Research on Countermeasures for Intelligent and Digital Transformation of Manufacturing Industry—Take Suzhou City, China as example

2022, Vol.3 No.1
© Economics & Management Review 2022
DOI: 10.37420/j.emr.2022.002
https://masonpublish.org

Chunmei Zhang*
School of Business, Suzhou Vocational University, Suzhou, China
***Corresponding author, e-mail: 1765473952@qq.com**

Abstract

In the next 30 years, Suzhou manufacturing needs to change from emphasizing speed rather than quality to emphasizing quality rather than speed, and to realize the transformation from "Made in Suzhou" to "Inspired in Suzhou" and "Created in Suzhou" in terms of business model, technology and management. The transformation from "Made in Suzhou" to "Inspired in Suzhou" and "Created in Suzhou" in terms of business model, technology and management. "Made in Suzhou" is in line with the world trend of industrial development, focusing on intelligent and flexible production, emphasizing on improving labor productivity; while "Created in Suzhou" focuses more on the degree of technological innovation and product advancement. "Industry 4.0" is the digitization and networking of manufacturing, through the combination of IT technology and manufacturing technology, creating intelligent factories, making production highly flexible and personalized, improving production efficiency and resource utilization efficiency. We insist on technology and product innovation, improve user experience, and firmly deepen and promote digitalization, automation and intelligence to accelerate the transformation and upgrading of global manufacturing. Through the construction of the system, Suzhou has the talent, foundation and method to export to the global manufacturing and help the future upgrading and development of Suzhou manufacturing.

Keywords

Intelligent Transformation; Digital Transformation; Suzhou Manufacturing; Upgrade Development

1 Introduction

The manufacturing industry plays an extremely important role in the macro economy, and is the foundation of a country, the instrument of a country, and the basis of a strong country, as well as an important symbol of a country's international competitiveness. Therefore, smart manufacturing can also be regarded as the "cornerstone" of the new economy represented by "smart +", which has become the focus of technological inno-

vation and economic development competition among countries in the world, and major western industrial countries have established the development strategy of "re-industrialization" led by smart manufacturing. The major Western industrial countries have established the development strategy of "re-industrialization" led by intelligent manufacturing. (Huang, 2015) Suzhou is at a critical stage of development model transformation and upgrading, and it is particularly important to promote the high-quality development of manufacturing industry. The deep integration of manufacturing and innovative technology will be conducive to promoting the transformation of Suzhou from a large manufacturing city to a strong manufacturing city and achieving innovative development.

2 The Meaning of Smart Manufacturing

2.1 The Meaning of Smart

Intelligence contains two meanings, one is the intelligence of the product and the other is the intelligence of the manufacturing process. "Traditional products + intelligence", from smart phones, smart TVs, wearable products, smart mugs to smart cars, smart robots, etc., require companies to continuously make technological innovation and invest in the intelligence of their products. Such as Haier, Gree, Midea are investing in intelligent appliances. Regardless of the definition of intelligent manufacturing and the method of implementation, it must be aimed at the business strategy of enterprises, which is also the value of enterprises as a whole (Lu, Chen & Liu, 2019).

2.2 The Connotation of Smart Manufacturing

Smart manufacturing is a human-machine integrated intelligent system composed of intelligent machines and human experts. It can perform intelligent activities in the manufacturing process, such as analysis, reasoning, judgment, conception and decision making. It updates the concept of manufacturing automation and extends it to flexibility, intelligence and high integration. It is easy to see that the functions of customization, personalization, intelligent analysis, prediction and management.

The "intelligence" of smart manufacturing is "information interconnection", and the "energy" is "lean production+industrial engineering", which are the two driving wheels, and the middle is "people", the core.

3 The Importance of Promoting the Intelligent and Digital Transformation of Suzhou Manufacturing Industry

Statistics from Credit Suisse's Global Wealth Report 2015 China's total household wealth has reached $22.8 trillion in 2015, an increase of $1.5 trillion over last year, surpassing Japan to leap to the second place in the world, second only to the United States, China's middle class (with $100,000 wealth) reached 109 million people, surpassing the 92 million in the United States, leaping to the first place in the world. These data show that China will usher in a big explosion of consumer upgrading intelligence provides the direction for upgrading industrial and consumer products. And China has become the world's largest Internet country, coupled with the government's continued promotion of network speed and fee reduction, providing a network envi-

ronment for hardware intelligence.

