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Research on Artificial Intelligence Technology Promoting High-Quality Development of High-End Equipment Manufacturing Industry – A Case Study of Linyi City, Shandong Province

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Abstract. The high-quality development of the high-end equipment manufacturing industry is inseparable from the support of emerging technologies. As a typical emerging cross-cutting technology, artificial intelligence has been widely used in many fields of the high-end equipment manufacturing industry in Linyi City, Shandong Province. Combined with the application of artificial intelligence technology in the local high-end equipment manufacturing industry in Linyi, the paper analyzes and explores the impact of artificial intelligence technology on the development of high-end equipment manufacturing industry, and focuses on artificial intelligence technology in construction machinery, agricultural machinery, intelligent manufacturing industries in Linyi City, such as energy vehicles and parts, illustrate specific measures and methods on how to apply artificial intelligence technology to promote the development of high-end equipment manufacturing industries.

Keywords. High-end equipment manufacturing, artificial intelligence technology, high-quality development, Shandong Linyi

1. Introduction

As an important basic industry for the steady development of national economy, highend equipment manufacturing industry is also the key core of manufacturing industry [1]. With the continuous integration and development of emerging artificial intelligence technology and traditional manufacturing technology, the equipment manufacturing industry continues to develop, change and innovate. The original traditional mode of relying on capital increase to drive the development of enterprises has developed into the

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product upgrading and production process transformation of manufacturing equipment industry based on artificial intelligence technology. Through the introduction of artificial intelligence technology in the product R&D design, manufacturing and production, aftersales maintenance and other links of equipment manufacturing enterprises, the quality of equipment products can be improved in an all-round way, making artificial intelligence technology an important way for the transformation and upgrading of high-end equipment manufacturing enterprises in the new era [2-3].

In recent years, the state has issued a number of policies for the high-end equipment manufacturing industry to make good use of emerging technologies and promote industrial development, aiming to accelerate the development of high-end equipment and intelligent manufacturing (table 1). Up to now, relevant state departments have successively issued "Made in China 2025", "Intelligent Manufacturing Development Plan (2016-2020)", "Thirteenth Five-Year Plan" National Strategic Emerging Industry Development Plan, "High-end Intelligence Re-Action Plan (2018)" -2020)", "Three-Year Action Plan for Promoting the Development of the New Generation of Artificial Intelligence Industry (2018-2020)" and other important plans, and formed a strategic policy system for manufacturing a strong country [4-5].

Release time	Policy issuing Unit	File name	Main content
2015	The State Council	Made in China 2025 strategy	By 2020, the level of intelligence in key areas of manufacturing will be significantly improved, and by 2025, all key areas of manufacturing will be intelligent.
2016	Ministry of Industry and Information Technology, Ministry of Finance	Smart Manufacturing Development Plan 2016-2020	By 2025, the intelligent manufacturing support system will be basically established, and key industries will initially realize intelligent transformation.
2017	The State Council	Development planning for the new generation of artificial intelligence	By 2020, the integration of artificial intelligence and the real economy will be further deepened, and the environment for industrial development will be further optimized.
2018	Ministry of Industry and Information Technology	Industrial Internet Development Action Plan	By 2020, the industrial Internet infrastructure and industrial system will be initially completed, with more than 2 billion signage registrations and more than 300,000 industrial apps.

Table 1. Part of China's intelligent manufacturing related policies

Although China has become a manufacturing power, but "big but not strong" is still the main contradiction plaguing the development of China's manufacturing industry, according to the data of China Machinery Industry Federation, in the field of high-end equipment, China still imports 80 percent of its integrated circuit chip manufacturing equipment, 40 percent of its large petrochemical equipment, 70 percent of its key equipment for automobile manufacturing and advanced intensive agricultural equipment (figure 1).

