Research Article

Manufacturing Service Innovation and Foreign Trade Upgrade Model Based on Internet of Things and Industry 4.0

Ling Liu¹ and Ping Zhao²

¹School of Business Administration, Xinjiang University of Finance and Economics, Xinjiang 830012, Urumqy, China
²School of International Economics and Trade, Xinjiang University of Finance and Economics, Xinjiang 830012, Urumqy, China

Correspondence should be addressed to Ping Zhao; zhaoping@xjufe.edu.cn

Received 12 June 2022; Revised 22 July 2022; Accepted 26 July 2022; Published 1 September 2022

Academic Editor: Zaoli Yang

Copyright © 2022 Ling Liu and Ping Zhao. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

At present, the industrial Internet has gradually become a product of the integration of new generation of information technology and manufacturing. The development of the traditional manufacturing industry with transformation and upgrading faces various bottlenecks. These bottlenecks require the industry to make technological improvements through the concept of promoting sustainable development. At the same time, these issues also need intelligent support to match them. IoT technology can help enterprises realize product design and production, inspection and testing, risk early warning and post-sales, and other process links. The Internet of Things technology improved and innovated the industrial production process in the process. This technology has become the main means to promote industrialization and information integration, and it is an important basis for promoting manufacturing capabilities and networking forces. At present, the industrial Internet of our country is generally developing rapidly. However, this technology encountered many difficulties in the process of promoting discrete manufacturing and upgrading. There are still some difficulties in the entire technology landing application process. For example, there is still a significant gap in the breadth and depth of the Internet of Things applications. In particular, the value of data needs to strengthen. Based on the analysis of the risk solutions and development dilemma of artisanship, this article shows the benefits of the Internet of Things technology. Trend demand, practical application demand, production efficiency demand, after-sales service demand, and other aspects promote management innovation. This article first classifies the development of the industrial Internet in information transmission and development of the industry around the world. On this basis, this article has built a three-dimensional reference model for the industrial Internet to promote the transformation and upgrade of discrete manufacturing. In addition, this article proposes a strategy to promote the transformation and upgrade of discrete manufacturing. It includes three development stages: industrial Internet, industrial and commercial Internet, and industrial intelligence Internet. On this basis, the text explains the corresponding technical system and its challenges. Through the research results of this article, it provides theoretical guidance for the industrial Internet to promote the transformation and upgrade of discrete manufacturing.

1. Introduction

Process manufacturing is an important pillar of my country's economic development. This technology realizes the appreciation of raw materials by changing the properties of raw materials and produces useful and value-creating products. The Internet of Things technology originated in the late 1990s and was initially applied to the intelligent management of logistics systems. At present, with the continuous innovation and development of information technology, IoT technology has been widely used in material production processes. The Internet of Things interacts with network information such as people, things, and the environment. Based on this, my country's manufacturing industry can gradually form an intelligent production system with intelligent identification, screening, control, positioning, monitoring, and tracking [1–3]. This technology has changed the production methods, management concepts, and business ideas of traditional manufacturing industries. Through analysis, we can find that the systematic application
of IoT technology to process manufacturing, which is an important support for national economic development, is an innovative thinking of management concepts and management models. This technology helps to improve production efficiency, reduce production costs, and promote the sustainable and efficient development of enterprises [4–7]. It is also a new opportunity and new direction for the development of China’s traditional manufacturing industry.