3.1 Digitalization and Networking of Manufacturing can Interconnect Resources, Information, Objects and People through Digitalization

GE can optimize its operating parameters to reduce fuel costs by analyzing the data returned from aircraft engines, and Google can realize driverless cars. This means that in the era of "Industry 4.0", for the first time, people and people, people and products, people and machines, products and machines, and machines and machines are interconnected, and resources, goods and people are digitally exchanged.

3.2 Create Smart Factories by Combining IT and Manufacturing Technologies to Make Production Highly Flexible and Personalized

The Germans claim that "the real arrival of Industry 4.0 may take about 20 years", and for China, this time is estimated to be longer. (Wan, 2020) With the release of Made in China 2025, Suzhou City has made a strategic choice to develop advanced manufacturing industry, actively respond to the challenges of industrial high-end constraints, optimize the development environment, promote automation, informatization and intelligence of Suzhou manufacturing industry, improve production efficiency and resource utilization efficiency, and make every effort to promote Suzhou manufacturing to a new level, and take a solid step forward in the new practice of "two concentrations and one height". In the new practice of "two concentrations and one high", we will take solid steps.

3.3 According to the "Made in Suzhou 2025" Action Plan, the Manufacturing Advisory Committee will Guide Enterprises to Implement "Made in China 2025".

The Suzhou Municipal Government has issued "Several Measures on Promoting Intelligent Transformation and Digital Transformation of Manufacturing Industry" and "Suzhou Smart Manufacturing Three-Year Action Plan (2020-2022)". These specific measures aim to create a new brand of "Made in Suzhou" through digital empowerment, which is the strategic goal of the new manufacturing in Suzhou. The new ecology of development is based on the networked industry of the information age. This new ecology changes the traditional hierarchical structure through digital empowerment, and forms a flat industrial ecology based on networking between enterprises and enterprises, and between enterprises and consumers to create value together.

3.4 Suzhou Manufacturing Companies can Gradually Improve the Level of Lean, Standardization, Modularization, Automation and Digitalization

Smart manufacturing is a complex system, and due to the immaturity of the technology and the huge investment, each company needs to weigh the timing of the introduction and, like automation, consider the return on investment, system reliability, information security risks, and talent pool. Intelligent manufacturing systems can perform intelligent activities in the manufacturing process, such as analysis, reasoning, judgment, conception and decision making. Through the cooperation between human and intelligent machines, it goes

to expand, extend and partially replace the mental work of technical experts in the manufacturing process. It extends manufacturing automation to flexibility, intelligence and high integration.

3.5 Intelligent Manufacturing Transformation to Drive Suzhou's Local Economy to Achieve Innovative Development

Suzhou has formed a complete system of manufacturing industry, with a full range of manufacturing categories. In 2020, the output value of Suzhou's equipment manufacturing industry reached 1,020.5 billion yuan, accounting for 29.3% of the total output value of the industry, a record high in terms of both total output value and proportion. (Xinhua Net, 2019) This is another trillion-dollar industry in the 13th Five-Year Plan period, after the electronic information industry. In 2020, Suzhou's total industrial output value above the scale will be 3.48 trillion yuan, ranking among the top three large and medium-sized cities in China. Therefore, the manufacturing industry constitutes the industrial foundation of Suzhou's development, and the new manufacturing industry needs to rely on a large number of modern production factors such as capital flow, talent flow, information flow and technology flow to promote the development of new manufacturing, and the new manufacturing industry needs the support of regional and cross-regional innovation ecosystems.

