The Opportunities and Challenges of "Made in China" under the New Model of Intelligent Manufacturing

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Abstract. This paper analyzes the opportunities and challenges faced by China's manufacturing industry under the situation of intelligent manufacturing mode, and puts forward two routes which should be taken in the development of intelligent manufacturing in our country, and take the new round of global technological revolution and industrial revolution as the background and combine the development of our country's manufacturing industry. Emphasizing to step-by-step, step by step to promote the construction of intelligent factories, in the process to focus on product innovation and enhance the reliability of product quality, to develop intelligent manufacturing and intelligent manufacturing services for China's intelligent manufacturing In the industry to promote the application.

1. Introduction

At present, the new round of technological revolution and industrial revolution led by information technology is deeply affecting the human production and way of life. The deep integration of informatization and industrialization has led to the development of traditional manufacturing industry in the direction of digitalization, networking, intelligence and service. The new industrial revolution marked by intelligent manufacturing has brought the world manufacturing industry into a new stage of development.

Manufacturing industry is an important pillar of China's national economy, China's manufacturing industry since 2009 go beyond the United States, becomes the world's largest manufacturing industry, but there is still a big gap between the world's power from, how to improve the level of manufacturing development is currently a strategic task[1]. After the 2008 world financial crisis, the world's manufacturing industry developed countries have developed national strategy, focusing on the development of their own manufacturing industry, to seize the future development of the world manufacturing industry, the high point of compression of China's traditional manufacturing industry has the size, cost and other advantages, China's manufacturing industry is facing the international demand shrinking, the rapid rise in costs, developed and developing countries, "before and after the attack" and many other challenges. In the global manufacturing network, intelligent, service development trend, how to clearly analyze the new situation under the opportunities and adjustments in China's manufacturing industry, China's manufacturing industry has an important reference significance for long-term development.

2. Overview of intelligent manufacturing development
2.1. Intelligent manufacturing definition and characteristics

Intelligent manufacturing (IM) has no internationally accepted definition[2]. Intelligent manufacturing as a production mode is the general term of intelligent manufacturing technology and intelligent manufacturing system. The carrier of intelligent manufacturing is intelligent manufacturing system or intelligent factory, which relies on artificial intelligence technology to realize the intellectualization of production activities. As a unique production mode, intelligent manufacturing has its unique characteristics compared with the traditional production mode and the current advanced production mode.

1) Intelligent manufacturing is a complicated system engineering on the time dimension, intelligent manufacturing activities throughout the product design, manufacture, use, maintenance, scrap the whole life cycle, the purpose is to make the product whole life cycle of the lowest cost of production, the value of the minimum resource consumption, the product itself to achieve the highest; On the spatial dimension, intelligent manufacturing activities involving enterprise internal departments to work together on one hand, on the other hand, involves the related to enterprise synergy between upstream and downstream enterprises and related industries, makes the production activities are no longer isolated, closed, make the product between related industries and enterprises to form a stereo system.

2) Intelligent manufacturing brings disruptive change to traditional production activities and makes industrial production process more flexible and stable than traditional production mode. Traditional process to manufacture the product as the core, rely on enterprise workers, engineers and managers work together, in a relatively closed the factory produce the required final product, in this process, people, machine, material, method, ring and other elements determine the properties and quality of products. Because the traditional discrete production process each link, each link between information cannot transmit, efficient and fast system once appear abnormal, if not found in time, will bring great loss, and a system exception if there is no technical personnel after adjust, repair, system can not run normally. In intelligent manufacturing mode, however, due to the artificial intelligence technology, network technology, a new generation of information technology such as technology advances, the whole production process of each link together through the network, a different link information can realize high speed circulation through the network, make the production process has the adaptive, since the decision, self diagnosis and self repair ability, reduce the influence of uncertain factors, the stability of the production process is higher.