Intelligent manufacturing is the main direction of global manufacturing development. Major developed countries in the world are vigorously promoting and implementing intelligent manufacturing technology. At present, the enthusiasm for the promotion of intelligent manufacturing technology on a global scale is unprecedentedly high. China’s industry needs actively promote the deep integration of the Internet and traditional industries, creating a new development format system. Especially in the service industry, the rise of platform economies based on the digital economy has given birth to new business models such as the network economy and sharing economy. This kind of innovation has triggered profound changes on the demand side and changes on the supply side, thus forming a strong pushback on the upgrading of the manufacturing industry. The concept of smart manufacturing has been around since the late 1980s [8–11]. Various countries have carried out research in many aspects around intelligent manufacturing technology. The research content involves the development and exploration of various aspects of intelligent manufacturing technology. Driven by economic globalization, the demand for global product markets continues to increase. Japan gave the concept of intelligent manufacturing system in 1989. Driven by the advancement of information technology, new scenarios, new formats, and new model innovations, the transformation and upgrading of traditional manufacturing has become inevitable. At the same time, the development of new-generation information technologies such as intelligent manufacturing, Internet of Things, big data, and artificial intelligence is becoming more and more mature. The application focus of the supply side of the manufacturing industry is constantly shifting, and the manufacturing industry will become the main battlefield for the digital economy to play the role of innovation driving and transformation and upgrading. This concept mainly refers to the environment for the integrated application of intelligent manufacturing technology. Various countries have carried out cooperative research on a global scale within 5 years around this technology. The United States began to implement a new technology policy as early as 1992. The United States focuses on developing various key technologies, including information technology, new manufacturing processes, and intelligent manufacturing [12–15]. The EU launched new R&D projects in 1994 on 39 key technologies. Some of these key technologies highlight the status of intelligent manufacturing technology. Countries not only focus on developing the basic technology of intelligent manufacturing but also actively carry out international cooperation and exchanges. In the current environment, the industrial division of labor and enterprise cooperation are deepening, and the R&D, design, manufacturing, operation management, and other activities of a single enterprise inextricably linked with other enterprises in the industrial chain. The actual development status of different manufacturing enterprises is different, and considering the driving effect of the digital economy on the transformation and upgrading of the manufacturing industry at the level of a single enterprise has limitations. Specifically, the major industrialized developed countries regard intelligent manufacturing as an important means to revive the manufacturing industry. After the financial crisis, countries around the world have been exploring solutions to the crisis [16–18]. Among them, governments and experts from countries such as the United States, Germany, and Japan proposed to use intelligent manufacturing technology to promote the rapid development of the manufacturing industry.

In 2011, the United States began to implement the “Advanced Manufacturing Partnership Program” centered on industrial robotics. In the following year, the United States launched the “National Strategic Plan for Advanced Manufacturing” [19–22]. Key elements of these plans are enhanced research and experimental (R&E) tax breaks. In addition, the integrated development of the digital economy and manufacturing will drive the latter to carry out all-round changes in production models, organizational forms, and value distribution. The industrial chain under this model also restructured. The plan can focus on strengthening and optimizing government investment and building a “smart” manufacturing technology platform. Through this platform, the innovation of related technologies will be promoted. In 2012, the U.S. Manufacturing Innovation Network was established. On this basis, the United States has established an innovative research institute for additive manufacturing. The United States has also established an information-based manufacturing and design innovation research institute accordingly. Germany actively promotes cooperation between the government, the Fraunhofer Institute, and local governments. These entities collaborate to implement manufacturing research across multiple industrial sectors [23–26]. The Internet of Things and Intelligent Manufacturing Technology Application Framework are shown in Figure 1.

2. The Overall Background of the Application of IoT Technology to Process Manufacturing

Since 2013, the world’s major industrialized developed countries have deployed in the field of artificial intelligence and successively issued a series of support policies for the development of artificial intelligence. According to the changing characteristics of the manufacturing industry in production, manufacturing divided into discrete manufacturing and process manufacturing.