4 The Real Dilemma of Intelligent and Digital Transformation in Suzhou Manufacturing Industry

4.1 The Majority of Enterprises in Suzhou are Still at the Stage of Partial Use of Application Software

A few enterprises have only achieved information integration, just to reach the level of digital factory; very few enterprises can achieve effective human-machine interaction, to reach the level of smart factory. Intelligent manufacturing system is not just an artificial intelligence system, but an integrated human-computer intelligence system, a hybrid intelligence. The system can independently undertake analysis, judgment, decision-making and other tasks, highlighting the core position of people in the manufacturing system, while in cooperation with intelligent machines, better play the human potential. Machine intelligence and human intelligence are truly integrated together and complement each other. The essence is human-machine integration.

4.2 Most Companies in Suzhou are Still in 2.0 or 3.0 Stage

Many enterprises in Suzhou are still in the 2.0 or 3.0 stage, digitalization or "Industry 4.0", which is a major trend. security, legal protection, talent pool, etc. As a major manufacturing city, Suzhou has fully implemented the Made in China 2025 document and is using it as an opportunity to achieve a strong manufacturing city. For enterprises that have not yet automated their production and are at the Industrial 2.0 stage, they should vigorously develop automation and informatization in order to quickly upgrade to Industrial 3.0; for enterprises with a high degree of automation and at the Industrial 3.0 stage, they should accelerate innovation-driven, intelligent transformation and promote cross-border integration of Internet + manufacturing.

4.3 Many Smart Manufacturing Companies in Suzhou are Built on Inefficient

Production Models, and Lean is the First Step that must be Taken

Lean has not been effectively implemented in most of the enterprises in Suzhou, because they cannot stick to it half-way due to quick success and lack of experience in introducing methods. Waste abounds in these enterprises, with high inventory, repeated handling, high-intensity manual work, intermittent segmented production patterns, shoddy quality, long delivery lead times, etc. In the electronics industry, the average inventory turnaround time for Chinese companies is 51 days, compared to 8 days in the U.S. In the textile and apparel industry, the average inventory turnaround time for Chinese companies is 120 days. This means that even with the same profit margin, the return on investment is lower. Lean is the first step that must be taken, and as long as companies stick to it, most of them can get a 50% or higher improvement. And it is the path with the highest return on investment. Because Lean requires almost no additional investment from the company, just a reallocation of production resources from the existing base, it can yield returns beyond imagination

4.4 Lack of Well-known Brands and Data-driven Product Development in Suzhou Manufacturing; Low Percentage of Digital Factories

The digitalization and intelligence of China's consumer side has led the world in many areas. The number of people shopping online in China is over 600 million, the first in the world; the scale and proportion of mobile payments, as well as the number of express logistics China is the first in the world with 50.7 billion pieces in 2018. However, the digital level of China's supply side, as a whole, is still low, for example: the lack of well-known brands, 50% of advertising waste, lack of precision marketing capabilities; research and development of new product development cycle is long, consumer feedback lags behind, lack of data-driven product development; the proportion of digital factories is much lower than in Europe and the United States (46% in Europe, 54% in the United States, 25% in China).

4.5 "Made in Suzhou" is Locked in the Low Value-added Manufacturing Process

R&D, manufacturing and market are separated in space, and the smile curve is the image expression of the old manufacturing in the industrialization era. Supporting the development of the old manufacturing mainly relies on the input of cheap factors of production and on the assembly line to achieve the improvement of production efficiency. Entering the new development stage, the connotation of manufacturing will undergo significant changes. There will be frequent interaction among the three links of manufacturing, R&D and market, and information technology provides the basis for interaction. If R&D, manufacturing and market are represented by three circles, there is an intersection between them, and the intersection part is represented by gray, which is called "gray-scale innovation". The gray innovation between R&D and manufacturing is a kind of industrialized innovation ability. The gray innovation, the combination of "manufacturing and market", is the innovation of "business model". (Bian, Yabin, Fang, Maotao,& Yang, 2019)

5 Problems and Challenges of Intelligent and Digital Transformation in Suzhou Manufacturing Industry

The development of township enterprises in 1980s was the first wave of manufacturing industry develop-

ment, and the development of export-oriented economy in 1990s was the second wave of manufacturing industry development, the development of the first wave and the second wave was mainly based on Suzhou manufacturing in the industrialization era, and Suzhou will step into the third wave of manufacturing industry development in the future, and the intelligent manufacturing promoted by informationization is a major opportunity for "Made in Suzhou" industry development. "In the future, Suzhou will enter the third wave of manufacturing development. Based on information and data, the digitalization of "Made in Suzhou" has stepped into the production side from the traditional consumption side.

