The Role of Artificial Intelligence in China's Manufacturing Industry: Reality and Prospects

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Abstract. The convergence of artificial intelligence with China's manufacturing sector marks the dawn of a new digital era with profound implications for productivity, innovation, and global trade. The emergence of artificial intelligence is redefining how factories operate in China, bringing unparalleled efficiency and agility. Powered by AI, the promise of smart manufacturing is more than just an incremental advance; It represents a fundamental shift in manufacturing towards intelligent, connected and autonomous systems. In the current situation, AI has begun to be deployed in many manufacturing areas in China, focusing on process optimization, supply chain management, product development and after-sales service. Factories are becoming smarter, using big data analytics and machine learning algorithms to improve decision-making and operational efficiency across all aspects. At the same time, such rapid development will raise questions about the collapse of the low-skilled labor market and information safety. This essay also puts forward some solutions in turn.

Keywords: Artificial intelligence, Manufacturing, Industrial upgrading, Industrial transformation, labor market.

1. Introduction

Since 1990s, the digital economy based on digital information and communication technology has gradually begun to develop. By the 21st century, many digital economy technologies such as big data and cloud computing have matured and begun to be put into use. Artificial intelligence, as one of the most important core technologies of digital economy, promotes economic growth in terms of production process optimization, supply chain management, product design and development, and market analysis and services. Furthermore, AI's advanced market analysis and service personalization capabilities enable manufacturers to meet consumer demands with greater precision. By analyzing vast arrays of market data, AI can identify emerging trends and preferences, enabling factories to tailor their products and services in real-time, creating a dynamic trading market that is both responsive and predictive. This article will discuss how artificial intelligence will change the production, management and trading markets of factories from the perspective of manufacturing.

2. Applications of artificial intelligence in manufacturing

2.1. Production process optimization

Artificial intelligence is often used to improve efficiency through predictive maintenance, quality control, automation and optimization of production processes.

2.1.1 Predictive maintenance

Artificial intelligence's predictive maintenance technology can predict and detect equipment failures through vibration analysis, infrared thermal imaging, ultrasonic analysis, acoustic monitoring and other methods [1]. To be more specific, artificial intelligence collects key parameters and indicators in the operation process of equipment through real-time monitoring of equipment operation data. Using these data, artificial intelligence can extract the features related to different equipment failures and build corresponding failure prediction models. Later, during the production process, if the machine produces the same trend as the predicted model, the AI will make a forecast, and speculate and analyze the location of the problem. The technical personnel will overhaul it early after

clearly understanding the situation and take corresponding maintenance measures according to the predicted data and analysis provided by artificial intelligence, so as to reduce unplanned downtime and maintenance costs, and improve efficiency [2].

2.1.2 Quality control

The utilization of artificial intelligence technologies lowers manufacturing process faults [1]. Through the infrared scanning of the production goods, defective goods can be accurately screened out, which greatly improves the outgoing quality of goods. In addition, different from the traditional manual random sampling of quality inspection, artificial intelligence can analyze the appearance of each commodity. This not only saving manpower, but also more quickly and perfectly find goods with quality problems and improve the efficiency and quality of factory inspection. At the same time, it also increases the reputation of the factory by improving the quality of the goods.

2.1.3 Automation

The automated operation of artificial intelligence in manufacturing is mainly achieved by replacing some simple and repetitive tasks. Automation of artificial intelligence in manufacturing industry is primarily achieved by replacing some simple and repetitive tasks. With a few simple instructions, artificial intelligence can make the machine do the work. Take mechanical robot, which is a specifically artificial intelligence designed to automate repetitive and routine tasks. It can complete remote sensing, machine translation, classification algorithm, dimensionality reduction algorithm and clustering algorithm [3]. They can work longer hours than humans (24/7), and their work is more accurate and less prone to error.

2.1.4 Production process optimization

Artificial intelligence technology applied to production data processing can increase throughput, reduce downtime, forecast business interruptions, and boost manufacturing efficiency [1]. To achieve this, AI may simplify, rearrange or merge some production processes to avoid unnecessary time wastage.

2.2. Supply chain management

2.2.1 Supply chain forecasting

On the basis of historical sales information data, artificial intelligence effectively uses algorithms to estimate the consumption demand of related goods in various stores [4]. Through the prediction of consumer demand, enterprises can purchase raw materials in advance and start to produce.

2.2.2 Inventory management

Firstly, by integrating previous procurement data, pertinent procurement analysis, and model deduction to ensure that the ideal inventory for production can be maintained, artificial intelligence gives manufacturers the optimum timing and amount for sourcing raw materials [1]. Secondly, artificial intelligence can provide ideal consumption plans for inventory through optimization algorithms, using information data such as future forecast orders, current product orders, and historical orders [4]. In this way, enterprises can avoid excessive inventory backlog or find that raw materials are insufficient after obtaining orders, so as to complete orders one step ahead of customers' needs. It reduces the problem of long production scheduling time, perfectly provides backup resources for machine production, and makes full use of resources.

