

How does AI Technology Affect the Development of Physical Manufacturing Industry under the Background of Intelligent Economy

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Abstract. AI technology plays a positive role in promoting the development of physical manufacturing industry, which can improve production efficiency, reduce costs, improve product quality, innovate research and development capabilities, expand market opportunities and strengthen customer service. In the future, with the continuous development and application of AI technology, its potential will be further released, bringing more opportunities and challenges to the development of physical manufacturing.

Keywords: Intelligent Economy; AI Technology; Real Economy.

1. Introduction

In recent years, China's manufacturing industry has developed rapidly, and the added value of manufacturing industry has been rising in the global manufacturing industry. In 2021, the added value of China's manufacturing industry has been about 2.37 trillion US dollars ahead of the United States, about 3.87 trillion US dollars ahead of Japan and about 4 trillion US dollars ahead of Germany.[1] With the continuous development of intelligent economy, China's manufacturing industry is constantly exploring new models. Report to the 20th CPC National Congress of the Party pointed out that it is necessary to "accelerate the development of digital economy, promote the deep integration of digital economy and real economy, and build a digital industrial cluster with international competitiveness". In 2023, the Central Economic Work Conference proposed to speed up digital transformation and promote the upgrading of traditional industries.[2] At present, with the development of a new round of scientific and technological revolution and industrial transformation, intelligent manufacturing is leading the direction of global manufacturing development and transformation, becoming the commanding height of global manufacturing technology innovation and the new engine of global economic development.

However, constrained by resources, technology, talents and other factors, many physical manufacturing industries face many difficulties in the process of digital transformation. The dilemma of "unwilling to turn, afraid to turn, and not turning" is more prominent, which is the focus and difficulty of industrial digital transformation. Under the intelligent economy, the influence of AI technology on the physical manufacturing industry is various. The physical manufacturing industry should actively meet the challenges, seize the opportunities, and achieve high-quality development through continuous innovation and reform.

2. Difficulties Faced by the Development of China's Entity Manufacturing Industry under the Background of Intelligent Economy

2.1. High Technical Threshold, Lack of Professionals

The development of intelligent economy involves many advanced technologies and emerging fields, such as artificial intelligence, Internet of Things and cloud computing. The physical manufacturing

industry needs interdisciplinary and interdisciplinary technical talents to promote the transformation of intelligent manufacturing. At present, there are relatively few such talents, which brings certain difficulties to the intelligent transformation of the physical manufacturing industry.

2.2. High Cost of Technology Input, Lack of Financial Support

Intelligent manufacturing needs a lot of technical input, including hardware equipment, software system, network construction and so on.[3] For some entity manufacturing industries with low profit margins, it is difficult to bear these high technical input costs, so the lack of financial support has become a major dilemma they face. The application of intelligent manufacturing technology needs to adapt to the actual production scene of enterprises, and different enterprises have different production processes and equipment, which brings certain difficulties to the application of technology. At the same time, the application effect of intelligent technology also needs to be verified through long-term practice, which also brings certain risks and uncertainties to the intelligent transformation of enterprises.

2.3. Data Security and Privacy Protection Issues

Intelligent manufacturing needs a lot of data support, but there are risks of data security and privacy protection in the process of data collection, storage and use. Physical manufacturing needs to pay attention to data security and privacy protection, and take measures to protect business secrets and customer privacy.

2.4. Market Competition Intensifies and Profit Margins Shrink.

The development of intelligent economy has brought more competitive opportunities and participants, and the physical manufacturing industry needs to face more intense market competition. At the same time, due to the improvement of technical threshold and the increase of capital investment, the profit margin of physical manufacturing industry has also been compressed to some extent. In a word, the development of intelligent economy has brought some new development opportunities to China's entity manufacturing industry, but it has also brought some difficulties. The entity manufacturing industry needs to take corresponding measures to deal with these difficulties according to its own actual situation, so as to realize intelligent transformation.

3. The Impact of AI Technology on the Physical Manufacturing Industry under the Background of Intelligent Economy

3.1. Positive Influence

Under the background of intelligent economy, AI technology has a positive role in promoting the development of physical manufacturing. The following are the main impact areas:

(1) improve production efficiency

AI technology can improve the production efficiency of manufacturing industry through intelligent monitoring, automatic process and optimized scheduling. For example, machine vision technology can realize fast and accurate defect detection and avoid errors in production process; Robot automation system can improve the running speed of production line and reduce manual intervention.

