

Analysis on the Development of Intelligent Shipping

Bo Xiao

School of transportation and civil engineering, Nantong University, Nantong 226019, China.

Abstract

Intelligent shipping is a modern shipping system and a new shipping format formed by the deep integration of traditional shipping elements and modern information, communication, sensing and artificial intelligence technologies. The guiding opinions on the development of intelligent shipping clearly stipulates five basic elements of intelligent shipping, namely, intelligent ship, intelligent port, intelligent navigation insurance, intelligent shipping service and intelligent shipping supervision. This paper analyzes the development of intelligent shipping in the Yangtze River region, and points out the existing problems and how to improve them.

Keywords

Intelligent Shipping; Intelligent Port; Intelligent Ship.

1. Introduction

From the initial consensus of the industry, the development of intelligent shipping can be roughly divided into four stages: the primary stage of interconnection, system integration, remote control and autonomous operation. In the intelligent revolution, traditional shipping embraces the intelligent era one after another, and is actively exploring the transformation to intelligent shipping. Many countries represented by Northern Europe are actively promoting the research of intelligent shipping, and plan to realize the actual operation of unmanned autonomous ships in the next 10 years. Hamburg South America shipping company has launched its new remote container management technology to assist the transportation of its refrigerated containers, help customers track their containers and delivery, real-time monitor the temperature, relative humidity, oxygen and carbon dioxide concentration in refrigerated containers and other factors; China Merchants Nanyou intelligent shipping management platform (itbp), ship management system (SMIS) and crew management system CMIS was officially launched in November 2019; Maersk released a new version of remote container management platform and a new version of "Captain Peter" virtual assistant, which can remind customers and pay attention to the condition of containers at any time when necessary. This series of measures shows that the revolution of intelligent shipping has begun and will have a profound impact on the mode and organization of shipping for a long time. Based on the core module of commander, through data visualization, high-density real-time fleet information monitoring display and convenient interactive operation, the shore terminal realizes fleet navigation management, realizes the planning and optimization of ship routes, and the personnel at both ends of the ship and shore work efficiently and cooperatively.

2. Basic elements of intelligent shipping

2.1 Intelligent ship

Intelligent shipping is the result of the development and progress of science and technology, its essence is the Internet of shipping industry, and intelligent ship is the basis of realizing intelligent shipping, which means that ships will realize electrification, digitization and intelligent interconnection. The so-called intelligent ship refers to the use of sensors, communication, Internet

of things, Internet and other technical means to automatically perceive and obtain information and data of the ship itself, marine environment, logistics, port and other aspects. The required technologies mainly include: information perception technology, communication and navigation technology, energy efficiency control technology, state detection and fault diagnosis technology, safety early warning technology, etc.

Mingyuan, the world's first intelligent super large ore carrier, has realized five intelligent functions, including auxiliary autopilot, comprehensive energy efficiency management, equipment operation and maintenance, ship shore integrated communication, and cargo liquefaction monitoring, by constructing the whole ship network platform and information platform serving the intelligent system. The large intelligent tanker "Kaizheng" has highly integrated sensors, communication, Internet and other technical means, which can automatically perceive and obtain information and data of the ship itself, marine environment, logistics, port and other aspects, and based on computer technology, automatic control technology and big data processing and analysis technology, it has been applied in ship navigation, management, maintenance, cargo transportation and other aspects. Norway has built the world's first unmanned ship test base, and the first unmanned container ship will be pilotless by 2020.

Some countries have even started the trial voyage of mass (autonomous navigation ship), and the smaller unmanned ships have been put into use. For ships involving dangerous or tedious operations, such as oil spill emergency ships, fire boats and rescue ships, unmanned operation capability is a particularly attractive choice. Automation has great potential to avoid casualties and save a lot of costs. To ensure the safe operation of mass, IMO Maritime Safety Committee (MSc) is exploring how to incorporate safe, stable and environment-friendly mass operation into IMO regulations. In June 2019, the MSc meeting adopted a set of preliminary guidelines on the trial voyage of autonomous ships, which requires that the ship should at least have the safety and environmental protection level stipulated by relevant laws. IMO stressed that the risks involved in the sea trial should be properly pointed out, and the measures to reduce the risks should also be well arranged. The guidelines further stipulate that the onboard or remote operators of mass should be qualified to operate such ships. The personnel who participate in the sea trial of autonomous surface ships, whether on board or remotely, should have the qualification and experience to safely conduct the sea trial of autonomous surface ships. Reasonable measures should be taken to ensure adequate network risk management of the systems and infrastructure used when conducting sea trials of autonomous surface vessels.

