

Industry 4.0 and Supply Chain Management: The Future of Chinese Manufacturing

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Abstract—A new round of industrial revolution is about to come and the manufacturing will be completely changed. Today, China is already a big manufacturing country, but there is a big gap between industrial power. In the upcoming industry 4.0 time, the development of manufacturing industry is the development of supply chain. Therefore, in order to meet the needs of the development of the industry, China's manufacturing model must be innovative. This paper aims to review some of the literature on industrial 4.0 and supply chain management, and some suggestions are put forward on the research direction of Chinese manufacturing in the future.

Index Terms—Industry 4.0, intelligentize supply chain management

I. RESEARCH BACKGROUND AND SIGNIFICANCE

In 18th Century, the invention of the steam engine promoted the birth of the industry 1.0, and the manual workshop is gradually replaced by the machinery factory. In the early 20th Century, with the development of electric power technology, the power system has been greatly improved. The advent of the electrical age announced the advent of the industry 2.0. In 1970s, the use of computer application technology, people began to enter the information age, the industry 3.0 is coming. With the development of the Internet, the gradual integration of the physical world and the virtual network world is the trend of the future industrial development. In April, 2013, in the Hannover industrial exposition, the German academic and industrial circles put forward a new concept of industry 4.0.

The industry 4.0 concept contains the model transformation from centralized control to decentralized enhanced control, the goal is to establish a highly flexible and personalized product and digital production mode. In this mode, the traditional industry boundaries will disappear, and will produce a variety of new areas of activities and forms of cooperation, industrial chain division of labor will also be restructured. The framework can be summarized as industry 4.0 to build a system, namely information (Cyber Physical System, a physical system referred to as CPS); on the three major themes, namely "smart factory", "intelligent manufacturing", "intelligent logistics"; three integration, horizontal integration, vertical integration, end-to-end integration." Industry 4.0" is regarded as the Internet entered the important starting point of manufacturing system, its intelligent interconnection system, collection features, personalized demand data, and then use the intelligent manufacturing system produce personalized products.

Germany in the implementation of the "industry 4.0" strategic process, fully focus on the extension and integration of technical boundaries, and the integration of the supply chain, the implementation of the priority elements of the implementation of the three levels of synergy. Academia and industry generally believe that the industry 4.0 will be a bottom-up mode of production revolution, it can save production costs and time, the liberation of more labor, so that the robot to achieve intelligent production.

At the same time, the Chinese government put forward the concept of "two integration". "Industry 4.0" and "two integration" reference is different, but in the core connotation of consistency. China economy is at a critical transition period, China manufacturing industry 4.0 "for the vision of the transformation and upgrading, can learn from the experience of Germany, and vigorously promote the digital, networked, intelligent manufacturing, attaches great importance to the core technology innovation, market development, planning and implementation of the standards, supporting system of industrial transformation and upgrading of the role of coordination play; driving effect of large enterprises, through the cultivation of talents, resources, market liberalization and other industrial policy arrangements, to promote the transformation and upgrading of manufacturing industry. How will the future of Chinese manufacturing, the corresponding supply chain innovation? In view of these problems, this paper after reading a lot of literature at home and abroad were summarized, and put forward some own views and suggestions.

II. PROCEDURE FOR PAPER SUBMISSION

Under the vision of the industry 4.0, 3D printing, big data technology as the core of digital production, everyone has become a producer, the resulting distributed social production mode, completely subvert the traditional manufacturing mode. However, the distributed mode of production can also make large multinational enterprises through remote control, network economy and technology standardization and other means to strengthen the global economy industrial control and monopoly, many developing countries and their enterprises fully suppressed in the low value-added part of the global production value chain. This is a new challenge for developing countries, including China, but also hidden behind the crisis of the infinite innovation and development opportunities.

Supply chain integration concept was initially thought to be a set of front-end information flow and integrated management of back-end material flow and information flow, this management model closely the suppliers, manufacturers,

distributors, retailers and end-users are integrated, is the integration of different enterprises to increase the efficiency of the whole supply chain network, strengthen supply chain network node enterprise collaboration eventually form a community of interests. Johnson et al. think that the meaning of supply chain management is the integration of all enterprises in the supply chain, suppliers, customers, professional logistics providers to share the necessary information and plans to make the channel more efficient and competitive, and the relationship between the parties in the supply chain has become more closely. Fawcett and Magnan (2011) that the supply chain management is a kind of essence to meet the specific needs of the end customer as the goal of the cooperation, the cooperation process through the design, implementation and management of the product or service value, its success depends on the level of integration of resources and capital flow, logistics and information flow management. Zhao et al (2008) systematic definition of supply chain integration. Their definition is to emphasize the strategic cooperation, strategic cooperation is crucial in supply chain integration, it is beneficial to strengthen mutual trust, extend the term of the contract, to resolve the conflict effectively, promote the information sharing and risk sharing and reward; two emphasizes that the enterprise internal and external processes in the supply chain integration process, internal processes and external process is very important.

