

Analysis of the factors influencing the development from traditional manufacturing to intelligent manufacturing

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Abstract: With the rapid development of economy and technology, the traditional manufacturing model cannot balance the needs of industrial production and personalized products. Intelligent manufacturing will effectively solve the contradiction between large-scale industrial production and customized products. The transformation from traditional mass production manufacturers to personalized and customized products eliminates the inventory and sales links of finished products under the traditional commodity model. It meets the needs of downstream customers and determines the new business logic of upstream production and supply.

Smart manufacturing is not only the direction of global manufacturing, but also a strategic move for China to realize the deep integration of industrialization and information technology and build a strong manufacturing country. With the wide attention of the innovation of intelligent manufacturing, the developed countries and regions are actively deploying to accelerate the development from traditional manufacturing to intelligent manufacturing. In order to implement the strategy of manufacturing power in China, the State Council has issued a "Made in China 2025" to make smart manufacturing the main direction of the transformation and upgrading of China's manufacturing industry. The development from traditional manufacturing industry to intelligent manufacturing industry has become an important strategic task for building a manufacturing power. The development from traditional manufacturing industry to intelligent manufacturing industry has the characteristics of information perception, optimal decision-making, executive control and so on. It requires multi-party cooperation and is influenced by various factors. It is of great significance for China to implement the braking force strategy and improve the intelligent development level of traditional manufacturing industry by determining the main influencing factors for the development of traditional manufacturing industry to intelligent manufacturing industry, clarifying the development level of traditional manufacturing industry, and clarifying its influence degree and action path. Different factors from traditional manufacturing to intelligent manufacturing.

1. Overview

1.1. Intelligent manufacturing

Intelligent manufacturing based on digital information driving force, consisting of intelligent

system, intelligent machine and mutual cooperation, and can automatically complete the whole process of manufacturing tasks according to production needs. It has real-time independent analysis, judgment and contingency capabilities. It can adapt to changing production requirements and implement new manufacturing models through flexible production. The basis of intelligent manufacturing is information, including orders, raw materials, processes, processing details, quality control standards, packaging storage, logistics and other data covering all manufacturing processes. The digital production information connects the intelligent system, the intelligent equipment, the manpower and the material product together, and becomes a common language among various elements in the production process. Information and instructions can be exchanged, thus effectively and cooperatively completing product manufacturing. Data information is the core driving force of intelligent manufacturing, with an intelligent system at its core. In Smart manufacturing, smart system ACTS as the "brain" and smart mechanical device ACTS as the "hand", "Eye" and "ear". Therefore, the intelligent system is the source and core of the "intelligence" of the production line. The intelligent system has an independent overall, intelligent logic capability to command, adjust and coordinate the whole production process, and forms default logic post-processing instruction efficiency through rigorous, accurate and large number of work instructions. It is reasonable and intelligent equipment can be automatically produced and manufactured. It can be changed according to the real-time demand sequence independently and distinguish production tasks.

1.2. Traditional manufacturing

Detailed cost management mainly refers to strengthening the application of advanced scientific cost management methods, rational use and allocation of enterprise resources, and keeping production costs under control Win More economic benefits for manufacturing enterprises. Compared with the traditional cost management mode, the cost refinement is relatively comprehensive, which needs all the personnel of the enterprise to participate actively, implement the "people-oriented" thought, and promote the smooth operation of the enterprise.

2. The problems of manufacturing industry in our country on the road of intelligent manufacturing

2.1. Informatization on the basis of backward management

Informatization is the only way and important foundation of digital transformation. Information construction is the first step of intelligent manufacturing. If an enterprise has a vision for smart manufacturing, is able to manage information at the core, and has some infrastructure for future communications and system integration, then the enterprise is in the state of planned information construction. Operation digitization includes product development digitization, production management digitization, operation management digitization, supply chain management digitization and after-sales service digitization. If the enterprise can not meet any of these five digital parts, please do not try to engage in information. Each link or module that is digitized causes an interruption in the information-building process. Therefore, enterprises must accurately assess their own information base in order to avoid over-ambitious in the beginning of information construction.

2.2. Intelligentize on the basis of the absence of a digital network

When purchasing automated production lines and equipment, many manufacturing enterprises do not have open data interfaces and many automated equipment can not automatically collect data

during the production process to achieve human-computer connectivity. In addition, some enterprises have only automation equipment, and lack of corresponding software information system connected with it, so the production workshop is still a black box. Product quality issues and production processes can not be tracked due to non-transparent data. Intelligent manufacturing requires highly integrated smart devices, information systems, sensors, automatic control and other fields, which is very difficult. Many enterprises do not have a unified plan for these areas, and lack top-level design, resulting in a large number of data island.