3) Intelligent manufacturing is the inevitable trend of manufacturing development in recent years, the information technology to lead the world a new round of technological revolution and industrial revolution is sweeping the globe, the depth of the integration of informatization and industrialization, prompting manufacturing industry to develop in the direction of digitization, network, intelligence and service, the representative is Germany put forward the strategy of "industrial 4.0", "advanced manufacturing country strategic plan" in the United States, is known as a smart manufacturing leading a new round of industrial revolution.

2.2. Technological development status

The development of manufacturing industry has experienced the stage of manual production, assembly line manufacturing, automatic manufacturing of flexible automation and integrated manufacturing, parallel planning design and agile manufacturing. Since the 1980 s, the advanced manufacturing technology and computer technology is widely used in modern manufacturing industry, the traditional design methods and management methods cannot effectively and quickly solve the new problem in the modern manufacturing system. As a result, people started using modern tools and methods, using the latest research results, through the traditional Manufacturing Technology, artificial intelligence science, computer Technology and science, and other organic integration, the development of a new type of Manufacturing Technology and System, which is Intelligent Manufacturing Technology (IMT) and Intelligent Manufacturing System (IMS), they make general Intelligent Manufacturing (IM), intelligent manufacturing system (IMS) has been focused by many countries.
In China in the late 1980s also take "artificial intelligence" into the main topics of the national science and technology development planning, has in the expert system, pattern recognition, robotics, machine understanding of Chinese has made a number of results. Since 1993, the national natural science foundation (NSF) has been supporting research projects on intelligent manufacturing in a modest amount each year; The country's "nine-five" plan also places advanced manufacturing technologies (including IMT and IMS) as one of the key areas of development. In the strategy of rejuvenating emphasizes the advanced manufacturing today, our country attaches great importance to the development of intelligent manufacturing, especially since May 2009, the equipment manufacturing industry adjustment and revitalization of planning " , the national policy support will be increasing. On March 27, 2012, China's ministry of science and technology organized the "special plan for the development of intelligent manufacturing technology". Since the financial crisis, governments of the United States, Germany, Japan and other countries have proposed to revitalize manufacturing by developing intelligent manufacturing. Launched in June 2011 by the United States, including industrial robots, "advanced manufacturing partnership", introduced in February 2012 and "advanced manufacturing national strategic plan", in 2012 set up the network for manufacturing innovation, and has set up a material manufacturing innovation research and institute of digital manufacture and design innovation. Germany, through the government, the Fraunhofer institute and state governments, has invested in manufacturing research in the automation of numerical control machine tools, manufacturing and engineering automation. Japan has offered to boost the international competitiveness of its manufacturing industry by speeding up the development of collaborative robots and unmanned chemical plants. In 2013, Germany formally implemented the "industrial 4.0" strategy of intelligent manufacturing as the main body, consolidating its manufacturing years, the growth momentum of China's intelligent manufacturing and equipment industry has been growing rapidly, which has initially formed certain rules. This section must be in one column.

3. Challenges and Opportunities Faced Under China's Manufacturing Industry

3.1. The challenge

(1) International division of labor for the intense after the financial crisis, the manufacturing industry presents the developed countries and developing countries to step in for the situation of a new round of international division of labor and global manufacturing division map may therefore refactoring, attack before and after the manufacturing industry in China is facing a situation. On the one hand, the financial crisis is the United States, the European Union and other developed countries and regions to attaches great importance to the development of the real economy, put forward development strategy of industrialization, again stressed that make full use of information technology to enhance the level of manufacturing, development of emerging industries, to consolidate manufacturing in the developed countries in technology, industry leading advantage, further widened and the gap of our country. On the other hand, the export price of low value-added products in China is weakened by the appreciation of labor costs and RMB exchange rate. In addition, India, Vietnam, Indonesia and other developing countries with lower labor costs to undertake the transfer of labor-intensive industries, China's manufacturing industry in some labor-intensive industry with developing countries battle has begun.