2.1. The Urgent Need for Process Manufacturing to Eliminate Variable Risks. Japan is also actively developing new technologies such as collaborative robots and unmanned factories. These new technologies mainly used to improve the internationalization level of Japanese manufacturing.
Germany has implemented the "Industry 4.0" strategy, which takes intelligent manufacturing as the main body. This strategy guarantees Germany's dominant position in advanced manufacturing [23]. Process manufacturing mainly uses physical or chemical means to change the properties of raw materials and generate new forms. We need to accelerate the deep integration of the real economy such as the Internet, big data, artificial intelligence, and traditional manufacturing. We need to focus on intelligent manufacturing to promote industrial technological transformation and optimization and upgrading. We need to drive a fundamental shift in the manufacturing industry model and corporate shape. This production process is complex, with process series interrelated and independent at the same time. The individual process modules are different, but organized through a systematic manufacturing system. The system can form the total production unit in an orderly manner according to preset rules. In this unit set, the raw materials for production undergo qualitative changes and dissolve their original forms. The manufacturing process produces new materials and products that meet production goals. At the same time, process production has great variability in the process, and there are many constraints. In this production process, each independent production unit restrained from each other. Any problem in any link will lead to a decline in product quality [24]. Therefore, for the process manufacturing industry, the use of IoT technology can realize the dynamic control of the manufacturing process. Through the introduction of this technology, the variable risk greatly reduced. The role path of digital economy driving manufacturing upgrade is shown in Figure 2.

For a long time, China's process-based manufacturing companies have low profits and high factory inventories. The labor cost of each production plant is high. The production methods of these factories have transformed from the original B2B model to the B2M and C2M models. This development model has become an important topic and direction of national development. Under the current mode of integrated economic development, the digital economy takes digital knowledge and information as key production factors. The integrated development of traditional manufacturing and the real economy can give full play to its role in activation, innovation, and empowerment. The core of this development model lies in the application of a new generation of information technology in the real economy. These patterns eventually become low-volume, multi-variety patterns. This mode can refer to simply as the miniaturized production mode. This production model is more inclined to the production theory and technology model of the traditional planned economy period. The specific performance of this mode is that almost all manufacturing resources are statically allocated and independent of each other. The objects of production organization are mainly design units, manufacturing units, and logistics and equipment support units. There is a correspondence between the various branches of the manufacturing industry. Although this pattern has parallel characteristics, it is composed of isolated
individuals. The degree of synergy varies among individuals. In the process of manufacturing execution, different production organizations need to adjust the load of manufacturing resources at any time. However, the manufacturing system needs to change the above static relationship. The system needs to realize sharing among various subsystems. The system also needs to accelerate the innovation of manufacturing resources but cannot effectively provide organizational element resources at various levels.

2.2. The Demand for Intelligent Development of Process Manufacturing Factories. Based on this, the manufacturing industry can realize the university operation of the manufacturing system through the static binding of manufacturing resources. The explosive growth of the digital economy and its deep integration with the real economy are becoming mainstream in the industry. This development model has become an important driving force for the reform of the quality, efficiency, and power of China’s economic development. The implementation of the Internet of Things action plan has given full play to the advantages of Internet resource allocation optimization and integration. This technology also accelerates the penetration and application of information technology represented by the Internet in all lifestyles. This operation mode of manufacturing resources is also likely to cause bottlenecks in the operation of the entire system. Such a model would overload some manufacturing resources while others far from fully utilized. Therefore, this system organization model seriously restricts the implementation of the organization model among various production factors in the manufacturing industry. This paper solves the production problem of “small batch, multi-variety” process-based manufacturing enterprises by introducing the Internet of Things technology. Based on this, the system improves the production efficiency by implementing the information of the production process. Specifically, the system realizes the efficient operation of the manufacturing system through the digitization of manufacturing resources, the networking of the workshop environment, the software-based production scheduling, the integration of manufacturing execution, the paperless process, and the automation of logistics perception. Through continuous optimization, the system can change the current production capacity problem and realize the interconnection between people and things. Through this method, the system can improve the production capacity of the manufacturing industry to meet the requirements of market competition. Process-based manufacturing enterprises mainly realize the reprocessing and reoptimization of specific manufacturing processes through IoT data perception technology. The system strengthens the analysis and judgment of the manufacturing industry by means of information technology. Through this technology, the manufacturing industry can change various problems of the production process in

![Image](https://example.com/image.png)
the past. This technology can realize the digital, transparent, and intelligent transformation of the entire industry.