5.1 The Intelligent Era Requires Suzhou Manufacturing Industry to Innovate and Construct Production Factors, Production Organization and Production Methods

From the agricultural era, the industrial era, the information era, to the intelligent era that humanity is currently entering, each technological and industrial change has brought about the innovation and construction of production factors, production organization, and production methods. (P. Aghion, J. Cai, M. Dewatripont, et al., 2015) In the new economy represented by intelligence, digitalization or "Industry 4.0", this is a major trend, although at present only human-to-human communication is realized, other communication still needs to have various conditions, such as data transmission protocols and measurement standards, strong infrastructure, security of data transmission, legal protection, talent pool, etc.

5.2 Data + Algorithm + Algorithm" Model to Promote the Smart Manufacturing Subvert the Traditional Industrial Survival and Development Mode in Suzhou

Every advancement in human technology has brought about a revolution in the tools of production. From the early production of animal power instead of human power, to mechanization and electrification instead of natural power, to modern assembly line type of large-scale production, and then the development of computer and Internet technology has brought about a leap in human ability to process information. The intelligent manufacturing promoted by the mode of "data + algorithm + arithmetic" has overturned the development mode of "traditional tools + empirical decisions" on which the traditional industry has relied for hundreds of years, and set off a deep revolution in the two dimensions of tools and decisions. (Song, Zhang, 2019) The tool revolution, whether in physical or mental labor, has made human production more efficient and less costly.

5.3 Smart Manufacturing has Driven a New Revolution in Decision Making through the Deep Empowerment of "Data + Algorithm + Algorithm"

As smart manufacturing permeates all aspects of demand to production, intelligence can improve the accuracy and science of decision making, shorten the decision cycle, and reduce the cost of trial and error brought about by the uncertainty of decision making. Smart manufacturing will help production make better decisions and do the "right thing" while providing better tools. Unlike previous technological advances, smart manufacturing is empowered by the depth of "data + algorithm + algorithm", not only in the tool side, but also in the

decision-making side to promote a new revolution.

5.4 Digital Empowerment, Innovation Driven, Branding "Made in Suzhou"

The third wave of "Made in Suzhou" needs to be digitally empowered, supported by talents and driven by innovation, to make full play of the 'Made in Suzhou' brand, to continuously drive traditional industries to promote intelligent transformation and digital transformation, and to provide more solid support to accelerate the formation of a new development pattern of 'double cycle'. 'double cycle' new development pattern to provide more solid support." Accelerate the intelligent transformation and digital transformation of traditional industries. Accelerate the progress to promote the pace of upgrading and transformation, to take the initiative to undertake the spillover effect of the construction of Shanghai International Science and Technology Innovation Center, actively dock with Shanghai head scientific research institutions, and promote the transfer and transformation of Shanghai's science and technology resources in Suzhou.

5.5 Focus on Digitalization, Reshape the New Networked and Flat New Industrial Ecology, and Promote Industrial Transformation and Upgrading

Industry 4.0 is not simply a technological innovation, but will bring about a transformation of the production model and even the entire industrial ecology, which is called the fourth industrial revolution. Fundamentally, it is about reshaping the industrial ecology and abandoning the old thinking of linear and hierarchical industrial organization and system of the industrialization era. In terms of production factors, in addition to the traditional capital and talent, information and data are increasingly becoming the core elements of Suzhou's manufacturing enterprises. (Humphrey J., Schmitz H., 2002) In terms of production organization and social division of labor, there is a greater tendency to socialization, networking, platform, flattening and micronization; in terms of production methods, there is a shift from mass single production to consumer-centered mass personalization services.

6 Research on Countermeasures to Promote the Intelligent and Digital Transformation of Suzhou Manufacturing Industry

In the government work report made at the fifth meeting of the 16th National People's Congress, it is proposed to focus on the digital economy and focus on promoting industrial transformation and upgrading. Promote the integration of the real economy and digital economy technology to accelerate the construction of a modern industrial system. To comprehensively promote the digital economy and digital development. Around big data, cloud computing, artificial intelligence, blockchain and other fields, the development of platform economy, creative economy, experience economy and other new business models, the scale of the digital economy, and promote the intelligent transformation of industry and digital transformation.