(2) China's manufacturing industry is still large and weak. Manufacturing is the main body of the national economy. The strength of manufacturing determines the international status of a country. After decades of rapid development, China has become a real manufacturing power, yet it is still not a manufacturing power. Although the "made in China" brand has been known all over the world, but our country manufacturing industry as a whole big but not strong, independent innovation ability, product quality, resource utilization, industrial structure, informatization level and industrial powers in the world, there is still a large gap in the core technology, additional value, product quality, production efficiency, energy resource utilization and environmental protection problems, sharp contradictions.

(3) Manufacturing traditional advantage gradually lost after the financial crisis in 2008, the world's developed countries and developing countries to step in a new round of international division of labor, the global manufacturing division of labor is thus refactoring, makes our country manufacturing industry on the one hand, by the advanced industrial countries in the world of the extrusion of
“industrialization” development strategy, the other party facing India, Vietnam, Indonesia and other countries of low labor costs on the strong competition of manufacturing industry in our country, to our country formed "attack" before and after the serious situation of [3]. Along with the rising cost of human resources, environment and other aspects of the increasingly prominent, the traditional dimensions, resource consumption mode of production has come to an end, manufacturing advantages gradually lost.

(4) Technology innovation ability is insufficient for over 30 years of reform and opening-up, through the introduction of foreign advanced technology, digestion and absorption, the overall level of manufacturing industry in our country has greatly promoted, formed a relatively complete industrial system. However, in the process of rapid development of manufacturing industry, there are still outstanding problems.[4] which are embodied in the following aspects: first, the overall manufacturing industry is large and not strong. Although our country has been truly manufacturing power, but is still not a manufacturing powerhouse, manufacturing power depends on the element, and the manufacturing powerhouse rely on innovation, knowledge, and our country manufacturing industry in the international industrial division of labor in the chain, at the stage of low technology content and added value of "processing, assembly" link, in the high value of research and development, design, engineering contracting, marketing and after-sales service, lack of competitiveness; Second, core technologies are still under control. It is shown that the core technology of basic manufacturing equipment is dependent on people, core equipment and parts, key raw materials and devices. Third, the basic research and development investment that supports the product core technology is insufficient, the product core competence lacks. Compared with developed countries in foreign countries, China still has a significant gap in investment in basic technology research and development. It also leads directly to the gap between the core technology and developed countries in the world.

(5) Product quality reliability issues highlighted by the thought of extensive economic growth, the speed of product quality reliability level for a long time lag behind the growth of economy of scale, product quality and relevant technical standards of the overall level is not high reliability. In numerical control machine tool, for example, although China's machine tool use and manufacturing power, but in our country, more than 50% of the use of CNC machine is imported machine tools, among them, automotive, electronics, aerospace and other fields used by the machine almost dependent on imports, the main or even the only reason of this situation is the quality of the machine tool reliability problems. Although the product can be close to or even reach the international advanced level in the function of precision index, this function can't be maintained effectively. Compared with foreign products, the reliability difference is obvious. In the use of domestic machine tools, the fault frequency is frequent, which brings high maintenance cost and huge downtime loss to the user enterprises. Meanwhile, it also has a great impact on the reputation of machine tool manufacturers. At the same time, in the related technical standard field, our country is almost empty, compared with the developed countries, the gap is obvious.

(6) the development of resource utilization is low in the previous process, make the enterprise rely on large-scale inputs to obtain the economic efficiency and growth rate, however, low utilization rate of resources and environment pollution caused by serious [5]. Take the 2013 statistics as an example. In 2013, China's GDP accounted for 12.1 percent of the world's gross domestic product, while China's energy consumption accounted for 22 percent of global energy consumption in the same year. It can be seen that China's energy resources utilization efficiency is still low, contradiction is very prominent.

