

# Research on Digital Transformation and Upgrading of Manufacturing Industry

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**Abstract:** It is not only a theoretical but also a practical issue in influencing the development of high-quality manufacturing. The author thinks that the high-quality development of the manufacturing industry is highly efficient, innovative, and highly valuable, and they are internally and externally coordinated with each other. On this basis, the theoretical framework of high-quality development in the manufacturing industry is analyzed. The paper probes into the theory mechanism of the high-quality development of the manufacturing industry. Meanwhile, this paper studies the influence of digital technology on the manufacturing industry, analyzes the problems in the course of development, and puts forward some countermeasures.

**Keywords:** Digitalization; Manufacturing; High-quality Development; Theoretical Analysis Framework; Development Countermeasures

## 1. Introduction

Since the reform and opening-up, several important system advantages have been formed in China and achieved historical results. Since the founding of New China, China has achieved great success in manufacturing, not only in increasing industrial value but also in developing an integrated industry system. The Chinese government has put forward the idea of "the real economy" and "push forward the integration of the digital economy with the real economy." Manufacturing is one of the pillars of the national economy, and it is also the foundation stone of the real economy. Since 2010, the Chinese manufacturing industry has been ranked first in the world regarding value added, but there are still several problems with its rapid growth. Among them, "Large but Not Strong" has been an outstanding problem in China's manufacturing industry, characterized

by low productivity, inadequate innovation capacity, and low value-added. Currently, the "broad" development pattern of Chinese manufacturing cannot satisfy the demand, and the transition from low level to high level has become an urgent matter. In the meantime, the digital economy will become a new "engine" to push Chinese manufacturing into a "new path" and realize high-quality development.

## 1.1 Research Background

Due to its long industry chain, technology-intensive, scale economy, and so on, the manufacturing industry has a great influence on various departments. Since the reform and opening-up, China's "manufacturing" has developed rapidly regarding labor, land, and raw materials, and has been called the "World Factory". Since 2010, China has been leading the world in manufacturing value added. It is still the biggest producer in the world, with a strong manufacturing power. But at the same time, China's government and the academic community have become increasingly aware that the quality and core competence of the manufacturing industry is far from the scale. The situation of "large but not strong, complete but not outstanding" has not changed, and needs a breakthrough. Currently, there are some problems in China's manufacturing industry: 1. Low operational efficiency; 2. Lack of independent innovative R&D ability; Low end in the world; High reliance on core technology and high-end components. Generally speaking, low-grade products.

In recent years, many Chinese manufacturing companies have adopted Cloud Computing, Big Data, Mobile Web, Smart Hardware, etc. They also use ERP, MES, etc. These applications have contributed to developing networking, intelligence, and digital technologies in manufacturing. Applying the digital technique not only reduces the cost, increases efficiency, promotes innovation, and

optimizes the management, but also improves the long-term business performance.

Cloud Computing, Big Data, Mobile Web, and Smart Hardware have been adopted by many Chinese manufacturers in recent years. They also use ERP and MES. These applications have helped to develop networking, intelligence, and digital technologies in manufacturing. The application of digital technology can not only reduce cost, raise efficiency, promote innovation, and optimize management, but also enhance long-term operation performance.

Internationally, countries worldwide have been actively promoting digital and smart manufacturing in the last decade, and they have seen it as a key tool to rebuild their competitive edge. With the help of the next generation of information technologies, such as Cloud Computing, Big Data, the Internet of Things, new software, and intelligent hardware, we will push forward the integration of digital and traditional manufacturing, and continue to carry out intelligent manufacturing projects. Under the impetus of the actual changes and policies, the digital transition has become a necessary choice for Chinese manufacturing to break away from the "big but not the strong", and it is also the focal point of the government, the industry, the university, and the research.

### **1.2 Formulate Research Questions**

Traditional manufacturing is more dependent on capital, labor, technology, etc. Digitalization is a means of information exchange and circulation, but its function is insignificant. Along with the emergence of big data, artificial intelligence, cloud computing, and the further development of the economy and the internet, the position and function of digital technology in China are becoming more and more outstanding. Digital is not only an independent element in manufacturing, but also a more powerful integration of traditional development factors, which leads to a new kind of manufacturing industry. Speeding up the digital transition and upgrading the manufacturing industry is the key to realizing Chinese high-quality development.

Most of the research has explored how the digital economy can improve the quality of the manufacturing industry. Among them, the most representative is the ratio of GDP or industry value-added, represented by digital

technology, to examine the change in manufacturing TFP. The TFP index of the Chinese manufacturing industry is a good description, but it is hard to measure it precisely. Moreover, due to the wide range of concepts of industry figures, their value-added statistics are also horizontal and complex, which makes it difficult to assess their numerical value. Based on this, this paper aims to analyze the effect of the digital economy on the transformation and upgrading of the manufacturing industry and discuss the mechanism of the digital economy.