Intelligent shipping is the result of the development and progress of science and technology, its essence is the Internet of shipping industry, and intelligent ship is the basis of realizing intelligent shipping, which means that ships will realize electrification, digitization and intelligent interconnection. The so-called intelligent ship refers to the use of sensors, communication, Internet of things, Internet and other technical means to automatically perceive and obtain information and data of the ship itself, marine environment, logistics, port and other aspects. The required technologies mainly include: information perception technology, communication and navigation technology, energy efficiency control technology, state detection and fault diagnosis technology, safety early warning technology, etc. Therefore, for us, in order to truly realize the intellectualization of ships, we must constantly break through these technologies, and finally move towards the intellectualization of shipping.

2.2 Intelligent port

Xiamen port, Shanghai port and Qingdao port have built automatic terminals in China's coastal areas. Their successful operation marks a major change in the application of port technology in China and sets an example for the intelligent operation of terminals in China. The inland port basically realizes the mechanization of loading and unloading operation and the electronization of storage management. Some ports along the Yangtze River are in the forefront in terms of intelligent control of production: Jiangyin port has a certain scale of hardware facilities and network, and is one of the largest, most

advanced and most intelligent modern specialized terminals on the Yangtze River; Yueyang Chenglingji new port uses the production system of Shanghai port to realize real-time monitoring of all links of container production and ensure the most efficient production Dahua. The national demonstration project of smart port has been actively promoted, and good demonstration results have been achieved in Shanghai port, Nanjing port and Wuhu port. The construction of the Yangtze River smart port has basically formed a template that can be copied and promoted, and the whole process of the downstream port terminal operation has basically realized unmanned.

2.3 Intelligent shipping service

The Yangtze River shipping and logistics public information platform is an important part of the national transportation and logistics public information platform. The major shipping center, Nanjing regional shipping logistics center and Zhoushan river sea intermodal transport service center realize a certain degree of logistics data exchange and sharing, and provide free one-stop information service for ports, shipping enterprises and institutions along the Yangtze River; the emergency mobile communication platform of the Yangtze River trunk line is composed of four mobile communication platforms deployed in Chongqing, Yichang, Wuhan and Nanjing. It is composed of two communication vehicles and a satellite ground station deployed in Wuhan. It can provide emergency power and lighting for the site, realize the docking with other communication systems and other comprehensive support. It also has the functions of satellite bandwidth allocation, emergency command and dispatch, multi-point communication and so on. There are nearly 3000 port enterprises and more than 4000 shipping enterprises in the Yangtze River Basin. In addition to the internal business information system, the construction of information system should also include external customer service system and comprehensive transportation management system, so as to realize business processing and transaction informatization, realize data exchange and docking business with the outside world, and realize business management and decision-making of multimodal transport and whole process logistics. In addition, the third-party shipping e-commerce platform in the Yangtze River Basin has also accelerated its development.

In recent years, on the basis of learning from the development experience of domestic and foreign shipping e-commerce, the Yangtze River Basin has explored the establishment of various types of e-commerce platforms, such as: Changjiang River, Jinmayun logistics, freighter network, yunquna, ilaiwun, shopkeeper, wharf network and other shipping logistics e-commerce platforms; Juhang network, Changjiang River and other shipping consumer finance e-commerce platforms; Shangmu network, Chongqing orchard mass production Data trading platform and other trade e-commerce platforms based on Port Industrial Logistics Park; freight trading and shipping materials e-commerce platforms based on Shanghai Shipping Exchange, Wuhan shipping exchange and Nanjing shipping trading center.