Next, the paper takes the local high-end equipment manufacturing industry in Linyi City, Shandong Province as an example to analyze the influence of artificial intelligence technology on the promotion of high-end equipment manufacturing industry, and put forward corresponding countermeasures for how to use artificial intelligence technology to accelerate the transformation and upgrading of high-end equipment manufacturing industry in the future.



Figure 1. China's high-end equipment field relies on imports to account for the proportion

2. Development Status of High-end Equipment Manufacturing Industry in Linyi

By 2020, there are 267 machinery and electronics enterprises above the scale in Linyi City, with an output value of 52.2 billion yuan. There are 30 R&D centers above the provincial level, forming a pattern of synchronous development of construction machinery, agricultural machinery, automobiles and parts, building materials machinery, hardware machinery, instrumentation, wood machinery, machinery and electronics, etc. In 2018, the output value of the city's advanced equipment manufacturing industry reached 56.16 billion yuan. In 2022, the city's advanced equipment manufacturing industry will continue to expand and strive to reach an output value of more than 65 billion yuan.

Linyi City's high-end equipment manufacturing industry mainly involves construction machinery and accessories, agricultural machinery, basic parts, machine tools, precision bearings, special equipment and other fields, leading products such as loaders, excavators, garden plant protection machinery, the domestic market share of 24%, 9%, 60%. At present, Linyi City has three provincial high-end equipment manufacturing industrial parks, and gradually formed the construction machinery industry cluster in the opening zone, Yinan building materials machinery industry cluster, Yishui County machinery industry cluster and other equipment manufacturing clusters with local characteristics. The formation of industrial clusters has played an important role in accelerating the development of the whole local industrial chain. Linyi high-end equipment manufacturing enterprises attach great importance to the construction of technology platforms. There are 8 national platforms such as national enterprise technology center, enterprise key laboratory and high-tech industrialization base, and 64 provincial platforms such as provincial enterprise technology center, industrial design center, enterprise key laboratory and academician workstation. The development area has been approved as the national construction machinery high-tech industrialization base, the national new industrialization demonstration base, the national construction machinery industry well-known brand to create a demonstration area. In the future, Linyi

City will focus on the layout of construction machinery, agricultural machinery, intelligent manufacturing equipment, new energy vehicles and parts and other fields.



Figure 2. New energy loader and AGV trolley of Shandong Lingong Group

3. Application of Artificial Intelligence Technology in High-End Equipment Manufacturing Industry of Linyi City

With the application of the new generation of information technology, artificial intelligence and other advanced technologies in equipment manufacturing enterprises, it plays a significant role in improving the added value of science and technology and the market competitiveness of equipment products [6]. Linyi characteristic equipment manufacturing and manufacturing enterprises have successively introduced artificial intelligence technology into equipment products to continuously improve product quality and increase new technological chips for winning the market. At present, Linyi City construction machinery, agricultural machinery, intelligent manufacturing equipment, new energy vehicles and other equipment manufacturing enterprises have successively integrated artificial intelligence technology in equipment manufacturing research and development, production.

3.1. Artificial Intelligence Technology Helps Upgrade Construction Machinery Products

With the deepening of the country's emphasis on low-carbon environmental protection, energy saving and emission reduction in the field of construction machinery has become a key part of product competitiveness. Shandong Lingong L956HEV 5 ton electric loader takes the lead in adopting electric drive mode, the whole machine adopts deep learning intelligent control system, the system can automatically adjust the power output according to load, speed and other conditions; The machine has the advantages of light and comfortable operation, good dynamic performance, small impact and high efficiency (figure 2). At present, Shandong Lingong L956HEV electric loader has been applied in engineering production, successfully assisted the construction of Sichuan-Tibet line [7] and delivered to large iron and steel groups for application. The electric loader designed and developed based on artificial intelligence technology fully responds to the country's adherence to the road of green, low-carbon and ecological civilization development; At the same time, the development and research of Shandong Lingong L956HEV 5-ton electric loader has made a temporary contribution to the goal of carbon peak and carbon neutrality advocated by the assistant country.

