and accumulate strength for the economic recovery after the epidemic.

4.2.2. Challenges of smart port construction

The construction cost of terminal automation is too high, and it is not realistic to vigorously promote the smart port mode. The development of port collection and distribution system does not match the development of smart port, which will cause a large number of goods accumulation. There are too many departments involved in the smart port to deal with the cross regional and cross departmental coordination in a short time.

4.2.3. Resource consumption challenges

The construction of smart port is a long-term project, and its maintenance also needs a lot of human, material and financial resources. The required materials are more advanced, and the consumption of these materials resources will become a big problem in the future. For example, certain materials, coastlines and oil will gradually become scarce resources with the development of human society. Without these resources, it will be more difficult to build anything.

5. Development trend of smart port

5.1 More intelligent port operation

With the rapid development of modern science and technology, and the gradual deepening of the concept of green environmental protection and human ecology, the intelligent port operation has become an inevitable trend. On the one hand, the port makes full use of modern information technology, AI technology, automatic control technology and intelligent mechanical equipment to promote the realization of port operation scheduling, plane transportation and yard operation, and improve the operation capacity of the terminal. On the other hand, through the application of big data intelligent analysis technology, mobile Internet, cloud computing and other means, integrate the port logistics chain information resources, realize the data-driven intelligent operation service, and comprehensively improve the port operation efficiency.

5.2 Pay attention to the application of modern information technology means

The construction of smart port is inseparable from the application of big data and digitization, in which the application of advanced information technology is the main mode of operation. Domestic ports continue to improve the infrastructure related to data, which can improve the operational efficiency of terminal transportation, cargo yard, relevant ships in and out of the corresponding port, management services, business processing and other aspects. At the same time, we should establish our own data application center to integrate the data resources related to business, port service and

management, and improve the operation efficiency of the port through the application of big data and advanced information. This paper puts forward a new concept of big data governance of port, and applies the concept to a new business model to provide high-quality services for port stakeholders.

5.3 Development and construction of green port

Green and smart port construction is the best choice to reduce port energy consumption and pollution and improve terminal production efficiency. One belt, one road, the policy of economic globalization and the implementation of the state and the whole area, the transportation and throughput of the major ports have been greatly improved, and the energy resources have been consumed. Especially, the large-scale input and long time operation of the ships and equipment have made the emissions increase rapidly, which eventually led to the port becoming a large source of energy consumption and an important source of regional ecological pollution. Growth. Therefore, the development of green smart port technology is an urgent requirement for regional ecological green development and healthy economic development.

5.4 Innovative logistics supply chain collaborative services

Paying attention to the logistics and transportation function of the port and building a new service-oriented port need to ensure that the goods meet the chain service requirements of upstream, middle and downstream users in the transportation process. As a part of the supply chain, port realizes the cooperation between port and upstream, midstream and downstream by strengthening the resource contribution between ports. Among them, the most important is to make the business, port and maritime three parties merge into a network platform, independent and interconnected, and realize the single management of network service window, aiming to realize the efficient collaborative operation of government departments, port shipping service companies, port management departments, financial departments, legal institutions and other relevant departments, and help to provide all-round service for the port logistics supply chain. It can reduce the communication cost between links and departments, and ensure the efficient operation of the whole logistics supply chain. In addition to coordination and unification, each important node of the logistics supply chain should give full play to its own advantages. The port is the core node of the supply chain, and its service and business should be closely customer-oriented, providing personalized services to meet customer needs.

6. Conclusion

Smart port is a long-term project, which needs support and help from all walks of life. The port has gone through several generations of changes, and now it is the fifth generation port. Facing the progress of science and technology, China's smart port will continue to develop and enrich the content, but the following requirements are also constantly improving. We are in a new era of development. We should firmly grasp the opportunity period of strategic development of a transportation power, keep up with the pace of the times, and constantly innovate and develop China's coastal ports on the basis of China's existing Qingdao port, Xiamen port and Shanghai port, so as to move the construction of China's smart ports into a new stage. I believe that as long as China is down-to-earth, innovates and strives to be the first in the construction of smart ports, it will surely overcome this technical difficulty. In the near future, China's smart port will be a busy scene. This is also China's wisdom and strength as a big shipping country to contribute to the world shipping industry.

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