3. The development process from traditional manufacturing to intelligent manufacturing.

In the manufacturing process, product and manufacturing system constitute the main component of traditional manufacturing, and is also the main component of intelligent manufacturing. At the same time, manufacturing systems and products correspond to the system level and life cycle dimension in the guidelines of the Ministry of Industry and Information technology for the construction of the national intelligent manufacturing standard system. Therefore, this paper analyzes the development process from traditional manufacturing to intelligent manufacturing from two dimensions of manufacturing system level and product life cycle, as shown in figure 1.

3.1. System-level development process.

System-level development is a manufacturing process or organization that uses advanced intelligent manufacturing technology to make some or all systems realize intelligent production. According to different intelligentization and maturity, the system level can be divided into equipment layer, control layer, workshop layer, enterprise layer and alliance layer. (1) Device layer. In the development of manufacturing system, the intelligent breakthrough of equipment was first realized and the intelligent equipment was formed through the key technology innovation and the research and development of the core parts of manufacturing equipment. The intelligent equipment includes the basic structure unit with the function of analysis, perception and decision and the software system of the embedded equipment, which can realize the relatively complete intelligent manufacturing activity. (2) The control layer. The control layer is closely related to the equipment layer, which refers to the application of a large number of intelligent equipment and intelligent components in the automated production line to form an intelligent production line. Intelligent production line according to the needs of different types of products to achieve intelligent flexible production; (3) Shop floor. Based on the intelligent equipment and the intelligent production line, various intelligent equipment and the intelligent production line are established to realize the interconnection between the intelligent equipment and the production line in the workshop. And an intelligent workshop standard is formed through the unified environment of hardware and software facility interfaces. Intelligent workshop includes hardware and software infrastructure and intelligent control system; (4) Enterprise Layer. On the basis of intelligent workshops, a physical factory is constructed by improving the infrastructure needed for intelligent manufacturing. The data of each workshop is integrated and cooperated through a unified enterprise digital platform, and a virtual factory based on data and capable of in-depth interaction with the entity factory. Using advanced technologies such as big data analysis and cloud computing to build an intelligent factory. including decision-making and management systems four parts. (5) Synergy layer. On the basis of the intelligent factory, depending on the Internet of things and Internet service platform, different types of intelligent enterprises can share their resources through cross-industry and cross-region cooperation to achieve cross-industry, cross-regional intelligent services, production and R & D.

3.2. The life cycle development process

The product life cycle includes the stages of design, production, management and service. (1) Design phase. Intelligent design refers to the concurrent and collaborative design of products in virtual environment based on the traditional design, using the design system with simulation technology and supported by database and Internet. At the same time, the function, structure and performance of the product are simulated in order to optimize the product design. (2) Production phase. Intelligent production refers to the combination of new information technologies such as big data, cloud computing and Internet of things with traditional technologies based on information machinery, knowledge and skills to realize the integration of systems and equipment to become a mutual response and cooperation information physical system to achieve resource conservation, improve efficiency of personalized production; (3) Management phase. On the basis of interconnection, software management systems such as product data management and supply chain management will realize interconnection. And multi-enterprise cooperative manufacturing in industrial chain will help to reduce logistics and manufacturing costs and improve management efficiency. (4) Service phase. Intelligent Service is based on the new generation of information technology to achieve agile and remote services.