3.2. Artificial Intelligence Technology Enhances the Power of Intelligent Manufacturing Equipment and Products

Linyi City's main research in the field of intelligent manufacturing equipment involves high-end CNC machine tools, laser additive manufacturing, intelligent fire trucks, etc. In the field of high-grade CNC machine tool equipment manufacturing, linyi has emerged in the shandong linyi Venus machine tool co., LTD., YiLong the nc machine tool co., LTD., and other machine tool production research and development of manufacturing enterprises, the products covered by the CNC lathe, vertical machining centers, CNC milling machine, horizontal lathe, surface grinding machine and various types of high-end machine tool products. In particular, in recent years, Linyi machine tool enterprises actively introduce artificial intelligence control technology, advanced material processing technology, intelligent factory management and production concept, all-round improvement of machine tool product quality.

Linyi City's intelligent manufacturing equipment products, in addition to the traditional mechanical processing industry products, but also involved in advanced laser manufacturing. Especially in the field of laser additive manufacturing, advanced laser additive manufacturing enterprises such as Shandong Zhongke Intelligent Equipment Co., LTD and Pentium Laser have emerged in Linyi in recent years. Among them, Pentium laser composite laser processing system developed by Pentium laser, based on artificial intelligence technology, industrial robot and other methods, to achieve the laser processing system intelligent welding path planning, a variety of laser welding process switching and other advanced functions.

4. Suggestions on Artificial Intelligence Technology Boosting the Development of High-End Equipment Manufacturing Industry in Linyi City

(1) Strengthen technological innovation and make breakthroughs in key technologies. The development of high-end equipment manufacturing industry in Linyi city cannot be separated from the support of innovative technology, and only through technological innovation can we obtain the power of sustainable and rapid development of enterprises. For some key technologies of equipment, enterprises must make original innovation to break through some key "stuck" technologies limited by human, and truly master the key core technologies in their own hands. Through several years of technological innovation and development, they can improve product innovation and win more opportunities for their own market share.

(2) Strengthen personnel training and build a solid talent foundation. Talent is the source and power of enterprise innovation and development, and attaching importance to talent training is attaching importance to innovation and development. Therefore, enterprises need to closely combine with their own development reality, according to the needs of training talents, especially in the intelligent control of talents. At present, most equipment manufacturing enterprises in Linyi City are abundant in machinery manufacturing talents, but lack of talents in intelligent control, which plays an important role in improving the intelligence of products. Enterprises can flexibly introduce relevant talents through industry-university-research cooperation with universities and scientific research institutes, so as to solidify the foundation of enterprises talents and provide sufficient impetus for technological innovation of enterprises.

(3) Integrate into industrial clusters and optimize industrial structure. At present, Linyi City has three provincial high-end equipment manufacturing industrial parks, and has gradually formed equipment manufacturing clusters with local characteristics. In the future, the equipment manufacturing enterprises in Linyi City should closely integrate the local industrial clusters, enhance the aggregation effect and play the radiation driving role through the driving role of industrial clusters. Through the industrial cluster effect, enhance the supply and demand industrial chain among enterprises, constantly enlarge and strengthen the brand effect, and form the internal force to continuously promote the development of enterprises.

5. Conclusions

Combined with the application background of artificial intelligence technology in highend equipment manufacturing industry, and combined with the specific application cases of artificial intelligence technology in the field of construction machinery and intelligent equipment manufacturing in Linyi City, Shandong Province, this paper analyzes and expounds the internal role of artificial intelligence technology in promoting the innovation and development of enterprises. At the same time, based on the actual development of high-end equipment manufacturing in Linyi at that time, the paper provides corresponding suggestions for the rapid development of high-end equipment manufacturing enterprises in Linyi City in the future from three aspects of strengthening technological innovation, strengthening talent training and integrating into industrial clusters.

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