III. INDUSTRY 4.0 AND SUPPLY CHAIN MANAGEMENT

Xiang Yin (2015) believes that the supply chain under the industrial 4.0 will shift from production oriented to customer oriented, the individual needs of customers and the scope of the utility will be amplified. Therefore, the future of manufacturing enterprises will gradually expand the meaning of the product from the pure tangible products to value-added services based on the product, the future supply chain of the topic will be around the service supply chain and expand. Zhou Liqun, Li Zhihua (2016) argues that the industry 4.0 is the intelligent supply chain, is the electronic information, mechanical and software integration integration system as the foundation, with the help of the Internet and the Internet of things to people, machines and Internet, interactive, but can operate independently, from product design to raw materials procurement to production to the logistics delivery to the terminal sales, breaking the traditional role of barriers, the formation of intelligent supply chain integration, to provide new business model of intelligent manufacturing and intelligent services. University of Potsdam professor Christopher Meynell believes that the essence of the German industry 4.0 is the change in the way the integration form of division of labor and production, all around the needs, is the integration of a full range of value chain and industry chain. Zheng Ren (2014) believes that the industry 4.0 is the goal, the wisdom of the future manufacturing data, operational intelligence, machine intelligence, intelligence network is a major trend of future industrial development, but its implementation cannot do without the support of information technology, which requires the establishment of corresponding to the agile supply chain. Huang Shunkui

(2015) believes that the Internet entered the important starting point of manufacturing system is the industry 4.0, and it is based on Intelligent interconnection system, collection features, personalized demand data, and then use the intelligent manufacturing system produce personalized products. Chinese manufacturing industry to upgrade industry 4.0 for the vision of the transformation of Germany can learn from experience, and vigorously promote the intelligent digital network manufacturing, attaches great importance to the core technology innovation, market development, planning and implementation of the standards, supporting system of industrial transformation and upgrading of the role of coordination; hair driving effect volatile large enterprises, through the cultivation of talents, resources the opening of the market and other industrial policy arrangements, to promote the transformation and upgrading of manufacturing industry. Hu Jing (2015) of the United States of the Internet industry, Germany proposed industry 4.0, China proposed "two" the depth of integration of the three new concepts were compared, and pointed out that "the lack of a strategic brand concept attribute disadvantages two deep integration formulation, it is proposed that China should upgrade: Learn from the industrial Internet, industry 4.0 of the advantages and long, innovative and perfect its own two of the depth of integration. In the two deep integration in manufacturing Chinese must insist the combination of independent innovation and learning; combined with the investment and efficiency of the combination of the unified software development and hardware development; integration of industry and enterprise; the combination of market and government decision guidance; unified industrial civilization and ecological civilization.

IV. INDUSTRY 4.0 AND MANUFACTURING IN CHINA

Xu Guanglin, Lin Gongqin (2015) believes that although the trend of global economic development 4.0, developed in the industrial industry 4.0 and 3.0 transitional stage. But China's situation is more complex, China is still in the industry 2.0 and industry 3.0 phase of the stage. At present, ninety percent of the production enterprises in China is still in the industry 2.0, a small number of enterprises in the industry 3.0. China has called the world's factory, but in practical terms, China was in the low value-added production processes in the world. In order to comply with the industry 4.0 development trends, manufacturing in China need to high-end development, must insist on innovation-driven, intelligent restructuring. Zhang (2014) believes that the connotation of industry 4.0 can be divided into two areas: the first aspect is intelligent, green and human nature, the second aspects are the depth of the integration of networking and information physics. China enterprises should make full use of information technology infrastructure what has adopted the top-down method, step by step forward. Wu Di (2015) think that industry's core 4.0 is to enhance the added value of the manufacturing sector, innovation, automation and sophisticated design is the Foundation of success in manufacturing, is the key to maintaining its core competitiveness. Zhang Yanan (2016) believe that industry