The calculation formula of information entropy of each node is as follows:

\[
\text{gain} = \text{info}(T) - \sum_{j=1}^{N\text{Class}} \frac{\text{freq}(C_j, T)}{|T|} \times \log_2\left(\frac{\text{freq}(C_j, T)}{|T|}\right).
\]

The calculation principle of local consistency is simple, mainly using Kendal Concorde coefficient, and the specific calculation formula is as follows:

\[
W = \frac{\sum(R_i)^2 - n(\bar{R})^2}{1/12K^2(n^3 - n)}
\]

The calculation formula of single-sample statistics is as follows:

\[
t = \frac{\bar{x} - \mu}{\delta_x/\sqrt{n - 1}}
\]

2.3. The Realistic Needs of the Process Manufacturing Industry to Break through the "Internet +" Development Dilemma. The core content of IoT technology is physical identification technology. The exchange of different material elements carried out based on the Internet of Things technology, and each exchange has its unique identification code. Combined with the conceptual connotation and evolution of the digital economy, the current research can summarize the connotation of the digital economy into the following three aspects: first, the core connotation of the digital economy lies in the application and empowerment of information technology in the real economy. The increasing complexity of economic and social activities makes the importance of information technology in modern economic activities more and more prominent. At the same time, the significant increase in the level of economic contribution of the second information sector is also a concrete manifestation of the role of information technology in the integration and application of innovation and empowerment. For the abovementioned exchange codes, there are usually two types: permanent and temporary. In the practice of the Internet of Things in process manufacturing, we need to deploy identifiable code devices and equipment sensors on the original objects of the Internet of Things. Such sensors include temperature sensors, humidity sensors, vibration sensors, ranging sensors, rotational speed sensors, flow sensors, and other types. In the field of process manufacturing and automation, many enterprises take DCS (distributed control system) as the main system model.

In order to ensure the accuracy of the results, this paper uses two evaluation indexes, mean absolute error and root mean square error, to evaluate the optimization effect of the model. The specific calculation formulas are as follows:

\[
\text{MAE} = \frac{1}{n} \sum_{i=1}^{n} |\hat{y}_i - y_i|
\]

\[
\text{RMSE} = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (\hat{y}_i - y_i)^2}.
\]

There are many ways to normalize data, but one common goal is to make data dimensionless between data. This paper summarizes the following data standardization methods based on several literatures:

Range transformation formula of cost index:

\[
y_{ij} = \frac{x_{ij} - \min_{i\in\{1,2,\cdots,n\}} x_{ij}}{\max_{i\in\{1,2,\cdots,n\}} x_{ij} - \min_{i\in\{1,2,\cdots,n\}} x_{ij}}
\]

The transformation formula of fixed indicators is as follows:

\[
y_{ij} = \begin{cases} 
\min_{i\in\{1,2,\cdots,n\}} x_{ij} - a_j & x_{ij} \neq a_j \\
\frac{|x_{ij} - a_j|}{x_{ij}} & x_{ij} = a_j.
\end{cases}
\]

The smaller the MAE value is, the higher the prediction quality is. Suppose there are \( n \) items in the system, the score set predicted by the algorithm is \( \{p_1, p_2, \cdots, p_n\} \), and the corresponding actual score set is \( \{r_1, r_2, \cdots, r_n\} \). MAE calculation formula is as follows:

\[
\text{MAE} = \frac{\sum_{i=1}^{n} |p_{ui} - q_{ui}|}{N}
\]

Coverage index calculates the ratio of predicted items to all unscored items, to measure the comprehensiveness of prediction. Assuming that \( h \) items are predicted, the calculation method of coverage is as follows:

\[
\text{Cov} = \frac{h}{n}
\]