6.1 The Development of Smart Manufacturing in Suzhou Requires a Bold and Forward-looking Strategy

The development goal of smart manufacturing in Suzhou enterprises should establish a core and six key technologies. One core is to build an intelligent lean factory, and six key technologies are intelligent automation, intelligent robotics, intelligent logistics, intelligent informatization, mobile big data, and IoT integration to create intelligent manufacturing in Suzhou. The trend of intelligent upgrading of manufacturing industry has been unstoppable, and corporate decision makers are facing an unprecedented challenge. A comprehensive and clear strategy can help decision makers break the functional silo and achieve the integrated integration of talent, process and technology to successfully achieve smart upgrade. The development of Smart Manufacturing in Suzhou is based on the business development strategies of technology leadership, direct access to users, digital intelligence, global breakthrough, total digitalization and total intelligence. (Yuan, Yin& Cao 2020) The development of the strategy must be led by the company's decision-making level, with a bold and forward-looking strategy that cuts across all levels of the company, and should not stop at the production floor alone.

6.2 Suzhou Enterprise Decision Makers to Promote the Transformation of Intelligent Manufacturing to be Value-oriented

The market for technologies related to smart manufacturing is forecasted to reach $152 billion by 2022. The Internet and Internet-based IoT are revealing a whole new landscape in the contemporary world by connecting the entire society, enterprise, and networked within the enterprise from people to information to physical objects. Businesses recognize all layers of this landscape and are actively and effectively participating in it. Some companies tend to focus too much on the technology itself when advancing smart manufacturing, ignoring its fundamental purpose of creating value for the enterprise. Enterprises should actively mobilize all elements of the industrial value chain when formulating smart manufacturing transformation strategies, establish cross-functional team, and lay out smart manufacturing upgrades based on value and performance.

6.3 Suzhou Smart Manufacturing Must be in Line with the Whole Process of Lean Manufacturing, Lean Manufacturing is the Cornerstone of Smart Manufacturing

Suzhou manufacturing companies need to change from the traditional rough manufacturing model to the lean manufacturing model. In the process of lean manufacturing, we need to change the thinking of the management from the top to the bottom of the manufacturing system, create a digital lean factory, and establish a "benchmark" of intelligent lean factories in Suzhou.

The two pillars of lean manufacturing are "just-in-time" and "intelligent automation". From the perspective of intelligent manufacturing, it is a human-machine integrated intelligent system composed of intelligent machines and human experts, which can carry out intelligent activities in the manufacturing process, such as analysis, reasoning, judgment, conception and decision making. It updates the concept of manufacturing automation and extends it to flexibility, intelligence and high integration. Not surprisingly, it has functions such as customization, personalization, intelligent analysis, prediction and management. The basis for the realization of intelligent manufacturing is lean, from the quality, cost, efficiency of the fundamental solution to "rapid response", to achieve customization, personalized manufacturing.(Liu, Chang& Zhang, 2019)

Lean management takes customers as the core, and drives the realization of intelligent manufacturing through R&D, manufacturing, quality, and supply chain management. Lean manufacturing, which was first designed for the personalized needs of multiple varieties and small batches, is a lean management concept and method that has driven the transformation of global industries. Industrial data shows that the growth rate of industrial profits is declining for three reasons: slow growth in product sales, rising costs faster than sales growth, and lower prices squeezing profitability, while lean management is a quick response to win, improve production efficiency, reduce costs, and achieve maximum value for the enterprise. The pursuit of "value creation and waste elimination" is the ideology, methods and tools that facilitate the optimal allocation of production resources, resulting in rapid improvements in quality, efficiency and responsiveness.