3.2. Development Opportunities
After more than 30 years of development, our economy has become a huge economic giant, and the capacity of resources and ecological environment has been saturated. Already say goodbye to the era of rapid development, economic development in our country into a new orbit, towards more advanced form, the stage of evolution of division of labor is more complex, the structure more reasonable, the manufacturing industry development mode in addition to the urgent demand, manufacturing shift from elements drive toward innovation is needed. However, a new round of scientific and technological revolution led to the development of new manufacturing models in the development of smart manufacturing provides a rare opportunity for China's manufacturing industry.
Manufacturing technology and information fusion technology brings the new industrial revolution in recent years, by leading the global information technology a new round of technological revolution and industrial revolution is sweeping the globe, the depth of the integration of informatization and industrialization, prompting manufacturing industry to develop in the direction of digitization, network, intelligence and service, is a representative put forward by the German "industrial 4. 0" strategy, is known as intelligent manufacturing as the leading factor, the fourth industrial revolution for the transformation and upgrading of China's manufacturing industry, and promote the depth of the fusion of industrialization and information, provide a new direction. A new round of technological revolution and industrial revolution, will bring the world within the scope of the manufacturing of disruptive change, main performance for the fusion of the digital technology and artificial intelligence technology to the product, apply digital technology and artificial intelligence technology and product design, manufacturing, production process, and based on the digital technology, the Internet, the Internet of things, cloud computing, big data, under the support of emerging technologies such as manufacturing from tradition to open, the service way transformation.

Four modernizations synchronous development huge space in accordance with the "industrialization, informatization, urbanization and agricultural modernization" synchronous development, urbanization and agricultural modernization provides demand for manufacturing industry. Urbanization will drive a large number of rural people into towns and cities, bringing huge demand for consumption, thus driving the growth of domestic demand. The agricultural modernization demand will drive rural infrastructure construction, agricultural equipment and other market demand; The integration of informatization and industrialization, in line with the current trend of manufacturing industry in the world, is in line with the actual demand of China's manufacturing industry, which will effectively promote the manufacturing industry in China. At the same time, the expansion of demand and the rapid growth of the consumption level brought by the development of China's "four modernizations" also provide a rare opportunity for the development of China's manufacturing industry.

High-end manufacturing equipment in our country go abroad in the golden age for a long time, our country high-end manufacturing equipment an awkward situation, on the one hand, domestic manufacturing of high-end manufacturing equipment are almost used by foreign monopoly, users would rather spend high price to buy imported brands choose domestic brands, domestic high-end manufacturing equipment in the domestic market in a dilemma; On the other hand, due to the impact of the global financial crisis, demand in emerging developed countries has shrunk, and the foreign market of high-end manufacturing equipment in China has been squeezed. Under the impetus of the intelligent manufacturing model, the global manufacturing industry will be more open, will form a highly organic network connectivity, it will be for our country, including high-end manufacturing equipment, products to the international market provides an excellent opportunity.

4. The development of intelligent manufacturing recommendations
Intelligent manufacturing is the deep integration of artificial intelligence technology and manufacturing technology, and the development of artificial intelligence leads to the emergence of intelligent manufacturing. As a production mode, intelligent manufacturing has its unique presentation carrier, and the carrier of intelligent manufacturing performance is intelligent factory and intelligent production. Therefore, the goal of developing intelligent manufacturing in our country is to cultivate and build intelligent factories in different industries in manufacturing, and gradually realize intelligent production.

Clear main line combined with current situation of the development of manufacturing industry in our country, the development of intelligent manufacturing can be around two main line, the first line, development of intelligent manufacturing can make industry, through the development of intelligent manufacturing promote the development and perfection of related enabling industry, such as industrial robots, high-end CNC machine tools, intelligent 3 d printing equipment, complete sets of equipment such as intelligent manufacturing equipment industry, and industrial control system, information security system represented by high-end industrial software industry, provide software and hardware foundation for the development of intelligent manufacturing. Second main line, to promote the
application of intelligent manufacturing mode in manufacturing, intelligent upgrade in the traditional manufacturing enterprise, the transformation as the breakthrough point, the construction of digital, intelligent and factory production lines, workshop, finally realizes the intelligent production.