2.4 Intelligent shipping support

Technological innovation "escorts" the safety of the Yangtze River's intelligent navigation. The Yangtze river navigation administration takes the lead in formulating the implementation plan for promoting the full coverage of Beidou satellite navigation system in the Yangtze River's navigation, and takes 2019, 2020 and 2025 as important time nodes to promote the application of Beidou satellite navigation system step by step. At present, the construction project of Beidou foundation enhancement system on the Yangtze River trunk line has been fully started, the installation and application of Beidou terminal has been steadily promoted, the AIS terminal has been successfully developed, and the relevant systems and specifications of Beidou application have been continuously improved. In addition, the Yangtze River trunk line has achieved full coverage of "digital channel", and the 2687.8 km channel navigation aids, channel water regime, control reach, channel scale and other information of the Yangtze River trunk line have been digitized to realize interconnection. In addition, domestic large-scale Internet enterprises and operators pay close attention to the development of intelligent shipping, and cooperate with the Yangtze River Navigation Administration to carry out relevant research. For example, Huawei, CCCC, Hubei Mobile and other

enterprises put forward intelligent development schemes in the top-level design of "long distance shipping on cloud", planning and design of intelligent aquatic products, 5g enabled Yangtze River intelligent shipping, etc. Beidou Positioning, unmanned technology, blockchain, 5g and other advanced practical technologies have made breakthroughs in the application research of shipping integration, providing "accelerator" and "catalyst" for the application of Yangtze River intelligent shipping.

2.5 Intelligent shipping supervision

The optical fiber transmission line from Yibin to Shanghai section of the Yangtze River trunk line has been fully connected. The internal network of the Yangtze river navigation administration system has been basically formed. All units directly under the Yangtze River Navigation Administration have built wide area office network to realize optical fiber interconnection, and the optical fiber broadband has been connected to all branches and locations, so as to ensure the cross regional and cross departmental transmission of video, voice and business data of grass-roots stations of all units. The Yangtze River Three Gorges Gezhouba ship supervision system uses shipboard terminal and public network to realize the interaction of ship positioning, declaration, plan and other information, and realize the functions of ship remote declaration, plan receiving, position monitoring and so on. At the same time, port and shipping enterprises mainly exchange business data and information through the enterprise internal business system information management software and internal network, so as to carry out production scheduling, transportation organization and command, and carry out visual dynamic monitoring of transportation and operation process through internal information network, video monitoring system, GIS system, electronic map and other technologies.

3. Thinking about the future development of ship market

At present, although the ship market will be affected in the short term, in the long run, the core competitiveness of the market is still the research and development ability and efficiency. Therefore, we should make greater efforts in the construction of high value-added ships, break through more core technologies and break the foreign monopoly. For example, for LNG carriers, it is necessary to accelerate the research and development of ship type, improve the construction scale and shorten the development cycle, and strengthen the innovation and development of technologies and patents such as enclosure system and fuel gas supply system. At the same time, we should adjust the industrial structure and product structure, and increase the proportion of high value-added ships in the overall product structure. Under the condition of high quality shipbuilding, shorten the shipbuilding cycle and improve the overall efficiency of shipbuilding enterprises. Therefore, it is necessary for shipyards to continuously improve their scientific and technological innovation ability, increase R & D investment, vigorously improve their independent R & D ability, and constantly improve the level of enterprise management.

(1) Constantly seeking for green technology of ship, our country has carried out green improvement and development in the whole cycle of ship design and dismantling, and has achieved great success in green ship construction, application of green equipment and ship dismantling and recycling. However, there are still some problems hindering the better and faster development of green ships, so it needs to be improved.

One is to plan the R & D of green technology. Europe, Japan, South Korea and other countries attach great importance to the development of green ship technology, and give great support from the policy and R & D funds. They continue to tackle key technical problems and research and development. Therefore, after the concept of green ship was put forward, they have made great breakthroughs and progress, and have a strong voice in the formulation of international policies. Therefore, in the development of green ships, China should formulate policies and make overall plans at the national level, continuously increase China's international competitiveness, and enhance China's voice in the formulation of international environmental protection policies.