### **2. Literature Review**

Initially, digital transformation originated from applying traditional IT in manufacturing [1]. Then, as the scope of application expands, IT is extended to other business sectors [2-3]. Along with the development of Big Data, Artificial Intelligence, Biocomputing, etc., the next generation of IT will enter a new phase [4]. Scholars have gradually come to know about all aspects. In their view, the digital transformation of enterprises is not only related to the application of digital technologies but also to the whole process of supporting the transformation and transformation of business models [5].

The literature about the influence of digitalization on the development quality of the manufacturing industry can be divided into three categories. Among them, the first one focuses on the study of the digital economy and the high-quality development of the manufacturing industry. Many researches indicate that the digitalization of industry can improve the competitive advantage of the manufacturing industry and realize it using digital technology and innovation. According to Wei [6], the digital transformation of the manufacturing industry has an obvious positive effect on the improvement of TFP. Zhao [7] has conducted deep research on the outstanding gap and the lack of impetus in the quality development of Chinese manufacturing. In the future, it is necessary to transfer the drive of innovation from the latter to the leading edge. According to the study of Jiao and Liu [8], the digital economy plays an important role in enhancing the IC capability. Li and Han [9] have systematically investigated the features of high-quality digital economy and manufacturing. They conclude

that the combination of these two areas can improve the quality, efficiency, and momentum of the manufacturing industry. Therefore, the government must push forward the industrial upgrading. Based on the analysis of the theory mechanism and the main approaches of the digital economy, Kuang and Peng [10] pointed out that digital transformation can be used in the production, operation, management, and marketing of enterprises.

Meanwhile, the development of the manufacturing industry and the maturity of technology will enhance manufacturing quality. Moreover, it also provides powerful support for digitalizing the traditional sector. According to recent research by Huang [11], AI innovation can improve the quality of manufacturing enterprises. However, as industry competition intensifies and technology innovation intensifies daily, artificial intelligence is important in promoting high-quality development. Hui and Yang [12] indicated that the digital economy could improve the quality of manufacturing using human capital, entrepreneurship, or industry upgrading, but the concrete mechanism is not clear. Zou [13] took the core journals of CNKI for the last 20 years as the research object and analyzed the knowledge chart of CiteSpace. Most of the research in this section measures the size of the digital economy or industry value-added from the macro point of view. It discusses its direct impact on manufacturing development. However, there is little research on how the digital process affects the transformation and upgrading of the manufacturing industry. Digital and manufacturing is a complicated concept, which is characterized by interactive, interactive, interactive, and interactive.

Secondly, the paper studies the influence of digital transition on listed companies from the micro-angle.

The third part is the qualitative study, which discusses how the digital economy influences the industry value chain. Yang [14] summarized the trend, risk, and strategy of GVC in the context of the digital economy. Digital technology has promoted the division of labor models in the global value chain and location reconstruction. However, it is also accompanied by the "neck" and "the digital divide" of the core digital technology.

Generally speaking, some achievements have been made in the study of digital transition and manufacturing transition in China. Among them, it has been concluded that digital transformation has a positive impact on the transition and upgrading of manufacturing. It is important to note that integrating digital conversion and manufacturing is still a hot issue in the present economy. However, studies on the mechanism of digital technology in the transformation and upgrading of the traditional manufacturing industry are still lacking. The project's innovation lies in the following aspects: Firstly, it will extend the empirical study of "Digital Transition" and "Transform and Upgrade of Manufacturing Industry".

### **3. Theoretical Mechanism**

The theoretical analysis frame of high-quality development based on digital transformation is as follows:

Firstly, we need to know the meaning of high quality in the manufacturing industry: Based on "scale structure" logic, high-quality development of manufacturing enterprises and industries; in the external circulation, the high-quality development of the manufacturing industry can be seen in the global value chain, namely, the rising status in the international division of labour, and the reverse "U" change.

The second is that the manufacturing industry can achieve economies of scale using the long-tail effect, digital network connectivity, and the marginal cost of digital products.

Iii. In the "Digital Technology Economy Paradigm", we can improve the capital, replace the capital, improve the efficiency of the factor distribution, and spread innovation. The mechanism consists of Enhancing Human Capital, Reducing Financial Costs, Innovating Business Models, and Enhancing Dynamic Capability.

IV. Digital technology has promoted the theory evolution of value added in the Chinese industry value chain. According to the origin and flow direction of industry value-added, the status and the degree of participation in the global value chain are calculated. Through their R&D and market knowledge, this paper reveals the added value of digital transition and its value creation to promote its status in the global value chain. In the meantime, the digital transition will also push China to

participate in the global value chain from the international to the local through intermediate substitution, the trade barrier, and the digital monopoly. The digital transformation has strengthened the manufacturing value chain.