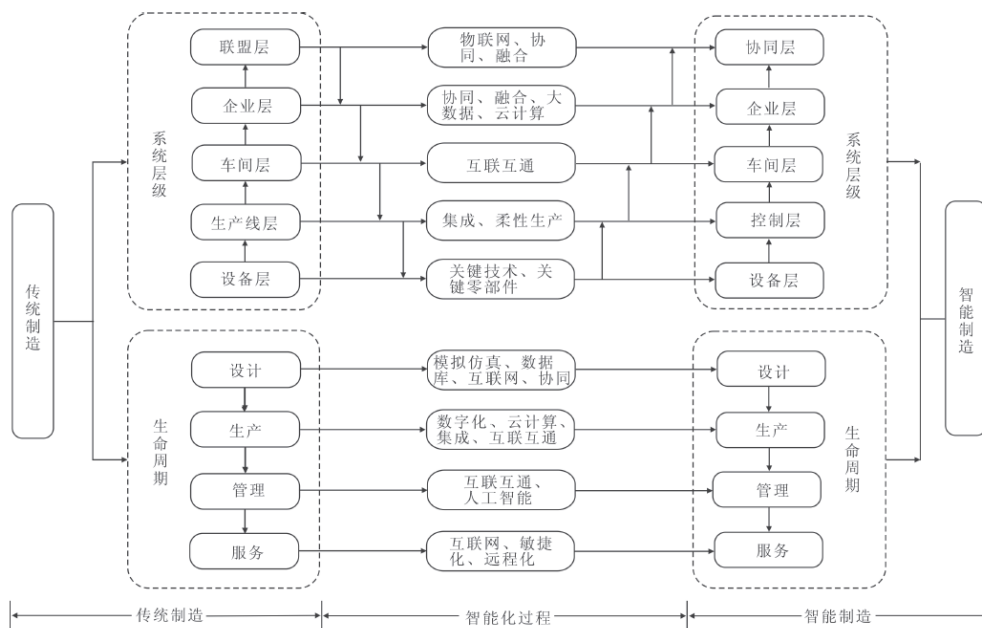


图1 传统制造向智能制造发展过程

4. Policy Recommendations

Based on the above theoretical analysis and practical verification, combined with China's actual situation, the following aspects can be considered to improve China's intelligent manufacturing capacity. (1) Focus on technological innovation. Improving the R & D capability of enterprises is the focus of the development from traditional manufacturing to intelligent manufacturing. Aiming at the various links of traditional manufacturing design and production, we should focus on the development of key common technologies such as new sensing technology, advanced control and optimization technology to realize the original innovation in the core areas, and establish and improve the innovation system of intelligent manufacturing technology. We will support cooperation between scientific research institutions and universities, focus on research and breakthroughs in key generic technologies that affect the development of manufacturing, and

gradually narrow the gap with countries and regions with high levels of technological innovation, such as Europe and the United States. (2) Strengthen policy guidance. Through policy guidance, Chinese enterprises are encouraged to develop intelligentized and gradually carry out the transformation and upgrade from traditional manufacturing to intelligent manufacturing. China should study and formulate corresponding policies and measures, encourage governments at all levels to set up open and low-cost, resource-sharing, on-line and off-line co-creation space, and unleash the innovative potential of China's manufacturing industry from design to production and management. In order to give full play to the role of fiscal and tax policies in the development of intelligent manufacturing enterprises, fiscal and tax policies are formulated.(3) Develop a new generation of information technology. The rapid development of information technologies such as cloud computing, the Internet, the Internet of Things and big data is the power engine to realize intelligent manufacturing. With the support of the new generation of information technology, traditional manufacturing enterprises will be encouraged to break the traditional mode of production management and integrate cloud computing, Internet of things and big data into the traditional mode of production management Traditional manufacturing enterprises in the design, production, management and service life cycle to enhance the level of intelligence, and accelerate the transformation and upgrading of manufacturing enterprises. (4) Strengthen the building of a contingent of talents. The key to the development from traditional manufacturing to intelligent manufacturing in China is still the construction of talent team. High-tech and R & D talents are the main force to realize the transformation and upgrading of the manufacturing industry. We should formulate the relevant incentive mechanism, talent training system and talent introduction program to encourage, cultivate and introduce all kinds of high-quality, high-tech R & D Talents. Encourage high-tech enterprises and social capital to jointly set up professional training bases, cultivate and bring up a number of key talents who can undertake research and development of key technologies for intelligent manufacturing, and bring in outstanding professionals from home and abroad to join intelligent manufacturing enterprises to provide "source of living water." for our traditional manufacturing to intelligent manufacturing upgrade.

5. Conclusion

The business model of smart manufacturing is that the customer puts a personalized order to the enterprise according to their needs, and pays the full payment or deposits. Industrial Machines and equipment are manufactured in smart factories according to customer orders and are delivered to customers through logistics and sales. Therefore, the business model of smart manufacturing is customer-centric, demand-centric, consumer-driven, producer-driven, and demand-oriented. With this kind of Chinese manufacturing enterprise, China, with its manufacturing strength and comprehensive national power, can realize the great transformation from big to strong, and can stand in the ranks of the world's manufacturing powers.

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