The second is to break through the framework of traditional design concept. China is not the maker of international environmental protection standards, but according to the established standards to research and design, it is inevitable to fall into the traditional design concept. Japan and South Korea have made great improvements on the hull shape, structure, power and other aspects in the conceptual design of green ships. Therefore, in order to achieve the breakthrough of green technology in the real sense, we need to break the shackles of traditional ideas. Third, strengthen the basic research of marine supporting technology. The development of ship supporting technology plays a key role in the development of green ships, such as the use of gas layer drag reduction, the improvement of propulsion efficiency, the optimization of hull line, the research and development of non ballast water technology, etc. The world has invested energy and funds to research and develop new technologies of energy conservation and emission reduction, although China is also vigorously carrying out, but has not yet carried out a comprehensive research, basic equipment data needs to be accumulated.

(2) Accelerate the layout of intelligent ship and shipping. For intelligent ship, China has achieved great development in recent two years, and has made breakthroughs in product development, technical conditions and platform construction. Many domestic and foreign experts believe that with the volume advantage of China's shipping and shipbuilding enterprises, intelligent shipping is likely to achieve the first breakthrough in China.

At present, the technology of intelligent ship has become more and more mature, but the reliability of equipment and intelligent system still needs to be further improved; and the development of intelligent shipping is slow due to the constraints of laws, regulations and interests. Looking at the world, intelligent ship and intelligent shipping are basically in the early stage of development. China has an early layout in intelligent ship and intelligent shipping, and has a certain policy environment and technical foundation. However, it still needs to break through many key technologies such as perception, decision-making and communication, and finally implement them in terms of safety, environmental protection and economy. Therefore, in terms of intelligent ship and intelligent shipping, it is suggested that:

First, strengthen the research and development of key technologies of intelligent ships. At the technical level, whether intelligent equipment and systems can operate and manage ships under any conditions and environment is actually a test for intelligent equipment. However, only from the current technology point of view, intelligent equipment still needs further development. In order to realize the real sense of unmanned, even the unmanned ocean going ships, we need to increase efforts to develop intelligent technology.

Second, accelerate the engineering practice, pilot demonstration and test verification of intelligent ship and intelligent shipping. By accumulating technical experience, improving scientific and technological strength, and actively participating in the formulation of code of conduct and legal norms in the field of international shipping and shipbuilding, we can improve China's voice in intelligent ship and intelligent shipping, enhance international influence, and lay a good foundation for the future intelligent ship market.

4. Problems in the development of Yangtze River intelligent shipping

4.1 Lack of top-level design and unified planning

As a new type of shipping industry, Yangtze River intelligent shipping has developed rapidly in recent years, but there is still a lack of top-level design and unified planning. It is still necessary to speed up the formulation of relevant laws and regulations. There is no stable channel for supporting policies and funds. The relevant technical standards and specifications are not perfect. The lack of professionals urgently needs to be solved. The development environment of intelligent shipping still needs to be further optimized.

4.2 Insufficient information data sharing

The Yangtze River port and shipping enterprises and management departments have "isolated islands" of information, insufficient data sharing, no interconnected intelligent information network, separate information construction, low degree of integration between systems, and difficulties in data connection or exchange between regional logistics hubs. The information service platforms of Yangtze River shipping units are not unified, the information sharing degree between business areas with high correlation is low, the core basic data and business data are difficult to obtain, the data format standards are inconsistent, and the coordination mechanism is not perfect. It is difficult to realize the information sharing, business collaboration and service integration among the trans regional, trans departmental and trans transportation modes in the Yangtze River economic belt. The transportation information among the shipping, wharf, railway, aviation, highway, warehousing, finance and other related enterprises can not be fully shared, and the joint effect can not be fully exerted.

