Study on the Constructing and Developing Mode of the Smart Port in the Beibu Gulf of Guangxi

Zilai Cheng1,*, Haibin Wu2 and Peng Ni3
1Logistics Engineering Technology Research Centre, China Waterborne Transport Research Institute, Beijing 100088, China
2Science, Technology and Big Data Centre, Beibu Gulf Port Group, Nanning 530021, China
3Information Centre, China Waterborne Transport Research Institute, Beijing 100088, China

*Corresponding author email: chengzilai@wti.ac.cn

Abstract. In order to form a new constructing and developing mode under the background of the deep integration of the traditional port and the modern information technologies, the Beibu Gulf Port Group in Guangxi will focus on the three core themes which are the intelligent control, the digital supply chain and the "Internet + port" information services, to carry out the smart port construction. Aiming at studying the constructing and developing mode of the construction of the smart port in the Beibu Gulf, its constructing objectives were clarified, the overall technical framework was built, the system constructing plans were put forward, and the expected effects were analysed. On the whole, the Beibu Gulf Smart Port will realize the intellectualization, automation and platform construction of the group ports, help the transformation and upgrading of "intellectualization" of the ports, and create a new smart port ecosystem of "resource integration and optimization, business cohesion and coordination, information interconnection and interoperability" in the Beibu Gulf region. The construction of the Beibu Gulf smart port can also play its leading role in the regional economy better, and provide strong support for promoting the development of the Beibu Gulf Economic Zone and the opening and development of Guangxi.

Keywords: Beibu gulf; Smart port; Construction and development Mode.

1. Introduction
Guangxi Beibu Gulf port group is a large-scale wholly state-owned enterprise directly under the government of Guangxi Zhuang Autonomous Region. It is a cross administrative region port construction, operation and investment innovation platform in Guangxi. Smart port is a new concept of modern port development and evolution. Based on the smart thinking, smart port deals with the port development strategy, planning and layout, production and operation and other issues, deeply integrates the use of the emerging information technologies,[1] to build an intelligent, agile, intensive and safe port collection and distribution system, and builds a precise, high-quality, efficient and customized smart port service system to promote the efficient and coordinated operation of information flow, logistics flow and capital flow,[2] realizing the intelligent promotion of port strategy, the optimal allocation of port resources, the flexible organization of port production, the agile extension of port services and the harmonious development of port, industry, GVZ and city. In this context, Beibu Gulf smart port will mainly focus on six aspects: port intelligent operation, precise management of dangerous goods, supply chain interconnection and cooperation, logistics regional coordination, agile service support, business
opening and innovation, so as to promote the improvement of the smart port operation efficiency, upstream and downstream cooperation of supply chain, information interconnection, value-added services and experience, dangerous goods safety management and port ecosystem construction.

2. Construction Objective
Through the integration and penetration of the new generation of information technology and port logistics business, [3] the Beibu Gulf smart port will be built around three core applications of intelligent control system, digital supply chain and "internet plus" innovation platform, focusing on the "one chain" - the Beibu Gulf intelligent logistical upstream and downstream integrated industrial chain linking the whole industry of the group including port, logistics, industry and trade, real estate and investment and the "three networks" – the Beibu Gulf regional port group business operation and service coordination network including the Beibu Gulf port group node network, the logistics network in the hinterland of Xijiang economic belt and the port and shipping network of the ASEAN Free Trade Area. The objective of the Beibu Gulf smart port is to promote the process reengineering, business coordination and management innovation in relevant fields, and to promote the realization of the port logistics operation system of "one freight order system, one information network" to form a new port logistics format and new mode with "extensive information interconnection, optimized resource allocation, business collaborative linkage", and finally to promote the construction of "one circle" - the Beibu Gulf regional smart port ecosystem based on sharing economy and platform economy [4].

3. Technical Framework
The technical framework for the construction of Beibu Gulf smart port, from the bottom to the top, consists of six layers. The first layer is the perception layer including perceptual and acquisition equipment and related information systems. The second layer is the hardware environment support layer including information infrastructure, communication network hardware facilities, computing and storage equipment and systems. [5] The two layers above constitute the basic environment platform of the smart port. The third layer is the data resource layer including basic information database, cargo information database, container information database, business information database, subject information database, etc., which provides data and information support for the smart port. The fourth layer is the software environment supporting layer, including the basic software supporting environment, data exchange center system, operation management center system, etc. These two layers in the middle constitute the support platform of the smart port. The fifth layer is the application layer includes the three main themes of application which are intelligent control, digital supply chain and "internet plus" service innovation. It provides diversified intelligent application services for the port and shipping enterprises, the government, the public and other users. The top layer is the user layer including internal and external users, as well as the corresponding extension layer.