(2) Reduce costs

The application of AI technology helps to reduce the operating cost of manufacturing industry. For example, through data analysis and machine learning, AI can predict equipment failures, realize intelligent maintenance, and reduce equipment maintenance costs; In addition, AI can also reduce waste and reduce raw materials and energy costs by optimizing production processes.

(3) expanding market opportunities

AI technology plays a vital role in ensuring the quality of manufacturing products. Through AI technology, the real-time monitoring of production process can be realized, and the problems can be adjusted in time, thus ensuring the quality and stability of products. The data shows that the market size of China's intelligent manufacturing equipment exceeded 1.51 trillion yuan in 2018 and exceeded 2 trillion yuan in 2020. In 2022, China's intelligent manufacturing equipment market will reach 2.87 trillion yuan, and the application of AI technology will greatly help to enhance the manufacturing market scale. (As shown in figure 1) [4]



Figure 1. Profit rate of intelligent manufacturing industry in China from 2019 to 2021

(4) innovative research and development capabilities

AI has great potential in innovative research and development of manufacturing industry. With AI technology, enterprises can develop new products and improve existing products more quickly. For example, through the analysis of a large number of historical data, AI can predict the needs of consumers and provide targeted design suggestions for manufacturers. At the same time, AI technology also shows strong capabilities in customer service and market expansion of manufacturing industry. Through AI technology, enterprises can achieve rapid response and accurate service to customer needs, improve customer satisfaction and expand market channels.

3.2. Negative Effects

Under the background of intelligent economy, AI technology has brought some negative impacts on the development of physical manufacturing industry, including unemployment, security risks, technology dependence and upgrading pressure, intellectual property rights and data security issues, and unfair competition. The following are the main impact areas:

(1) Unemployment

The development of AI technology has caused many people to lose their jobs. In the manufacturing industry, robots can work for a long time, do not need to rest, and will not reduce efficiency due to fatigue, so a large number of workers may lose their jobs. According to the data of China Statistical Yearbook, the proportion of manufacturing employment in total employment reached a peak of 13.4% in 2014 (12.6% in 2019), and the number of manufacturing employment reached a peak of 132 million in 2016, and then the number and proportion of manufacturing employment continued to decline.

(2) Security risks

The application of AI technology in manufacturing industry also brings some security risks. Because the adaptability and accuracy of robots may exceed that of humans in some environments, it may pose a threat to human safety. For example, in some dangerous environments, robots can work instead of human beings, but out of control or failure of robots may also cause harm to human beings. Therefore, while popularizing and applying AI technology, it is necessary to fully consider these

influences and take corresponding measures to reduce their negative effects, so as to realize the sustainable development of intelligent economy and manufacturing industry.

(3) Technical dependence and upgrading pressure

The dependence of manufacturing industry on AI technology may lead enterprises to face greater pressure in technological upgrading and transformation. In order to maintain competitiveness, enterprises must constantly update technology and equipment, and the upgrading of technology may cause some equipment and personnel to be unable to adapt to the new technical requirements, thus causing certain losses to enterprises.

(4) Intellectual property rights and data security issues.

The application of AI technology in manufacturing industry involves a lot of data processing and algorithm application, which also brings problems in intellectual property and data security. The core technologies and trade secrets of some enterprises may be leaked due to the use of AI technology, which will bring losses to enterprises. Unfair competition. The application of AI technology in manufacturing industry may also aggravate unfair competition. Some enterprises may use AI technology to gain competitive advantage, while some enterprises that have not mastered AI technology may be at a disadvantage, thus affecting fair competition in the market.

4. Suggestions on the Development of Entity Manufacturing Industry under the Background of Intelligent Economy

4.1. Strengthen Technological Innovation

China's entity manufacturing industry should pay attention to technological innovation and improve product quality and technical content. Specifically, we should strengthen technological innovation in the following aspects. The first is to introduce advanced technology and equipment, constantly update production equipment and technology, and improve product manufacturing accuracy and efficiency. The second is to enhance independent research and development capabilities, strengthen the construction of technology research and development teams, encourage enterprises to conduct independent research and development, and promote technological progress. The third is to attach importance to intellectual property protection, strengthen intellectual property protection, encourage enterprises to apply for patents, and improve their core competitiveness.