Recall index is also used to evaluate the system effect in the field of information retrieval. The larger the Recall value is, the better the recommendation quality of the algorithm is.

\[
\text{recall} = \frac{\text{Hits}}{\text{Total}} = \frac{|\text{test} \cap \text{Top} - N|}{|\text{test}|}
\]

In order to verify the clustering effect of user attributes, the contour coefficient \( S \) is used to evaluate the clustering result, and the specific expression is as follows:

\[
S(i) = \frac{b(i) - a(i)}{\max{a(i), b(i)}}
\]

These indicators \( a(i) \) and \( b(i) \) represent the average distance in its cluster. The direct trust between the two is as follows:

\[
\text{DTrust} (a, b) = \frac{|I_a \cap I_b|}{|I_a \cup I_b|}
\]
Finally, the system achieves centralized monitoring of the manufacturing workshop in the form of an enterprise industrial bus. Second, the digital economy is a technological economic paradigm dominated by information technology. The essence of the digital economy is to lead the digital transformation of the economy with new digital technologies such as big data, cloud computing, and the Internet of Things. Digital new technologies can not only improve the efficiency of information transmission and total factor productivity but also open up new space for economic growth based on its own fundamental and spillover characteristics. This technology can lead to new changes in economic activities, thereby changing people’s production and way of life. The system combines the application of Internet of Things technology through the goal of decentralized control. This approach offers significant improvements in planning, production, logistics, quality, and more relative to other approaches in the manufacturing industry. “Internet + manufacturing” is the core embodiment of the integration technology of information and industrialization. This method applies the Internet to every link of the manufacturing value chain and applies Internet innovations to the entire manufacturing field. Finally, the digital economy is an economic and social form. The digital economy is a more advanced economic and social form after the agricultural economy and the industrial economy. In the economic and social form of the digital economy, data have become a new core production factor. The means of data information transmission has become the key to determining the level of productivity and has also become the representative of advanced productivity. In addition, digitized knowledge, information, and the application of new digital technologies have become an important driving force for the evolution of economic and social forms to advanced dynamics. Every link of “Internet + manufacturing” focused on information technologies such as the Internet, cloud computing, and big data, and intelligent manufacturing carried out through system integration. The model diagram of the industrial Internet to promote the transformation and upgrading of discrete manufacturing is shown in Figure 3.

3. Effective Application of IoT Technology in Process Manufacturing

The system provides technical support for manufacturing production through industrial big data processing, intelligent decision-making, and other technologies. Through the application of sensing technologies such as the Internet of Things and sensor networks, we have realized real-time monitoring and adjustment of the manufacturing process network. In addition, cloud computing and big data technologies satisfy the processing and analysis of massive industrial data. In terms of specific application methods, the flexible and agile production method is a flexible way for manufacturers to respond to market demands. Through continuous breakthroughs in new-generation digital information technologies such as big data, artificial intelligence, the Internet of Things, and cloud computing, the acceleration of the digital economy has led to changes in social production methods. The digital economy also promotes the development and morphological evolution of the economy and society. Enterprises need further exploit the natural advantages of digital elements such as replicable, sharable, and unlimited growth. This model can meet the needs and response capabilities of customers in a timely and effective manner by flexibly adjusting the production scale. Customers’ needs change rapidly, and enterprises need to be flexibly adjusted to their needs. By adjusting their industrial structure in a timely manner, enterprises can eventually occupy a place in the market. Through rapid innovation and rapid supply, enterprises can effectively respond to rapid changes in the market. This kind of enterprise production mode can reduce the cost of enterprise production and make the enterprise obtain greater benefits.

3.1. The Role of IoT Technology in Process Manufacturing.

The new model of “Internet + manufacturing” allows companies accurately predict market consumer demand. This model establishes a dynamic complementary relationship between producers, sellers, and e-commerce buyers through information processing technology. The “Internet + manufacturing” model takes information and data resources as the elements to carry out the optimization iteration of the intelligent manufacturing system. This model specifically represented by the interconnection, which combines the new generation of information technology with all aspects of the manufacturing industry. The comparison of the combination of IoT and 5G communication technology applications is shown in Figure 4.

