# Status and Countermeasures in the Development of Intelligent Manufacturing Industry in China

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**Abstract:** With the progress of science and technology, the intelligent manufacturing industry has developed rapidly. Intelligent manufacturing industry is an important way for China's manufacturing industry to upgrade in the new era and seek sustainable opportunities for development. It is not only the requirement for improving the international competitiveness of China's manufacturing industry, but also the requirement of the trend of global intellectualization of production. This paper mainly analyzes the characteristics and development status of China's intelligent manufacturing industry, and puts forward effective countermeasures to promote the intelligent development of manufacturing industry and to cope with the current problems, in order to provide reference for China's economic development and social construction.

## 1. Introduction

Intelligent manufacturing includes intelligent manufacturing technology and intelligent manufacturing system. Intelligent manufacturing system can not only enrich knowledge base continuously in practice, but also have self-learning function, collect and understand environmental information and its own information, and conduct analysis, judgment and planning of its own behavior. Intelligent manufacturing is a human-machine integration intelligent system composed of intelligent machines and human experts. It can carry out intelligent activities in the manufacturing process, such as analysis, reasoning, judgment, conception and decision-making. By working together with intelligent machines, to expand, extend and partially replace the mental work of human experts in the manufacturing process [1]. It updates the concept of manufacturing automation and extends it to be flexible, intelligent and highly integrated. The intelligent manufacturing industry refers to the manufacturing companies that use this to produce.

The sino-us trade conflicts have intensified the country's thirst for original patents of knowledge and technology. It also shows that the country must rely on advanced technology to support its development. As the backbone of national construction and the main source of national economy, manufacturing industry is of great importance. With the slow progress of the traditional manufacturing production process, the increasing consumption of raw materials, the rising labor costs and the gradual saturation of the consumer market, the current stage has gradually developed to the bottleneck. The development of modern information technology has promoted the arrival of knowledge economy, and the progress of science and technology has promoted the progress of production technology and production mode by leaps and bounds [2]. Informatization promotes intellectualization, intellectualization promotes modernization, modernization promotes industrialization, and industrialization supports the development of the real economy. In recent years, there has been technological change in the field of traditional manufacturing, and the development model of manufacturing industry based on intelligence and information has gradually taken shape, indicating the development direction of the industry in the future. The innovative development of intelligent manufacturing industry is an effective means to improve China's industrial development level and international market competitiveness. We should learn more about the development status of intelligent manufacturing industry in China, and explore reasonable measures to improve the quality of development [3].

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## 2. Status

### 2.1. Late start, fast development

Since the country complied with the development of information and intelligence era and proposed the concepts and documents such as “Industry 4.0” and “Made in China 2025”, intelligent manufacturing has been put on the national economic development strategy level and become the main direction for the manufacturing industry to seek development breakthroughs. Compared to some other countries, China's intelligent manufacturing, has started a little late [4]. At present, it is still at the early stage of exploration, and still lags behind the industrialized and mechanized countries.

Although started late, but does not hinder the rapid development of China's intelligent manufacturing. From proposing the prototype of the idea, to following the standard construction, to creating suppliers and technology research and development to meet the needs of the industry. Overall, significant progress has been made. The guideline for the Construction of the National Intelligent Manufacturing Standard System, revised in 2018, has basically covered basic generic technical indicators and core technical standards. The basic general technology of intelligent manufacturing also depends on different industries and gradually forms a new production mode of intelligent manufacturing with the characteristics of various industries [5]. For example, in the aviation field, the network collaborative manufacturing mode is formed after the development of intelligent manufacturing. What’s more, in the fields of consumer goods such as textile, clothing, home furnishing and household appliances, mass customization mode led by market demand has emerged, which has enhanced the degree of connection between supply and demand. Also, in the field of wind power and construction machinery, intelligent remote follow-up operation and maintenance service mode appears with the help of intelligent manufacturing, which reduces the time and labor cost and speeds up the operation speed of the whole production chain.

### 2.2. Consciousness needs to be paid attention to

Although the concept of intelligent manufacturing has been widely spread with the network, television and other information communication channels, some enterprises still have a vague understanding of its specific connotation. To promote intelligent manufacturing, while clarifying its concept, we also need to be aware of its significance and benefits. Then it is to explore the development and upgrade path, to seek production change and market demand.

Among large manufacturing enterprises that focus on high and new technology, intelligent manufacturing is promoted more rapidly. In addition to its abundant capital and high r&d level of technical personnel, the most fundamental thing lies in the attention paid by enterprise leaders. At present, the enthusiasm of small and medium-sized enterprises to research and seek intelligent manufacturing production mode has not been fully aroused. Its subjective initiative to explore the efficient development of intelligent manufacturing has not been fully developed. There are differences between different companies.