Intelligence is a global optimization issue that must be built on top of lean operations, automation and information technology. Lean has evolved into a full value chain involving marketing, R&D, supply chain, production, processes and even entrepreneurship. Through a more global model, the synergy of market demand, process design and auxiliary manufacturing, supply chain (including smart grid and logistics in addition to the traditional supply chain), manufacturing, and operation and maintenance, an overall "optimization" based on equipment status, production orders, energy consumption, financial costs, etc. is formed. "and give operation "decision support".

6.4 Suzhou Smart Manufacturing to Promote Standardization and Modularization, Which is the Key to Achieving Low Cost to Meet Personalized Consumption

Suzhou manufacturing enterprises should realize that standardization is the basis of automation and the premise of intelligent manufacturing. Standardization includes standardized operation processes and methods. With standardization, automation can be developed accordingly, such as automatic welding and automatic assembly, assuming that parts are ever-changing and operation methods are not fixed, automation will be difficult to realize, and even if it is realized, the cost is high. Suzhou smart manufacturing should accelerate the transformation and upgrading of global manufacturing by multi-base and multi-category joint management mode, insisting on technology and product innovation, improving user experience, and firmly deepening and promoting digitalization, automation and intelligence.

Modularity reduces the complexity from design, procurement to production. Standardized interfaces and connections increase versatility, reduce manufacturing costs and cycles, and make automated production, logistics and information communication easier to achieve. For example, automobiles and computers are the first industries to achieve modularity, from modular design, modular procurement to modular production, modularity is also the key to whether smart manufacturing can achieve low cost to meet personalized consumption. If once realized, the real sense of personalized products will become possible, such as cell phones, each person's cell phone can be unique, people can be like assembling blocks as any combination of their favorite cell phone.

In the future, you can place a personalized product order through APP The manufacturer receives the order

information through CRM/ERP, the order information is passed to PLM system, the product simulation model is designed, the product and material information enters ERP and MES system, pulling the supplier to start producing the material, the material is produced and sent to the factory through IOT, it enters the automatic production line, the equipment is processed according to the instruction of MES system, and the finished product is sent to the customer through IOT after it comes off the line.

6.5 "Industry 4.0" is the Digitalization and Networking of Manufacturing, and the Digital Transformation of Suzhou Manufacturing Industry should be Preceded by Business Processes

Digitization is closely related to information technology, and like automation, it is the biggest piece of investment in smart manufacturing transformation. With the rapid changes in information technology, everything can be digitized, from people, products to equipment, to achieve everything connected. People can be identified through face recognition technology, which used to be possible only when they were static, but now they can be identified when they are walking. Products can be digitized through PLM/ERP software, from product development and design, material procurement to production and delivery, and every product drawing, every material information, and every production process can be digitally connected. Equipment can transmit operation data to MES, Internet and other networks through PLC, sensors, etc.

The construction of digitization starts with business process first. Through the combing and optimization of business processes, the process is solidified through digitalization, and it is continuously iterated and upgraded in the process of practical application, and the problems are exposed through digital application, which in turn forces business change and organizational change. "Industry 4.0" is the digitalization and networking of manufacturing, through the combination of IT technology and manufacturing technology to create smart factories, making production highly flexible and personalized, and improving production efficiency and resource utilization efficiency. (Zhang& Jin, 2019)

Transmitting the right data through digital and lean production. Through lean production, collecting a series of standardized data and reference architecture for analysis of beat, mold change, logistics and transportation, procurement, design, production cost, scrap rate, etc., then, smart manufacturing can objectively and reasonably assess the production capacity, production characteristics, and production strengths of their own enterprises, and then when designing products, they can avoid the shortcomings of their own production, expand and optimize the parts of manufacturing products that can be produced but the opponents cannot, and use the full strengths of their own production, thus improving the competitiveness of their enterprises and building a threshold for their opponents.

6.6 Each Manufacturing Industry in Suzhou has Different Characteristics and Enterprise Base, so the Order of Digitalization will be Different.

The intelligence of manufacturing process is more complex and needs to complete the transformation of lean, standardization, modularization, automation and digitalization, and the investment of automation and digitalization will be large. Due to the immaturity of the technology and the huge investment, each enterprise needs

to weigh the timing of the introduction, as with automation, and consider the return on investment, system reliability, information security risks, talent pool and other issues.