This technology model can create application systems such as smart factories, digital workshops, industrial robots, and smart logistics. The new digital technology needs to strengthen the penetration and integration in the production and manufacturing activities. This technological model has brought great changes to a series of activities such as manufacturing, business operations, and sales management in traditional manufacturing industries. In the historical category of the digital economy, data resources have become a new core production factor, and the organization and application of data resources and knowledge-mining capabilities have become the key. Digital infrastructure, new digital technologies, and industrial organization models have become the core connotations of the new digital economic system. The essence of intelligent manufacturing is to realize the transformation and upgrading of the manufacturing industry. The transformation path of the manufacturing industry is the transition from a resource-driven model to an information-driven model. This path of transformation and development can realize the interconnection of enterprises, factories, workshop machines and equipment, people, and the Internet. The comparison of the application of IoT and 5G communication technology in different manufacturing systems is shown in Figure 5.

This model can realize the greening of manufacturing in the manufacturing system. This model can also promote the fusion of the physical world and the information world. This paper comprehensively considers the relationship between the manufacturing process and the sustainable development of environmental resources. This paper analyzes the factors...
affecting the transformation and upgrading of China’s manufacturing industry in the context of artificial intelligence, mainly including external and internal factors. This paper expounds the different mechanisms of artificial intelligence technology to promote the transformation and upgrading of the manufacturing industry. This paper clarifies the process and goals of the transformation and upgrading of China’s manufacturing industry in the context of artificial intelligence. This paper further uses green manufacturing and the Internet as tools to create a channel service-oriented manufacturing system. This development model constitutes the focus and direction of the development of the manufacturing model in the “Internet +” era. The comparison of collaborative methods between IoT technology and industrial chain transformation and upgrading is shown in Figure 6.

The continuous improvement of the automation level of process manufacturing has realized the transformation from partial process automation to whole process automation. This model reduces the production cost of enterprises to a certain extent. This model also guarantees the quality of enterprise products.

3.2. IoT Technology Brings High Efficiency to Process Manufacturing. This paper analyzes the network manufacturing mode represented by the Internet of Things and effectively connects the sensing equipment with the control center. The intelligent manufacturing system realizes information acquisition and information processing by sensing the external environment and promotes the improvement of the automation degree of manufacturing production. The Internet of Things has the characteristics of large application span, long production chain, and high technology integration. The Internet of Things is also a key technology for the transformation and upgrading of the manufacturing industry. For example, in the iconic industrial process and manufacturing process, each link needs to identify the detail. The comparison of the combination of intelligent manufacturing promotion technology and physical network technology is shown in Figure 7.

Specifically, the system focuses on the elements of the pipeline process, such as pumps, valves, and electronic flow meters, to standardize the main control equipment. These goals mainly include the optimization of the internal structure of the manufacturing industry and the improvement of the
The integration of traditional industries and the Internet has deepened. "Internet +" technology continues to promote the intelligent development of the manufacturing industry in terms of products, equipment, processes, management, and services. This paper deeply studies the main connotation and characteristics of "Internet +" technology. The article attempts to reveal the integration mechanism of "Internet +" and manufacturing. The article clarifies the breakthrough in the process. Based on this, the system realizes the extended application of this technology in the manufacturing field by setting up the feedback control system of the infrastructure equipment. The comparative analysis of Internet collaborative manufacturing technology and industry 4.0 collaborative combination is shown in Figure 9.