### 2.3. Weak supporting supply capacity

Intelligent manufacturing supply capacity required for general embodied in core key technology and equipment supply ability, technical support and operational needs of industry software supply capacity, Internet information exchange and share of information network support ability, the perfect degree of the standard support intelligent manufacturing development, research and development and technical personnel of intellectual support conditions and so on.

At present, the development of intelligent manufacturing industry has entered a virtuous track, but it still cannot meet the development needs of intelligent manufacturing and the development of the industry. The essence of intelligent manufacturing is a new type of production mode. Its healthy and stable development must be supported by independent innovation ability. The shortage of independent innovation consciousness and independent research and development ability limits the supply of intelligent manufacturing. Moreover, the production capacity of the equipment is stronger than the design capacity, which will lead to the excessive dependence of core technology on

external supply and the loss of the dominant power and discourse power in a certain field. Although China's intelligent manufacturing industry has made some progress in recent years, the lack of innovation mode and lack of independent research and development ability make it difficult for related enterprises to reach the peak of technology application in the industry, and the innovation ability is lower than the average level of the industry, which affects the intelligent development of the manufacturing industry.

## 3. Countermeasures

### 3.1. Improving industry standards

Combined with the characteristics of the industry, repeated practice is also needed to improve the industry standard. To build a multi-dimensional system based on multi-dimensional analysis is the call of the era. Intelligentization has become an inevitable worldwide development trend of the manufacturing industry in the near future. Artificial intelligence, intelligent logistics, big data cloud computing and other fields will make outstanding contributions to the development of the economy and society. In order to ensure the healthy and orderly development of the industry, relevant departments should strengthen supervision and management, and commit themselves to establishing unified standards for the industry, so as to promote the standardization and organization of the development of intelligent manufacturing industry, and better serve the social development and economic construction. The establishment of unified industry standards, in line with the internal requirements of the development of China's intelligent manufacturing industry can help improve the efficiency of producing. In recent years, China's manufacturing industry has made remarkable achievements in the development of artificial intelligence, unmanned driving, CNC machine tools and related areas of rapid development. In order to promote the orderly development of the industry, the development of industry standards should be actively promoted.

The national should strengthen the top-level design and development planning of artificial intelligence, vigorously promote the construction and promotion of the “Internet + Industry” model, and provide favorable technical conditions for the development of intelligent manufacturing industry. In the early stage of industry development, strict access and management standards should be established to promote the standardized development of manufacturing industry. In addition, relevant departments should actively promote the openness of ideas, system innovation and organizational leadership of intelligent manufacturing industry, so as to ensure the steady development of intelligent manufacturing industry with unified industrial management standards and legal norms.

### 3.2. Strengthening independent innovation capability

Independent innovation is the driving force and source for the development of intelligent manufacturing industry. Taking intelligent metallurgy manufacturing industry for example, compared with the advanced technology of foreign enterprises, domestic related large metallurgical equipment manufacturers of the independent innovation ability is insufficient, in blast furnaces, open hearth furnace and continuous casting equipment production and manufacture of main components on the failed to realize intelligent information detection and fault diagnosis. Even though some enterprises have completed the introduction of advanced production systems, some of the equipment is in the off-line operation state, with certain safety risks. The lack of independence in the application of relevant systems, equipment and the ability of innovation and research also affects the overall development level of the intelligent manufacturing industry, which can reduce the speed of development and raise the cost of buying or learning.

Independent innovation is the core support to the development of intelligent manufacturing. Intelligent manufacturing development needs education resource as well as social capital to support. In the development of intelligent equipment and software system, the core technology and the introduction of professionals are needed to participate in, and as well as the view of the present status of the development of intelligent manufacturing in China. Because of a shortage of

production with good cooperation in the field, the development of intelligent manufacturing enterprises is facing the technical bottleneck and talent shortage problem, which has been reducing the skills into the rate of productivity. To give full play to the innovation ability of colleges and universities, mobilize the innovation resources of enterprises, and promote the development of intelligent manufacturing, strong independent innovation ability is also conducive to the improvement of supporting services and industrial development of intelligent manufacturing.

The key to measure the development of intelligent manufacturing industry lies in the application of original and breakthrough technologies. Therefore, intelligent manufacturing industry should strengthen independent research and development, cultivate highly sophisticated talents, constantly strengthen the attention to new technologies and new theories, and promote the improvement of independent innovation ability. In practical work, relevant departments of the intelligent manufacturing industry should actively promote cross-field and interdisciplinary cooperation among high-end technical talents, strengthen the exchange and sharing of advanced production technology and manufacturing experience, and promote the improvement of the overall R&D capacity of the industry. The competition of intelligent manufacturing industry comes down to technology and talents. In order to promote the sustainable development of the industry, it is necessary to increase the investment in high-end talent training and advanced technology application, continuously strengthen the independent research and development ability of enterprises, and make them gain advantages in the future of the development of manufacturing industry.