For Suzhou process-oriented manufacturing industries such as food and beverage, paper, chemical, electric power, etc., most of the processes of these manufacturing models have been connected and automated to a high degree, some equipment data can already be automatically collected, the difficulty of digitization is relatively small.

For Suzhou's discrete manufacturing industries such as machinery and equipment, textiles and garments, electronics and electrical appliances, household goods, etc., because the manufacturing processes and parts are scattered and the number is huge, it is really difficult to realize the connection, and even if it is realized the cost will be very large. Suzhou's feasible approach for these industries is not to achieve it in one step, but gradually. First apply lean continuous production techniques to connect the main processes and materials.

The intelligence of industrial goods is actually more urgent than the intelligence of consumer goods. All equipment needs to join the intelligent control module for automatic collection, analysis and control of processing data, equipped with a standard data interface that can be connected to the enterprise MES system or other information systems. These industrial big data will help improve operational efficiency, reduce breakdowns and lower energy consumption through the computational analysis of intelligent software systems.

7 Conclusion

Intelligence contains two meanings, one is the intelligence of the product and the other is the intelligence of the manufacturing process. The intelligence of the manufacturing process is more complex and requires the completion of the above mentioned lean, standardization, modularization, automation and digital transformation, and the investment in automation and digitalization will be large. Intelligent manufacturing is a complex system, and every enterprise in every industry has to figure out the right model for itself, which can gradually improve the level of lean, standardization, modularization, automation as well as digitalization. In the next 30 years, Suzhou manufacturing needs to change from emphasizing speed over quality to emphasizing quality over speed, and needs to make continuous innovation in each of the above areas to realize the transformation to Suzhou smart manufacturing in terms of business model, technology and management.

Funding

2021 Suzhou Vocational University Higher Education Research Project "Promoting Intelligent Transformation and Digital Transformation, Helping Suzhou Manufacturing Upgrade Development Countermeasures" Research Results [No. 202103A10].

References

[1] Huang Shunkui. (2015). Transformation and Upgrading of manufacturing industry: Inspiration from Germany's "Industry 4.0". *Learning and Practice*, 44-51.

[2] Lu Wenjing, Chen Jin, & Liu Jin. (2019). Intelligent manufacturing and global Value Chain Upgrading: A Case study of Haier COSMOPlat. Science Research Management, 40(4), 145-156.
[3] Wan Changsong.(2020). On industrial Revolution 4.0 and the rise of "super power". People's Forum, (19): 88-96.]
[4] Xinhua Net. (2019). China became the only country with all industrial categories [EB/OL]. HTTP: // WWW. Xinhuanet.
com/politics/2019-09/21/c_1125021487. htm, 2019-09-21/2021-05-15.
[5] Bian, Yabin, Fang, Maotao,& Yang, Hesong. (2019). The micro path of China's manufacturing industry transformation and upgrading under the background of "Internet +" -- Based on the smile curve analysis. Dongyue Discussion Cong, 40(08):62-73.
[6] P. Aghion, J. Cai, M. Dewatripont, et al., (2015). Industrial Policy and Competition. American Economic Journal: Macroeconomics, 7(4): 1-32.
[7] Song Lin, Zhang Yang. (2019). Industrial transformation and upgrading of manufacturing industry driven by innovation. Journal of Xi 'an Jiaotong University (Social Science Edition), (12):1-13.
[8] Humphrey J., Schmitz H. (2002). Effects of network ports in upgrading industrial clusters. Regional Studies, 36 (9) : 1017-1027.
[9] Yuan Qingtang, Yin Ruiyu, & Cao Xianghong. (2020). Research on the goal, characteristics and path strategy of process manufacturing intelligence for 2035. Engineering Science, 22(3): 148-156.
[10] Liu Jun, Chang Huihong,& Zhang Sanfeng. (2019). The Influence of intelligence on The Structure optimization of China's manufacturing industry. Journal of Hohai University, 21(4):35-41.
[11] Zhang Fanhua, Jin Hao. (2019). Research on The transformation and upgrading path of Wenzhou manufacturing industry under the background of intelligent manufacturing. Guangxi Quality Supervision Guide, (10):90-92.