(2) It is a long-term process to promote intelligent factory construction in a hierarchical and orderly manner, and should plan and step forward in an orderly way. First of all, should be developed intelligent manufacturing medium and long-term development planning, orderly advance in stages, step by step to choose the bibcock enterprise demonstration pilot, to point with surface, eventually to promote the all-round development of intelligent manufacturing and application; Secondly, in the early development of intelligent manufacturing should pay attention to the leading of the government policy, from the aspects of land, taxation, financial, personnel and so on enterprise support, and play their own intelligent upgrade internal demand, effectively promote the application of intelligent manufacturing model in enterprises; Third, Combine the actual situation of enterprises and promote intelligent manufacturing development in a hierarchical manner. It is a gradual process for the production of automatic production from industrial 1.0, industrial production and industrial production, and industrial 3.0 automation production to the current industrial 4.0. However, due to the development of China's manufacturing process of special process, the different levels of development of manufacturing enterprises in China, both in the industrial 1.0 of the era of enterprise; also has in the industry 3.0 and towards industrial 4.0 of enterprise, to combining the actual development level of different industry, different enterprise orderly, pay attention to the industrialization and intelligent.

(3) Pay attention to product manufacturing activities of technological innovation is the core of the product, the purpose of popularization and application of intelligent manufacturing is to improve the intelligent level of manufacturing activity, make intelligent, efficient, green manufacturing, personalization, as a service, the core is still around the product. Therefore, in order to promote the application of intelligent manufacturing, the government should pay more attention to the improvement of product innovation ability and enhance the added value of the product itself. Enterprises should pay attention to the establishment of independent innovation system, and change traditional passive innovation to active innovation. The government should play a positive role in guiding enterprises to enhance their independent innovation ability and cultivate the good atmosphere of independent innovation.

(4) The competition of product quality and reliability level is the primary way to win the domestic and foreign market. Enterprises shall establish perfect quality reliability work system, to carry out the system reliability design, test and verify the quality of the work, continuously enhance the level of components, parts, product quality reliability; The government should increase the investment in the development of the common basic technology of quality reliability, conquer the key technology of quality reliability, and provide support for the improvement of product quality and reliability. Pay attention to the quality reliability of intelligent equipment design, test, test, evaluation and analysis of the basic theory and application of intelligent equipment and process reliability of the whole machine, functional components, parts, quality consistency, such as technology research, enhance the level of high-end equipment machine reliability.

(5) Attaches great importance to the development of intelligent products and intelligent manufacturing services along with the advance of artificial intelligence technology, intelligent of the products is the development trend of the future, in advance of intelligent manufacturing activity at the same time, should pay attention to product intelligent level of ascension, make through intelligent manufacturing to produce a product with high intelligent level. At the same time, developing smart manufacturing services vigorously around the main line of "manufacturing services" and "service manufacturing" is necessary. First, to develop manufacturing services, both for producer and producer services, as well as for consumer and consumer processes. The former includes the product design and development of related services industry, transportation and logistics, financial services, information transmission and computer software, e-commerce and other services; The latter involves product recycling, disposal and remanufacturing services. Second, develop the manufacturing information services, such as the Internet industry, industry of big data, cloud computing and other new service forms, build innovation service system, improve the next generation Internet, a new generation of mobile communication, triple play, Internet of things, cloud computing and other emerging industries in the field of
independent innovation ability, strengthen the integration of information technology and manufacturing technology development. Third, the government to guide, the development of the third party inspection, certification, metrology, transformation of scientific and technological achievements, talents cultivation, the standard system revision related services, such as forms, which guarantees our province development of intelligent manufacturing.

Conclusions
As intelligent manufacturing as the core of a new round of technological revolution and industrial revolution of the world's arrival, our country manufacturing industry ushered in the unprecedented development opportunity, to develop intelligent manufacturing as the breakthrough point, to make our country by manufacturing power into a manufacturing powerhouse, is a strategic task facing us. However, there are still many challenges and difficulties to realize the change of manufacturing industry from large to strong won't happen overnight, the situation of development of China's manufacturing industry, hierarchical, popularization and application of intelligent production step, improve enterprise's capacity for independent innovation, the development of intelligent manufacturing can make industries, improve product quality reliability level and intelligent level, development intelligence services, eventually to promote intelligent manufacturing model is widely used in industry.

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