2.2.3 Logistics optimization

According to the priority of the order task, artificial intelligence will comprehensively consider various constraints such as carrier conditions, traffic, time and transportation distance, and adjust scheduling reasonably with the help of operation research optimization and artificial intelligence technology to improve the comprehensive utilization rate of transportation capacity resources [4]. Logistics will convey items in the most effective manner and minimize needless returns after

optimizing the logistics path. Trying to make sure that the things are transported once to the same location at the same time.

2.3. Product design and development

Artificial intelligence helps manufacturing enterprise design new products, including the development of customized products, through simulation and testing. The probability of problems occurring in the design and demand environments makes roughly 20% and 70% of the entire product research and development process, proportionately. AI can help to reduce this proportion and improve manufacturing efficiency [1]. Artificial intelligence can improve the products or help to design it based on the future customer needs analyzed. Through repeated simulations and tests, artificial intelligence guarantees the quality of the product and analyzes its likelihood of release in the market. In addition, artificial intelligence can also be customized according to the needs of each customer and make every effort to ensure that the designed products meet the requirements of each customer.

2.4. Market analysis and service

2.4.1 Market analysis and marketing

Predictive analysis of the market by artificial intelligence is often used to predict volatile market trends. For example, fashion apparel brands use it to predict fast fashion trends to better meet customer needs. At the same time, it can also be used to identify competitors in well-defined markets or external choices in new markets to help the enterprise to gain a competitive advantage over products in the market [4]. For the marketing section, by the carefully examining consumer data, which includes browsing costumers' purchase history as well as demographic data, artificial intelligence can help enterprises to create marketing campaigns that resonate with their target audience [5].

2.4.2 Service

Artificial intelligence enhances data collection and analysis capabilities, obtains demand preferences, feedback, and other data from intelligent clients or user interfaces, and improves the service-oriented level of the manufacturing industry [6]. Through the above means, enterprises can personalize customer service through emotional robots, which not only improves efficiency, but also makes customers feel more experienced. Emotional robots can not only provide a full range of services for customers 24 hours a day, but also store and analyze data during the conversation to expand the database [7, 8].

3. The impact of artificial intelligence on manufacturing

3.1. Economic

3.1.1 Benefit

Manufacturing enterprises can use robotics to enable production and operation, reduce the use of basic labor, manage the supply chain in a more planned way, and greatly reduce the overall production and development of the enterprise's operating costs [9].

From the perspective of supply chain, artificial intelligence automation and digitization of blockchain can allow enterprises to more effectively manage the supply chain, reduce product trend prediction, warehouse management and cargo transportation time and expenses, improve efficiency and reduce production costs of enterprises.

From the perspective of product development, the existence of artificial intelligence makes personalized customization cheaper, because on the basis of the designer's given, it only needs to make small changes according to the customer's personalized requirements, which greatly reduces the cost. With the help of artificial intelligence, companies can design more personalized and innovative products. The higher the innovation and technological content of a product or service, the

lower its imitability and fungibility, which is conducive to enhancing the bargaining power of an enterprise in the supply chain market and ensuring its earnings [9].

From the perspective of marketing and customer service, AI has changed traditional digital marketing methods, making them more personalized, efficient, and user-centric, attracting more potential users. For example, Ad targeting is made more effective by AI's ability to analyze user data to pinpoint the most receptive audience segments for particular ads, optimize ad placements, and even conduct A/B testing of various ad elements [10]. This makes marketing more personalized, can more accurately push to customers, and reduces the cost of marketing for enterprises. At the same time, the generation of digital service platform has enhanced user experience and satisfaction, but also improved brand loyalty, customer retention rate, etc., and increased enterprise revenue.

3.1.2 Shortcoming

The more complete the model that artificial intelligence relies on, the more complex its required parameters and network structure, so the requirements for hardware facilities will be higher. China does not have this kind of equipment today and has to import it from abroad. The large number of information needs and equipment as well as talent needs make the start-up capital of artificial intelligence technology in the manufacturing industry very high, and only large enterprises can afford it. This will result in large enterprises with cheaper prices, more efficient production speed, seize a larger market share. And some small and medium-sized enterprises because of insufficient funds, insufficient technology, cannot compete with it, and gradually withdraw from the market. This will gradually create an oligopoly or even a monopoly of large enterprises [11]. These small and medium-sized enterprises are very important to the economic development of the country. They can not only create more jobs, but also promote market economy reforms.

3.2. Industrial upgrading and transformation

Integrating artificial intelligence into the manufacturing industry, giving full play to the effect of digitalization and intelligence, using industrial big data and deep learning algorithms for independent optimization, improving the efficiency of the production process and the added value of the products produced, and greatly improving the advanced industrial structure of China's manufacturing industry [12]. This has transformed China's manufacturing industry from labor-intensive to capital-intensive manufacturing and technology-intensive. For example, CHAT GPT can play the role of decision-making brain in the manufacturing industry to a certain extent. By connecting with mechanical kinetic energy and traditional artificial intelligence, CHATGPT can analyze and process production data, combined with enterprise objectives and market demand information input by the management, supervise production quality data and make timely adjustments to the type and quantity of production. It can promote the manufacturing industry to enhance the degree of automation, improve production efficiency by relying on the solid industrial foundation of cities, and optimize and upgrade the production mode within China's manufacturing industry [12]. At the same time, the upgrading of industrial structure has an intermediary effect between artificial intelligence and the upgrading of employment structure in manufacturing industry. That is, artificial intelligence can promote the employment of high-skilled labor in the manufacturing industry through the upgrading of the industrial structure, inhibit the employment of low-skilled labor, and make the overall employment of the manufacturing industry show a trend of high-grade [4].