#### **4. Problems and Development Countermeasures**

Based on the theory and demonstration study of Chinese digital high-quality development, this paper points out the driving mechanism of the digital economy to high-quality growth. However, it is still confronted with problems such as low total transformation level, low transformation depth, and unbalanced development. Furthermore, it is significant to study the performance enhancement effect of the digital transition, the effect, the blocking mechanism, and the enhancement of the value chain. The following are specific responses to development:

Firstly, we should insist on the digital drive, strengthen the digital infrastructure, and promote high-quality manufacturing. Based on the analysis, the paper proposes a digital transition strategy for manufacturing enterprises. However, the whole transformation level of the digital index is not high, especially because of the shallow integration of digital technology and manufacturing. Concrete measures: (1) Continue overcoming key digital technologies, including Artificial Intelligence, Blockchain, Cloud, Data Mining, 5G, IOT, and machine learning. The R&D of digital technology has a high initial investment, long period, and high risk, and it isn't easy to get an upgrade result. However, if built, it can support the transformation of the whole manufacturing sector at long-term marginal costs. Therefore, the state capital should be the first to resolve the key issues in the R&D of digital technology and enhance the compensation effect of the government subsidy. (2) Under the Digital Transition Strategy, we should invest more in public goods, build high-speed, mobile, ubiquitous, and secure information infrastructure, enhance the smart transformation of power, water, and transport networks, and enhance the supply of digital public goods. (3) To construct a new data-driven manufacturing cooperation platform, to promote high-level production service innovation, to improve the interaction

between manufacturing and digital, to achieve the fast iteration of the supply chain, to push forward the collaborative manufacturing of the manufacturing industry, and to foster new business patterns and patterns.

Secondly, we should open up digital transition channels for manufacturing enterprises, and guide and help them to deepen the digital transition. Based on the analysis, the paper puts forward a new approach based on the asymmetric information, the human capital, the innovation of the operation mode, and the adjustment of the financing cost. (1) To improve the transparency and credibility of information disclosure, and to enhance the quality and efficiency of information communication. (2) Strengthen the training of digital personnel. Based on this, it is necessary to make great efforts to bring in high-level talents with digital literacy. On the other hand, it is essential to enhance the training of digital technical personnel in universities and research institutes. (3) Create a favorable environment for the innovation of digital technology. The government supports taxes and taxes. Through professional and service-oriented governance, it creates a competition-neutral market to facilitate the emergence of new business models in digital manufacturing. (4) Promote digital finance reform, reduce the asymmetry of credit information, optimize the financing environment, and release the profit from digital transformation.

Thirdly, it is necessary to design and implement differentiated industrial policies given the diversity of sectors, ownership systems, and market structures. (1) Make full use of the positive effect of digital investment on manufacturing, and enhance its transformation efficiency. To make a positive change and strengthen innovation, the manufacturing sector should invest more in digital technology. In contrast, the manufacturing sector with poor performance in digital transformation should reduce its investment in digitalization, or increase its conversion efficiency. For instance, in China's electronics industry, the electronic information industry is the most developed, but it has not benefited from the "digital" strategy.

(2) Private firms play a more important role in promoting disruptive innovation than state-owned enterprises. The former depends

on progressive innovation, and the latter is more creative, which makes it easier to get out of the "low-end lock" predicament. Therefore, when establishing the industry guidance fund to support the leading enterprises, it is necessary to consider the principle of non-discrimination. Create a competitive neutral market environment, and focus on the selection and training of privately owned enterprises. (3) In the course of digital innovation, it will be damaged by the market structure, which leads to a decrease in industry concentration, which leads to the change of path dependence to disruption. Given the market monopolization of digital capital, it is necessary to study and formulate policies and measures to encourage digital platforms to carry out their supervisory duties. (4) The number of digital transformations is relatively high, including the production of machinery, equipment, coking, petrochemicals, base metals, and nonmetallic minerals. However, their status in the industry is not clear. Capital-intensive manufacturing should speed up integration with digital technology, improve self-innovation, and increase the added value of each link in the industry chain.

Fourthly, we should resolve the "digital divide", namely, narrow the gap between the Middle and the West, and realize the harmonious development of each area. The "Digital Divide" is caused by two factors, one is the difference in the number of regions, and the other is the influence of the digital economy. Through the study, it is found that the difference in digital development among different regions in China is increasing, and the digital impact of central manufacturing is becoming a "Central Collapse". By contrast, the Western and Central Manufacturing Sectors are growing larger and larger, creating a "Digital Divide". The manufacturing industry in the middle and west of China must eliminate the dependence on the traditional manufacturing industry and build up a new computer network using "counting in the East and counting in the West" to accelerate the digital transition and catch up on Chinese manufacturing.

## 5. Conclusion

Given the problems in this thesis, for example, the lack of micro-evidence, single effect mechanism, and unclear functional boundary,

the theory frame of digital technology's influence on manufacturing quality is analyzed. This paper discusses the problems and countermeasures of digital transformation as a driving mechanism for high-quality development in the manufacturing industry. Nevertheless, it corrects the deficiency of previous research. However, there are still a lot of questions worth further study. Emphasis is placed on the correlation between industry and industry, the impact of digitalization on the quality of manufacturing, and the influence of digital transformation on the global manufacturing value chain.

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