

# Research on Weihai Port's Development Strategy in the "Industrial 4.0" Era

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**Abstract:** Port has been the important infrastructure and basic industry to national economy and social development. Since the 21st century, with the idea of the fourth industrial revolution and the "Belt and Road" initiative proposed by the Chinese government, intelligent ports have become the important carrier which connects freight trade, logistics, storage, and information service. The construction of intelligent port is also regarded as an important means to enhance the port competitiveness. Qingdao Port, Xiamen Port and Yangshan Port phase IV, is the earliest automatic terminal in China. Weihai Port is located in Shandong Province of China, the nearest port between China and Korea, only 93 nautical miles far away from Incheon port. Around Weihai Port, there are petrochemical, automotive, electronic parts and other industrial park infrastructure. Shipping lines between Weihai Port and Korea and Japan are very busy. Weihai Port has superior geographical position and strong hinterland economy, but the port development is still being hampered by poor infrastructure, inefficiency, low popularity and other problems. Combining China's intelligent port development in the fourth industrial revolution, Weihai port has the construction problems like small scale, poor efficiency and scattered distributions, a disconnection problem in all aspects, such as few roads and railway lines, low grades and poor collection and distribution efficiency, limited development space and face d brain drain problem. In this situation, this paper puts forward some strategies to help the better development of Weihai port.

**Keywords:** "Industrial 4.0" Era, Artificial Intelligence, Weihai Port, Development Strategy

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## 1. Background: The Fourth Industrial Revolution

The fourth industrial revolution is a new industrial revolution with intelligence as the core, and with artificial intelligence, Internet of things and other technologies as the representative. In 2013, at the Hanover Industrial Fair the German government firstly proposed that mankind will meet the "Industrial 4.0" era, and then Industry 4.0 quickly became another label of Germany and sparked a new round of industrial transformation competition around the world. Germany academics and industry believe that the concept of "industry 4.0" is the fourth industrial revolution dominated by intelligent manufacturing, or revolutionary production methods [1]. The strategy aims to intelligentize the manufacturing industry by making full use of the combination of information and communication technologies and the cyber-physical system. At present, Germany, the United States,

Japan and other manufacturing developed countries already possess the technology and conditions to achieve intelligent manufacturing. These countries have start a new round of competition on intelligent manufacturing and have implemented "intelligent manufacturing system" long-term development strategy to occupy the commanding heights of intelligent manufacturing field. Germany proposed the "Industrial 4.0" strategy, the United States put forward the "industrial Internet" strategy, Japan put forward the strategic planning to occupy the high ground of fourth industrial revolution. On May 8, 2015, China also put forward its first programme of action for ten years----<<China Manufacturing 2025>>. The programme put forward to achieve the strategic goal of manufacturing power through the "three-step": enter into the ranks of manufacturing power by 2025; achieve the middle level of the international manufacturing power by 2035; truly become a manufacturing power by 2050 [2].

"Industrial 4.0" project is divided into three main themes: First, "intelligent factory", focusing on intelligent production

systems and processes, as well as the implementation of networked distributed production facilities; Second, "intelligent production", mainly related to the entire enterprise production logistics management, human-computer interaction and 3D technology applied in the industrial production process; Third, "intelligent logistics", give full play to the efficiency of existing logistics resources provider through the Internet, Internet of Things, logistics network and integrated logistics resources, while the demand side can quickly get service and logistics support. The "intelligent logistics" part has a profound impact on port construction and development through high-tech development.

## 2. Intelligent Port Development in China

With the promote of the fourth industrial revolution, the Internet of Things, logistics network, large data and other information technology become more mature, bringing important support for port transformation and upgrading. On April 25, 2016, the Ministry of Transport of China issued <<The transportation information '13<sup>th</sup> Five-Year' development plan>>, pointing out to actively promote information Connectivity of multimodal transportation such as railway-water, road-railway, road-water and river-sea; to promote the use of freight "electronic waybill" to push "a single system" multimodal pilot demonstration; to guide the construction of intelligent port and intelligent logistics park to achieve smooth and coordinated operation among various transport modes [3]. On January 24, 2017, the Ministry of Transport of China issued a notice to carry out intelligent port demonstration project construction, focusing on foreign trade services model innovation with port as hub to improve China's port intelligence level. Intelligent port has become the main development direction of China's future intelligent transportation system. The construction of intelligent port is also regarded as an important means to enhance the port competitiveness. Qingdao Port, Xiamen Port and Yangshan Port phase IV, is the earliest automatic terminal in China [4]. In March 2016, Xiamen Ocean automated container terminal is put into commercial use; in May 2017, Qingdao automated terminal is put into operation; the world's largest automated terminal --- Shanghai Yangshan Port Phase IV project was put into operation in December, 2017.