4.2. Promote Industrial Upgrading

Industrial upgrading is the only way for the development of China's physical manufacturing industry. Specifically, we should strengthen the industrial upgrading in the following aspects: firstly, we should adjust and optimize the industrial structure, develop high value-added industries and improve industrial efficiency. Secondly, we should promote the coordinated development of industries, strengthen cooperation between different industries, realize the coordinated development of industries and improve the overall competitiveness. Finally, we should strengthen international cooperation, actively participate in international cooperation and competition, introduce foreign advanced technology and management experience, and upgrade the industrial level. According to the data of Intelligent Manufacturing Development Index Report (2021) [5], in 2021, Shenzhen, Jiangsu, Fujian, Shandong and Beijing encouraged enterprises to actively promote the upgrading of the manufacturing industry, and the number of enterprises that completed the self-diagnosis of the maturity of intelligent manufacturing capacity in their jurisdictions was significantly higher than that in 2020, and the growth rate was among the highest in the country. In the process of industrial upgrading, we should also strengthen brand building, which is the key for China's physical manufacturing industry to enter the international market. On the one hand, we should strengthen the brand awareness of enterprises and regard brand building as an important strategy for enterprise development. And by improving product quality and service level, win the trust and support of consumers and enhance brand reputation. At the same time, we should strengthen brand

communication, use various channels and means to strengthen brand communication and improve brand awareness.

4.3. Improve the Personnel Training System

Talent cultivation is a key factor in the development of China's entity manufacturing industry. Especially in the context of intelligent economy, the development of physical manufacturing industry should pay more attention to the quality of talents and cultivate a group of high-quality talents. First of all, we should strengthen the introduction of talents, and attract more outstanding talents to join the enterprise by optimizing the recruitment process and strengthening campus recruitment. Secondly, it is necessary to establish and improve the training system, carry out internal training of enterprises, and improve the professional ability and comprehensive quality of employees. Finally, we should implement the talent incentive plan, and encourage employees to be proactive and retain outstanding talents by setting up incentive mechanisms and promotion channels. According to the survey data, in the next three years, 66.4% of enterprises expect the employment of "first-line production or operation posts" to decrease, while 42.4% and 49.2% of enterprises expect the employment of "skills or technical posts" and "senior engineers or R&D posts" to increase. [6] In terms of training high-end talents, on the one hand, while guiding the construction of innovative disciplines such as colleges and universities and vocational and technical schools, and setting up majors related to digital transformation, enterprises are encouraged to set up collaborative innovation platforms, joint training centers and R&D centers in schools according to actual needs to jointly build digital transformation experiments, experiments and training scenarios, and vigorously implement the order-based innovative talent training model; On the other hand, set up a special talent program for small and medium-sized enterprises to "change their intelligence into digital skills", and guide enterprises to increase on-the-job training on digital literacy and digital skills of existing talent teams through financial subsidies or tax incentives.

4.4. Expand the Market

Expanding the market is a necessary means for the development of China's entity manufacturing industry. First of all, we should dig deep into the domestic market and tap the potential of the domestic market by optimizing product structure and expanding sales channels. At the same time, it is necessary to expand the international market, by participating in international exhibitions and strengthening international cooperation, to expand the international market and improve the position of enterprises in international competition. In addition, it is necessary to innovate marketing models, actively explore new marketing models, such as e-commerce and social media marketing, so as to improve marketing efficiency and effectiveness, fully combine the development characteristics of intelligent economy, and take the chain owners of industrial chain, innovation chain, data chain and supply chain as the guide to drive small and medium-sized enterprises in the whole chain, upstream and downstream to cooperate with chain owners. Build an industrial chain and a virtual industrial park on the cloud, realize "one-stop" digital intelligent service supply in design and development, material supply, manufacturing, inventory logistics, marketing and other scenarios, and build a brand-new development model of physical manufacturing industry with new models such as data sharing, collaborative creation, centralized collection and marketing, and Sharing Manufacturing, so as to boost the continuous innovation of marketing model.

5. Conclusion

Under the background of intelligent economy, artificial intelligence technology has unparalleled advantages in reducing environmental harm, realizing industrial integration, improving resource utilization efficiency and transforming innovation achievements. While realizing the deep application of its own technology in the industry, it can also promote the deep integration of traditional industries and emerging industries, thus realizing the transformation and upgrading of manufacturing industry. This paper mainly studies the influence of artificial intelligence technology on the transformation and

upgrading of China's physical manufacturing industry, and analyzes the path to upgrade the transformation and upgrading of the physical manufacturing industry, which is helpful to solve the problems faced by the manufacturing industry at present, such as labor shortage, industrial structure imbalance, resource and environment bottlenecks and so on.

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