4. Application Systems

4.1. Intelligent Control System

4.1.1. Intelligent control and decision analysis platform. The intelligent control and decision analysis platform is mainly supported by the Beibu Gulf port group's strategic management system, risk management system, equipment management system and other basic application systems. The functions of each system are described as below:

Asset management system: The function of the asset management system is to manage the economic resources owned or controlled by the group that can be measured in currency, including all kinds of property, claims and other rights.

Financial management system: The function of the financial management system is to provide multi-level financial reporting module, all-round financial analysis function, and to provide joint venture company decision support services for directors, supervisors and senior executives.

Investment control system: The function of the investment control system is to strengthen investment analysis and risk warning, to implement unified management and control of asset investment projects,
to provide investment project management, investment plan management, investment project process monitoring and evaluation, and to implement differentiated asset management and control strategies, and provide an interactive platform.

Production management system: The function of the production management system is to reasonably organize the ship loading and unloading, and realize the graphical display of the distribution of ships in the ports, the operation of the designated ships, and the stacking of the designated warehouse.

Comprehensive budget system: The function of the comprehensive budget system is to realize the multi-level budget management of the group, segment, branch and project, and realize the process warning and control of budget in combination with expenditure management, cost management and expense management system.

Strategy management system: The function of the strategy management system is to establish a unified group strategic control and assessment system, and conduct digital measurement of strategic achievement, and to provide strategic plan templates, indicators, and process definitions.

Group performance management system: The function of the group performance management system is to provide functions such as performance plan making, performance guidance and communication, performance appraisal and evaluation, performance result application, performance goal promotion, etc.

Integrated business management system: The function of the integrated business management system is to manage the comprehensive business operation, management and maintenance of the group's port, logistics, industry and trade, real estate and investment sectors.

Project management system: The function of the project management system is to realize information management of the whole life cycle of the project, formulate unified data collection standards and provide unified progress, quality, safety and other management platforms.

Contract management system: The function of the contract management system is to provide supplier performance management, guarantee investment benefit, and establish information connection between contract and business development, and to promote the transparency and standardization of the group’s contract management.

4.1.2. Dangerous goods transportation intelligent management and control system

4.1.2.1. Risk source online monitoring System. The risk source online monitoring system is the management and technical support for Beibu Gulf port group to implement and strengthen the entrepreneurial main responsibility of major risk source monitoring. The core of the system is to realize the online and real-time monitoring of major risk sources in the port, and to build the intelligent classification and warning technology system of major risk sources in the port, so as to realize the classified warning of major risk sources in the port, the linkage alarm of events and other functions. Meanwhile, the system will be connected with the management system of the government departments to provide support for the dynamic supervision of risk sources.

4.1.2.2. Dangerous goods operation chain checking system. The dangerous goods operation chain checking system mainly focuses on port dangerous goods operation to implement dynamic tracking and verification to improve the safety control level of the whole group. The system will master the dynamic information of dangerous goods operation plan, operation status, operation result and so on in all links of the group's port and logistics in real time, and realize business verification to form an efficient "plan-do-check-act" management and control cycle of dangerous goods operation. The system will also promote the construction of a whole process management and control system, as well as a multi-party emergency mechanism to significantly improve the group's ability to respond to emergencies. Meanwhile, the system will establish and gradually improve the emergency plan database of dangerous goods operation to provide guarantee for safe, green, and environmental protective production of the group.
4.2. Digital Supply Chain Application System

4.2.1. Logistics and transportation chain integrated cooperation system. In order to realize the seamless connection of the upstream and downstream participants on the supply chain of the group logistics, and to realize the interconnection of the group’s logistics resources, the logistics and transportation chain integrated cooperation system will be built based on the existing systems. The logistics and transportation chain integrated cooperation system will cover the logistics and transportation chain of all industries of the group. Through the upgrading of warehousing and land transportation system, the networking, informational and electronic services of each node of the logistics and transportation chain will be realized, and the efficiency of logistics and transportation will be improved. Meanwhile, through the efficient integration of logistics transportation chain resources, the system will also promote the integration and cooperation of all participants in the logistics transport chain, and finally improve the management efficiency of the upstream and downstream participants in the whole chain.[6] The system will also integrate and share all the logistics information of the logistics transportation chain to promote the cooperation and connection of the upstream and downstream of the whole chain, and integrate the resources of the logistics transportation chain of the group to realize the interconnection. Finally, the system will carry out the integrated order management and settlement management in the whole group, and provide the relevant support for the operation of the "one order system".