Qingdao Port has used GPS positioning, electronic tags, GPRS communications technology to acquire the data of field. Automatic production operations achieve a complete separation of man and machine, man and goods, becoming more secure and reliable; terminal equipment totally use electric power, becoming more energy saving and environmentally friendly; operation and management connect the world's most advanced system, becoming more intelligent and efficient [5]. Now in the rear production control center of the existing two berths, 9 remote controllers undertake the work of 60 people in traditional terminal, reducing operator about 85%, enhancing operating efficiency about 30%, terminal design operation efficiency is up to 40 container per hour. This is the world's highest automation degree, the fastest

loading and unloading container terminal.

Yangshan Port Phase IV built seven berths, will form a 4 million TEU handling capacity per year. After the latter expansion, 26 quay crane, about 120 RMGs (Rail-Mounted Gantry Crane) and more than 130 AGVs (automatic guided transport vehicles) will be put into use, throughput will reach 6.3 million TEUs per year.

As a representative of port integrated information system, Tianjin Port's integrated logistics information service platform achieves electronic data exchange among government, ports and logistics enterprises, providing a comprehensive service operation platform for logistics information exchange, also improving Tianjin port's informatization level [6]. The platform will further optimize and integrate the information resources of ports, shipping companies, shipping agents, inspection and quarantine bureau, customs and maritime bureaus, establish a "one-stop" external information service window, and establish a global logistics information service network.

## 3. Weihai Port's Development Situation Analysis

Weihai port consists of Weihai Bay port area, Shidao port area, Longyanwan port area, Lijiang port area, Jinghaiwan port area and Rushankou port area. There are totally 17 commercial ports, including 3 opening ports of national first class, 5 opening operation areas of first class, 2 opening ports of second class. There are 62 berths, including 25 million tons level berths. Now Weihai port has developed into a port system with ro-ro, container and general terminal facilities. Weihai port has 21 container shipping lines to the main ports of South Korea, Japan and China, is the busiest liner shipping city between China and South Korea. There are 1 ro-ro liner shipping lines from Weihai port to Dalian, China, 6 ro-ro liner shipping lines to Incheon, Gunsan and Pyeongtaek, Korea.

Even though Weihai port still has a big gap with other Chinese ports, even with Qingdao port of Shandong province. For example, there are totally 39 port enterprises that hold the "Port Operation License" and operate independently. This causes many problems like small scale, poor efficiency and scattered distributions, making each port very small and scattered [7]. And because each port invest and construt itself makes each port area don't pay many attention on its berth construction, so lacking large deep-water berths has been a very big problem in Weihai port. Moreover, the conditions of collection and distribution of Weihai port don't meet its development needs. There is a disconnection problem in all aspects, such as few roads and railway lines, low grades and poor collection and distribution efficiency, limited development space etc. especially before the promulgation and implementation of the "Port Law", there are problems such as lax checks on the use of coastlines and unscientific use of coastlines [8]. Some high-quality coastline is occupied by many enterprises, hindering the large-scale development of Weihai port. Furthermore, more and more foreign shipping

companies have entered Chinese shipping market, which make the competition for talents become more and more heated. Foreign logistics and shipping companies attract outstanding talents with generous treatment and incentive mechanism, leading to the more serious brain drain of Chinese ports, especially for the small port like Weihai port.

#### 4. Development Recommendations on Weihai Port

Weihai Port is located in Shandong Province of China, the nearest port between China and Korea, only 93 nautical miles far away from Incheon port. Around Weihai Port, there are petrochemical, automotive, electronic parts and other industrial park infrastructure. Shipping lines between Weihai Port and Korea and Japan are very busy. Weihai Port has superior geographical position and strong hinterland economy, but the port development is still being hampered by poor infrastructure, inefficiency, low popularity and other problems [10]. Combining China's intelligent port development in the fourth industrial revolution and the "Belt and Road" initiative, we make the following recommendations on the development of Weihai port.

Firstly, strengthening port infrastructure construction. The current port infrastructure of Weihai Port has been unable to meet its development needs and is not conducive to future development. It is recommended that the port authorities and government should make a long-term development plan to carry out forward-looking design and construction, including the port infrastructure construction and its surrounding construction, especially the railway, road and other transport construction.

Secondly, strengthening port automation and information construction. Port automation is a general trend. It can improve production efficiency, also can save labor costs. It is recommended to learn the advanced technology and experience from domestic and foreign ports to build a new modern port.

Thirdly, strengthening tourism development. Weihai port is close to Seoul, also is the nearest port from Korea. How to attract domestic and foreign tourists is a question to think about for the local government. It is recommended to strengthen the cruise port construction and tourism project to attract domestic and foreign tourists, so as to promote the development of local tourism.

Fourthly, taking use of the "Belt and Road" to actively promote multimodal transport. The opening of China-Europe rail routes greatly shorten the distance between South Korea

and Europe. It is recommended that Weihai Port should take advantage of its location to construct regional hub port or transit port, strengthening connection with China ports to develop multimodal transport, so as to drive local economy development.

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