4.3 The key technology innovation ability of intelligent shipping is insufficient

At present, China has made some achievements in the Yangtze River intelligent ship and intelligent port, but compared with the domestic coastal and foreign inland water transport, there is still a certain gap in the overall level. The key technology system of Yangtze River intelligent shipping has not been established, the technology research and development based on Algorithm and data has not been fully realized, and the key technologies and key links of intelligent shipping have not yet made a breakthrough.

5. Countermeasures and suggestions for the development of Yangtze River intelligent shipping

5.1 Strengthen the top-level design of intelligent shipping

Carry out research on the Yangtze River intelligent shipping architecture system, formulate development strategies, and promote the planning and construction of intelligent shipping. We will work out medium and long-term development plans and phased action plans, work with scientific research institutes to carry out research on the Yangtze River intelligent shipping architecture system, study and formulate intelligent shipping development plans or guidance, promote the development of Yangtze River shipping intelligent technology, enhance innovation ability, and better serve the strategy of transportation power.

5.2 Vigorously promote the innovation and application of intelligent shipping technology

By using the industry technology R & D platform, we should actively cooperate with and support core enterprises to carry out the research and development of key technologies of intelligent shipping; timely release the promotion directory of technologies and products such as intelligent ships and ports, guide port and shipping enterprises to apply mature intelligent technologies and products; organize and carry out the demonstration project of intelligent ships, and promote the first application of intelligent ship technology in public ships.

5.3 Promote the establishment of intelligent shipping innovation think tank

We will cooperate with well-known universities, industry leading enterprises, scientific research institutes and shipping enterprises to establish an integrated innovation think tank and Industry Alliance of government, industry, University, research and application; we will set up special industry funds for key nodes of intelligent ship and intelligent logistics, and take capital as a link to accelerate the formation of industrial ecology.

5.4 Optimize the development environment of intelligent shipping

Strengthen the research, formulation and improvement of laws and regulations, standards and specifications, index system, regulatory mechanism, management system, etc., attract information talents, build information team, accelerate the establishment of intelligent shipping development

guarantee system, and actively strive for policy and financial support from national ministries and commissions.

5.5 Realize intelligent shipping information sharing

Port and shipping enterprises integrate various subsystems internally, establish a unified data standard and database platform, realize the information sharing of water transportation, highway, railway, aviation and other logistics, and realize the multimodal transportation between various modes of transportation; the management department adopts the organization mode of combining the government and the market to promote the shipping information sharing, and integrate the information resources of the upper, middle and lower reaches of the Yangtze River Strengthen the construction of shipping data standards, promote the interconnection of shipping information database in the Yangtze River economic belt, make full use of big data technology, and speed up the construction of shipping information processing system.

References

- [1] Wang Yingyi, Zheng Chengrong, DU Liang, pan Fang. Green + Intelligence =future [J]. China Shipbuilding inspection, 2020 (06): 63-67.
- [2] Li Hui. Analysis and suggestions on the development of Yangtze River intelligent shipping [J]. Port science and technology, 2020 (02): 42-44 + 52.
- [3] Shao Peng, Li Zhishang. Future choice of safety information communication between ship and shore -- Research and development and construction of NAVDAT system [J]. Navigation technology, 2020 (1): 111 – 113.
- [4] Li Xiaojun, Huang Xiaowei, Wu Cong, et al. Application Research of submarine cable operation and maintenance ship shore wireless communication system based on wi Max [J]. Power information and communication technology, 2019 (11): 154 – 156.
- [5] Zhou Kaixin, Yan Shuang. Establishment of mobile monitoring and ship shore communication system based on wireless communication technology [J]. Water Conservancy Technical Supervision, 2019 (9): 99 – 101.
- [6] One belt, one road "[6]" background, China's shipping financial services development and innovation path analysis: take Ningbo as an example [J]. Hao Xinrong, Chen Guangmei. Enterprise economy. 2018 (09).
- [7] Intelligent transportation power [J]. Ye Hongling. China water transport. 2018 (01).
- [8] Development strategy of Chongqing modern shipping service industry based on SWOT analysis [J]. Li Ya. Water transport management. 2018 (09).