4.2.2. "One order" electronic order system. The “one order” electronic order system will integrate the original automobile transport documents, station operation documents, railway cargo transport documents, port operation documents and maritime bills of lading to implement the "one order system" for the whole logistics process, realizing the "one station commission, one charge, one order to the end". The system will also strengthen the group's integrated service guarantee, and realize the data cooperation, exchange and sharing of the whole logistics transportation chain.

4.2.3. Regional port network cooperation scheduling system

4.2.3.1. ASEAN Free Trade Area port information interconnection system. The ASEAN Free Trade Area port information interconnection system aims to realize the data interconnection among the group’s regional port network, hinterland anhydrous port transportation network and ASEAN Free Trade Area port transportation network, and to promote the connection of logistics management information system towards the ASEAN. The system will also integrate transnational logistics resources effectively to realize the coordinated development of regional logistics network. The main function of the ASEAN Free Trade Area port information interconnection system is to realize the dynamic ship schedule sharing and container status tracking among the Beibu Gulf port of China, Kuantan port of Malaysia and Mora port of Brunei.

4.2.3.2. Virtual anhydrous port and logistics resources cooperation scheduling system. The virtual anhydrous port and logistics resources cooperation scheduling system will realize the optimal connection among ships, ports, railways, stations and other logistics resources, as well as the efficient integration of main logistics nodes to build an efficient and intelligent collaborative logistics network in the Beibu Gulf port group, deep hinterland and ASEAN region and promote the healthy and good development of the network nodes. The system will also improve the core competitiveness of all the ports in the region, and provide better quality, lower cost and more efficient port and waterway logistics services in the Beibu Gulf region. Meanwhile, the system can strengthen the connection between regional economy and international market. By cultivating and improving regional business environment, it can introduce more diversified industries and economic elements to form agglomeration effect to improve regional economic vitality and strengthen core competitiveness.
4.3. "Internet Plus Port" Information Service Application System

4.3.1. One-stop customer service and information service system. The one-stop customer service and information service system aims to integrate and display the group's logistics information, service resources and provide customizable services. Through the informational operation mode, it provides customers with real-time logistics tracking and dynamic query, while supporting relevant logistics management and value-added services. The system will also build an efficient, convenient and safe logistics information interconnection network, and establish a public logistical information database providing public logistical information, logistics resource information, logistics tracking information, industry monitoring information, supply and demand platform information and other data services to realize the connectivity of regional enterprise logistics information and promote the construction of enterprise logistics information and credit system. In addition, the system will cover mobile terminals and provide users with integrated mobile logistics information services.

4.3.2. Guangxi national transportation and logistics public information platform. As the Guangxi node of the national transportation logistics public information platform, Guangxi transportation logistics public information service platform will base on the information network to build a distributed service platform with management innovation, open mode, complete functions, information integration, resource sharing, clear interface and convenient operation centering on the integration, development and utilization of information resources. The platform will provide the logistics industry in Guangxi and even the whole country with a network of resource integration and optimization, information interconnection and service transaction matching. The resources, information and services on the platform include not only those provided and supervised by the government, but also those provided by the market and enterprises. Through the platform, government supervision and market operation will be coordinated.

5. Expected Effects

5.1. To Form an Intelligent Control System for the Integration of Port Group Resources, and Take the Lead in Realizing the Resource Integration and Unified Management and Control of Regional Port Group in China
At present, ports in China are facing the trend and environment of port resources integration. However, there are still some problems and bottle necks in the management concept, unified management and control, coordinated development and other aspects of regional port resources integration. [7] Beibu Gulf smart port will build a unified and efficient dispatching platform and information system through the construction of the intelligent control system, which will promote the overall collaborative operation of the group effectively. In addition, Beibu Gulf smart port will strengthen the group's intelligent management and control by means of information construction and business process reengineering, integrate regional port group resources effectively and improve efficiency significantly. Therefore, the intelligent control system established by the Beibu Gulf smart port will make itself in a leading position in the fields of regional port group resource integration and the improvement of efficiency and coordination management and control ability, and can be used as a reference for other ports in China.