Intelligent manufacturing industry is the product of highly developed information technology. At present, with the development of science and technology, wise manufacturing has been transferred to intelligent manufacturing. Therefore, decision-making should be strengthened in the application of independent research and innovation ability, and the application and development of advanced technology should be strengthened. Recently, some Chinese enterprises or companies benefit from the development of intelligent manufacturing industry, and their production efficiency has been significantly improved, such as artificial intelligence machine manufacturing, data information machine tool processing and so on. With the rapid development of science and technology, the research and development and application of technology should also have the characteristics of the Times. Staff in related fields should take the current situation of enterprise development and the future development trend of the industry into account, constantly strengthen their independent research and development ability and innovation ability, so as to consolidate their market competitive position.

### 3.3. Policy support

In practice, facing with the complicated market competition environment, the government can put forward to more tax subsidies to intelligent manufacturing companies and encourage social forces to participate in the capital investment in the intelligent manufacturing industry, so as to reasonably guide the intelligent and modernized upgrading and transformation of the manufacturing industry. In the development and practice of enterprises, the government can appropriately reduce the tax range of intelligent manufacturing, especially in the procurement of core technologies, such as industrial robot manufacturing, big data technology management, Internet of things construction, 3D printing technology and other fields. At the same time, doing a good job in the docking of intelligent technology, can reduce the enterprise's technology application cost.

In the field of personnel introduction and capital investment, the government should actively guide the establishment of a broad participation mechanism of social forces, so as to improve the resource allocation efficiency of enterprises related to intelligent manufacturing and guide enterprises to carry out intelligent upgrading of core technologies. In recent years, although China has made great progress in the development of information technology, there is still a gap between China and developed countries, especially in the field of the practical application of intelligent manufacturing and the system software development. Thus, the government should provide more support for the intelligent manufacturing industry and stimulate the innovation and development of

relevant enterprises.

### 3.4. Innovating the development mode of supporting services

The core part of the manufacturing industry is in the factory and workshop. In order to improve the development level of the intelligent manufacturing industry, the staff in related fields should take reasonable measures realizing the intelligent upgrade of workshop. The old equipment in the workshop should be replaced and upgraded in time, and the existing production mode should be improved and the production efficiency of the manufacturing industry should be promoted by using artificial intelligence and big data technology. In practice, relevant enterprises can achieve systematic management of workshop information. The technology of the Internet of things is used to enhance the interconnectivity between devices, such as the coordination and application of controllers, sensors and execution units, so as to improve the development level of intelligent manufacturing related service devices. Based on the application of artificial intelligence, the intelligent analysis of sensor information can be realized, which is also the core of the development of intelligent manufacturing industry. With the application of industrial Internet technology, the development and service mode of the manufacturing industry will usher in progress. The application of machine and manual coordination will significantly improve the production and processing efficiency of the manufacturing industry.

In addition to production services, the intelligent system and service equipment can promote the improvement of the operation service capability of the intelligent manufacturing industry, so as to improve the management level and operation efficiency of enterprises. The development and progress of smart power grid, smart logistics, intelligent CNC machine tools and other related supporting equipment will continue to promote the development of intelligent manufacturing industry. The application of work and service mode based on digital information can realize the high efficiency and intelligence of manufacturing production process, help enterprise managers to control the whole manufacturing and processing process, thus realize the reasonable scheduling and arrangement of relevant staff, and improve the service efficiency of intelligent manufacturing plant. For the intelligent manufacturing service industry in the mode of big data technology, relevant personnel can provide support and guarantee for the optimization and upgrading of products based on data analysis and screening technology. At present, the product manufacturing and upgrading of most enterprises rely on information data and customers' reasonable suggestions and feedbacks. Therefore, it is of great significance for the development and progress of the service mode of manufacturing industry to improve the information service mode and promote the information development of the industry.

## 4. Conclusion

The transformation of traditional manufacturing industry not only needs to face the situation that China's intelligent manufacturing is still in the initial stage of industry development, but also needs to understand the gap between China and developed countries with advanced manufacturing industry. There are many things we need to do, from the plan design to the specific implementation. To promote high-quality development of manufacturing industry with intelligent manufacturing industry, we need multi-party cooperation from the whole society, such as further improving the standard system, improving independent innovation ability, and promoting supporting development of auxiliary industries around intelligent manufacturing. Although the aspect that needs effort is more, but its root still lies in breaking thought shackle, seek innovation. The foundation of innovation remains talent, technology and capital. Managers need to recognize the importance of intelligent manufacturing, education need to provide sustained efforts to transfer intelligence, government need joint enterprise to develop standard system, and the policy support should be published to guide social capital tilt. In order to effectively improve the development level of the manufacturing industry and promote the progress and improvement of China's intelligent manufacturing related technologies, it is necessary to strengthen the independent research and development ability of enterprises and seek strategies and methods of innovative service

development mode.

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