3.3. IoT Technology Realizes the Whole Process of Intelligent Production. In addition, the flexible and agile production model will effectively be implemented according to customer needs. This implementation method mainly uses information technologies such as the Internet, cloud computing, big data, and the Internet of Things effectively connect various systems. This approach combines customer needs with aspects of manufacturing production, operations, people, equipment, marketing, and more. The level of digitization in China’s service industry has now increased significantly. However, there is still a large gap in the level of digitalization between different types of service industries in China. In general, China should strengthen investment and construction of digital infrastructure. China should accelerate the application of technology in the commercial field and enhance the capabilities of digital infrastructure services. China needs to actively participate in the setting of global technical standards. In addition, this method can carry out technological innovation of enterprises through Internet innovation methods. This method rationally organizes enterprise demand and market demand through customer orders. The “Internet +” model helps enterprises to conduct trial production and trial sales through small batch orders, thereby providing a supportive platform for market demand. The comparison of the synergistic combination of manufacturing transformation and upgrading and Industry 4.0 is shown in Figure 10.

At present, the combination of the "Internet +" era and the transformation and upgrading needs of China’s manufacturing industry has shown broad market prospects. China is in the "Internet +" era, and the country is at a critical moment when an industrial power is moving towards an industrial power. The Chinese government needs to play a guiding and promoting role, increase policy support, and make the development of the manufacturing industry in a good environment. At the same time, enterprises should grasp development opportunities based on sorting out the transformation and upgrading path of the manufacturing industry and use the Internet to promote the transformation and upgrading of traditional manufacturing industries. The performance differentiation analysis of different industrialized manufacturing platforms is shown in Figure 11.

The system improves production safety through production monitoring and preventive equipment maintenance treatment. Based on this, the system guarantees the production safety of the factory. The Internet of Things is the source and foundation of field data in the production process. At the same time, the Internet of Things and Industry 4.0 are also the supporting contents of CPS. The system collects data, analyzes, and calculates real-time data.
point and application mode of the new generation of information network technology. The article analyzes the production operation, organizational structure, and competitive performance of manufacturing enterprises. This paper further analyzes the foreign models and experiences of using “Internet +” to transform the manufacturing industry. The article analyzes the main ways in which “Internet +” technology transforms the manufacturing industry. On this basis, this paper sorts out the combination point and development path of this technology. In addition, this paper puts forward relevant policy suggestions for the deep integration of the Internet and China’s manufacturing industry. “Internet +” represents the deep integration of a new generation of information technology and manufacturing.

This fusion can generate enormous room for change. The essence of “Internet +” technology is the penetration of a new generation of information technology into traditional manufacturing. Through penetration and integration between the Internet and various economic sectors, the production mode of the entire economy has changed. This technology has changed the format and business model of the industry. The technology increases the innovation capacity and productivity of the economy. As a general technological change, the innovation process caused by “Internet +” technology is gradually changing. Through gradual changes in the dimensions of technology, products, industries, and models, the Internet has led to a complete change in the technological paradigm.

Figure 6: The comparison of collaborative methods between IoT technology and industrial chain transformation and upgrading.

Figure 7: The comparison of the combination of intelligent manufacturing promotion technology and physical network technology.
3.4. IoT Technology Realizes After-Sales Guarantee without Dead Ends. Enterprises also need to actively respond to foreign competition and strengthen international cooperation. In the Internet and big data environments where information rapidly transmitted, enterprises need to obtain information quickly and strengthen their data analysis capabilities. The improvement of data analysis capabilities of enterprises can help them seize the commanding heights of manufacturing development. Through relevant policies, the state encourages Chinese manufacturing enterprises actively respond to the challenges of market transformation and upgrading. The government actively promotes and rewards demonstration enterprises. The country forms experiences and models by summarizing relevant content in a timely manner. In this way, the state supports the innovative application of Internet technology achievements and the transformation and upgrading of the manufacturing industry. In addition, the government should adopt an open strategy to strengthen technical exchanges and cooperation with other countries. The state encourages enterprises to go global and supports enterprises to develop research bases overseas. Countries need to use the Internet to strengthen close cooperation with countries around the world. The state obtains information in this way and improves the independent innovation ability of enterprises.
4. Conclusion