4.0, manufacturing enterprises between human resources and equipment to achieve not only remote operation and communication, production facilities and production equipment also can communicate through technology and control technology of secondary. On the integration of the manufacturing enterprise production scheduling command center, manufacturing informatization of machine tool equipment, production logistics and assembly resources, China manufacturing industry needs to explore a higher production efficiency, the use of resources more savings, the use of human resources management more humanized industrial manufacturing processes. Wang Feiyue proposed in mechanization, electrification, informatization, networking, we are entering the fifth stage of industrial development, namely virtual interaction, feedback, parallel to the industrial age dynamic execution. Li Jinhua (2016) believes that in the German industry 4.0 and China manufacturing 2025, the reality of the background, China Construction and manufacturing powerhouse has six major action path: Li Jinhua (2016) believes that in the German industrial 4.0 "and" 2025 China manufacturing "background, China building manufacturing powerhouse has six paths of action: the first is the expansion of the manufacturing sector accounted for, optimize the structure of manufacturing, improve manufacturing efficiency; second is the implementation of independent innovation, cutting-edge technology, a major breakthrough in key technologies of complex the products in the system; third is the top quality, professional manufacturing, to create a series of famous international brands; fourth is the implementation of precise doctrine and standard doctrine, construct international advanced level of the Chinese manufacturing standard system; fifth is the school enterprise dual education and training, build high-quality system Manufacturing workers and advanced manufacturing culture; sixth is the revolutionary transformation of the mode of production, the construction of new and advanced manufacturing industrial agglomeration area.

V. SUPPLY CHAIN MANAGEMENT AND MANUFACTURING IN CHINA

China made 2025 is in the context of the rapid development of the global industrialization, and Germany proposed the implementation of the industrial 4.0 strategy. Chinese proposed to deal with this situation has Chinese characteristics of the night development plan. China made 2025 of its overall objective for China to achieve industrialization, to enter the ranks of manufacturing power, to create an upgraded version of the Chinese manufacturing. Specific objectives are: to increase the value of ranking first in the world manufacturing industry; the main product quality reached the international advanced level, forming a group with independent intellectual property rights of the international famous brand; a number of industries to achieve breakthrough, to achieve big and strong; part of strategic industries to master the core technology, close to the international advanced level. Under the Internet of things technology supply chain members fully realize the sharing of information resources is the objective requirements of

enterprise supply chain management.

Zhu Sen said that the future of China's manufacturing should focus on building the wisdom of the supply chain to enhance the core competitiveness of enterprises, help enhance the transformation of enterprises. The future supply chain management of enterprises will be the traditional sense of the static supply chain, and gradually through the integration of functional departments, internal process integration, external synergy after the integration of the supply chain to achieve wisdom. Our country enterprise application of supply chain management is limited to the initial stage, there are still many problems in the supply chain management. For example, the supply chain is not complete, lack of coordination mechanism, index of customer service quality is not reasonable, low level of information sharing. Information system operating efficiency is not high is caused by the poor information sharing technical barriers. From a non technical point of view, corporate culture and organizational structure of the exclusion of different functional departments and information sharing between partners is the most fundamental obstacle. Farley (1997) pointed out all the members on the value chain of the enterprise culture must be changed, in order to adapt to the supply chain management of incomplete information sharing directly causes the supply chain information line, enlarge the bullwhip effect, increase inventory and other operating costs, resulting in low efficiency of supply chain management. The enterprise must from the system to ensure the distribution of benefits and risk sharing between the entities of the supply chain, otherwise it is impossible to realize information sharing. Speakman believes that the learning ability of supply chain enterprises will ultimately determine the success or failure of the enterprise, and put forward the concept of "learning complete chain". He pointed out that "learning chain" is a nonlinear learning network composed of nodes in the supply chain. Each enterprise in the network is cooperative learning, which obtains knowledge through the way of learning and learning together with partners. "Learning chain" has the same features as the learning organization, the enterprises in the supply chain in a unique way to make the knowledge sharing in collaborative learning in the value chain, to study the nonlinear relationship between the chain network in the competitive advantage is hard to be imitated. Empirical analysis shows that knowledge learning has a positive effect on the supply chain performance related to customer satisfaction, but knowledge learning has no obvious relation with the cost of supply chain performance.

VI. SUMMARY AND PROSPECT

The industry 4.0 is the trend of the future development of the industry, it will bring great impact on the productivity of the whole society, radical changes in global design, products and production systems of manufacturing, operations and service processes, higher flexibility, faster speed, improving production efficiency, improve the quality of multiple benefits. For China's manufacturing industry, the industry 4.0 is not only an opportunity, but also a challenge. Industry 4.0 is conducive to the transformation of China's manufacturing industry, China can regard the industry 4.0 as a vision to

achieve China's manufacturing 2015. The future development of the industry 4.0 will rely on the supply chain innovation and progress. In order to adapt to the development trend of the industry 4.0, academia, industry and government must work together for the future of Chinese manufacturing. Editorial Policy

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