5.2. To Form a Digital Supply Chain Application System through the Industrial Chain, and Extend the Port Logistics Industrial Chain of the Group Effectively
Under the new port transformation and upgrading, unbalanced market supply and demand and other new situations, the ports in China intend to expand from traditional loading and unloading, warehousing and other businesses to modern and intelligent logistics, information, commerce, finance and other businesses and functions, and improve service quality, efficiency and level. [8] Beibu Gulf smart port integrates internal and external resources of logistics, industry, commerce, finance and others efficiently through the construction of the digital supply chain application system with the port as the core, to promote the whole process cooperation of all participants, connect and optimize the upstream and downstream supply chains, and create the whole industrial ecosystem of Beibu Gulf smart port. The
system also promotes the integration and cooperation of logistics and transportation chain and the efficient transportation organization based on the "one order" system. Furthermore, it can improve the management level and core competitiveness of the group, optimize the upstream and downstream cooperation of the port supply chain, and accelerate the transformation and upgrading of the Beibu Gulf port group.

5.3. To Form a Mature "port-industry-park" Business Model Facing the ASEAN and Linking to the Whole B&R Area to Achieve the "Going Out" of Our Ports

In recent years, the enterprises in China have become more and more competitive in the international market, "going global" has gradually become an important developing trend and direction of the Chinese enterprises. [9] Beibu Gulf smart port based on the construction of the regional port network cooperation scheduling system to explore the new format and new mode of smart port, which insists resources optimization, business convergence, and information interconnection. It promotes the project cooperation with the ASEAN countries such as Malaysia, Brunei, Indonesia, etc. Meanwhile, it will take the ASEAN as the core to further develop strategic port hubs along the B&R. Through the asset coordination and logistics and transportation organization facing the ASEAN and connected with the B&R, Beibu Gulf smart port will integrate into the global economic integration pattern actively.

5.4. To Form Port Logistics Administrative, Technological and Informational Standards with First Mover Advantages, and Realize the Output towards the Countries of the ASEAN and along the B&R

Beibu Gulf smart port will seize the opportunity of China taking Guangxi as a strategic fulcrum to build the China-ASEAN Information Port, which is an international communication network hub and system facing the ASEAN and the southwest and central south of China. And it will make full use of the policy advantages of the B&R to optimize the supply chain business process, and study and formulate the key element standards of the supply chain business process. Then, relying on the national transportation and logistics public information platform and the China-ASEAN Information Port, Beibu Gulf smart port will extend these standards to other ports, port groups in China, Kuantan port of Malaysia and Mora port of Brunei to realize the export of the traffic, logistical and port administrative concepts, technologies and standards of China to the countries of the ASEAN and along the B&R.

6. Conclusion

Relying on innovative technologies such as information technology, artificial intelligence and so on, the construction of the Beibu Gulf smart port will build on three core themes of intelligent control, digital supply chain and "Internet + port" information services. It will focus on group supply chain process reengineering, plate linkage coordination and management innovation, and promote the systematic upgrading of group business organization mode to realize the transformation of the port group from traditional logistical nodes to an intelligent, efficient, and open platform. Currently, the core position of the Beibu Gulf port group as an important strategic resource of Guangxi has become more and more prominent. The construction of the Beibu Gulf smart port can play its leading role in the regional economy better, and provide strong support for promoting the development of the Beibu Gulf Economic Zone and the opening and development of Guangxi. The Beibu Gulf smart port can also help building a new strategic fulcrum for the opening and development of the southwest and central south region, building an upgraded bridgehead for the China-ASEAN Free Trade Area, and building a new portal of the 21st-Century Maritime Silk Road. Meanwhile, relying on its advantages in the construction and development of the China-ASEAN Free Trade Area and the interconnection with the countries along the B&R, the construction of the smart port will be an important step for the Beibu Gulf port group to integrate into the B&R strategy. And it is also the core carrier for Guangxi to realize the "gateway, fulcrum and channel" construction. In addition, the efficient integration and application of the emerging information technology to create a more rational, flexible, intelligent and harmonious smart port will also enable Beibu Gulf port group to cope with the upcoming round of port intelligent and automatic competition better. By promoting the "intelligent" transformation and upgrading of the whole port group effectively, [10] the construction of the Beibu Gulf smart port will finally realize the innovative, healthy and sustainable development of the Beibu Gulf port group.
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