Service-oriented transformation provides more data support for manufacturing enterprises, allows artificial intelligence to further analyze and organize them, increases the usability and universality of artificial intelligence, helps enterprises optimize the production process, manage the supply chain, upgrade and develop new products, helps to conduct more accurate market analysis and customer service, and helps enterprises to carry out digital transformation. Entering the new digital age.

4. Challenge and response

4.1. Labor market crisis

Although artificial intelligence can promote the upgrading of the industrial structure of the manufacturing industry and its employment structure, accelerate production efficiency and quality, and create more high-skilled jobs, it has a great impact on the low-skilled labor market in the manufacturing industry (low-skilled labor refers to junior high school education and below). According to the substitution effect and creation effect of AI, the upgrading of the employment structure means that many low-skilled workers are replaced by cheaper and more efficient automated artificial intelligence. At the same time, the manufacturing industry needs to introduce more high-end talents and artificial intelligence like industrial robot to work together, give full play to the maximum value, and achieve high-quality development.

Most of the low-skilled labor force cannot meet the demand for high-tech talents in the manufacturing industry in the short term, and most of them turn to the service industry with relatively low educational requirements for re-employment [7]. In order to avoid a large number of frictional unemployment and structural unemployment in society, the government should adopt relatively mild measures to make the transition, such as issuing relevant fiscal policies for the temporarily unemployed to avoid excessive losses, helping unemployed people with job transfer training or effective skills upgrading training. Operators in the industry should continue to vigorously strengthen the service upgrading of the manufacturing industry, create more jobs for the service part, so that more low-skilled labor can provide one-to-one customized services for customers after training. At the same time, it is also necessary to plan the training of highly skilled labor, the policy to encourage highly educated technical talents, set up more majors on the development and application of artificial intelligence technology, and set up an effective recruitment platform for fresh graduates so that fresh graduates can smoothly enter the industry as soon as they graduate. To avoid the loss of human resources and inefficient allocation, the government should also require all units to carry out regular on-the-job training of labor resources in the industry to ensure the continuous update and integration of intelligence, automation, and manufacturing.

4.2. Security concerns

Another major challenge is finding the ideal balance between user privacy violation and customization [8]. The application of artificial intelligence in the manufacturing industry requires the use of a large amount of data and user information, so how to obtain and use this information in a correct and safe way has become a problem. With the popularization of information technology, more and more customers are also very sensitive to their own information security issues, so when using such information, we should pay special attention to the source of information and promote and display to customers with appropriate means.

5. Future predictions of artificial intelligence

Although the use of artificial intelligence in China's manufacturing industry has been relatively common, due to the lack of high-tech talents and its high initial investment, artificial intelligence technology has not been fully and well combined with China's traditional manufacturing industry and achieved rapid development. But it can be believed that artificial intelligence has great prospects and potential for development in future. As long as manufacturing enterprises continue to carry out digital transformation and actively explore more practical applications of artificial intelligence in the industry, with the more sophisticated technology and the emergence of more high-tech talents, artificial intelligence will lead the development of manufacturing industry and bring great contributions to the increase of the national economy.

6. Conclusion

This essay first emphasizes the current application of artificial intelligence in China's manufacturing enterprises. Its role in manufacturing processes, supply chain management, market analysis, product design and customer service is very powerful. Secondly, the essay analyzes the impact of the application of artificial intelligence in manufacturing industry on China's economy and manufacturing industry structure. In terms of economy, although artificial intelligence can improve production efficiency, reduce production costs, and create new business models, its high installation and application costs will allow large enterprises with capital to seize a larger market share, resulting in monopoly phenomenon and market imbalance. In addition, artificial intelligence has promoted the transformation and upgrading of the manufacturing industry in terms of production process, labor force structure, product optimization and services. Third, this paper states the potential challenges and solutions of the combination of artificial intelligence and manufacturing. In the labor market, the substitution effect of artificial intelligence will have a huge impact on the low-skilled labor market, allowing a large number of labors to flow into the service market. In terms of technology, the access and use of user information have made many customers question information security. This essay emphasizes the importance of government policy support, talent training, continuous digitization, intelligence and service development of enterprises, and proper application of acquired digital information by enterprises to solve the existing challenges in the development of China's manufacturing industry. As China positions itself as a leading AI innovation hub, the fusion of technology, policy, and human capital will be determinant in realizing the full potential of AI in manufacturing. The journey is fraught with complexities, but the potential rewards-a robust, innovative, and efficient manufacturing sector-are compelling incentives for embracing AI's transformative power.

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