4.1. The Deep Integration of IoT and Industry 4.0 Technologies Is the New Direction of Manufacturing. First, the government needs to play the role of guiding, promoting, and supporting. The government needs to enhance the vitality of the physical mechanism and innovate the management ability of the system and mechanism. For traditional manufacturing enterprises, the focus of enterprises is not whether they should transform to the Internet. Companies need to focus on how manufacturing is transforming. Although the government has always attached great importance to the transformation and upgrading of the manufacturing industry, the government has also formulated many policies and systems that are effective in the development and growth of the country’s manufacturing industry. However, with the continuous changes in the manufacturing environment at home and abroad, my country’s manufacturing industry is also facing many new contradictions and challenges in the process of development and transformation. There are structural contradictions in the entire manufacturing environment. The bottleneck constraints of the manufacturing industry have fully manifested. Enterprises should update the development model as soon as possible, adjust the industrial structure, and promote the comprehensive upgrading of my country’s manufacturing industry. On this basis, the manufacturing industry needs to enhance its own innovation vitality based on the core technology of the Internet. Our country also needs further strengthen the reform of the system and mechanism.

From the perspective of industrial development and innovation system, the result of industrial integration is the emergence of new industrial growth points. Manufacturing is the soil and carrier of technological innovation. The traditional development model of China’s manufacturing industry and the development of manufacturing industry are facing bottlenecks. Industrial development urgently needs an innovation-driven transformation response. “Internet +” promotes the upgrading of the manufacturing industry, and the state should emphasize the innovation and breakthrough of general technology. This process focuses on the adjustment and optimization of the industrial structure. This article further examines the practices of the United States, Germany, Japan, and other countries. This paper promotes the practice of “Internet + manufacturing” development. All major industrialized countries in the world regard intelligent manufacturing, Internet of Things, and big data analysis technologies as the only way to improve the competitiveness of their manufacturing industries. Various countries use various measures to speed up the information process of their own manufacturing industries. China uses “Internet +” to promote the transformation and upgrading of China’s manufacturing industry. China should make better use of its own resources and capabilities to build China’s unique information network system.

4.2. The Data and Information Resources Become the Main Content of Intelligent Manufacturing. To this end, the government should further transform its functions, streamline administration and delegate power, deepen the
reform of the administrative examination and approval system, and improve management efficiency. In addition, the state should carry out the related innovation system reform and tax system reform related to the transformation and upgrading of the manufacturing industry. The state needs to formulate the relevant legal system and regulatory system for the reform of state-owned enterprises. The country needs to implement the construction and improvement of these systems.

The country stimulates the development vitality of manufacturing enterprises through this form. The state further strengthens the construction and prevention of network security. The extensive development and application of Internet technology is like a double-edged sword, and Internet technology brings huge profits to the development of enterprises. Internet technology can also hinder the healthy development of businesses and entire industries. The government needs to further strengthen the strategic research on network security and strengthen the management of network security. These policies can guarantee the orderly development of new technologies and new businesses. China needs to increase its support for network information centers and talent finance and innovate the network supervision mechanism. The government should warn against behaviors that violate consumer interests and violate cyber health and safety rules. In the era of “Internet +”, the government has created a favorable network environment for the transformation and upgrading of the national manufacturing industry.

**Data Availability**

The dataset can be accessed upon request.

**Conflicts of Interest**

The authors declare that there are no conflicts of interest.

**Acknowledgments**

The authors thank the financial support by “National Social Science Fund Project-General Project” No.19BGL260 “Research on Place-of-Origin Effect of Agriculture Products in the Context of E-commerce and the Path of Promoting Poverty Alleviation in Southern Xinjiang.” National Social Science Fund project-General Project No.20BGL020 “Research on High-quality Development of Logistics Industry in Xinjiang Based on Spatial Agglomeration of Logistics Industry.”

**References**


