

The Mechanism of Digital Economy in Promoting the Transformation and Upgrading of China's Manufacturing Industry

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Abstract: The era of China's digital economy has arrived, Chinese government is actively exploring how to use the technological changes brought about by the digital economy to promote China's economic development in the next 30 years. As the pillar industry of China's economy, manufacturing has maintained rapid growth in the past 30 years and has made great contributions to China's economic development. However, there are also many challenges at present, such as, China's manufacturing industry is at the low end of the global industrial chain, and the added value is very low; Backward technology and poor competitiveness in the international market. In this context, this paper analyzes the impact of the digital economy on the transformation and upgrading of the manufacturing industry from a qualitative perspective, attempts to explore the way how China's manufacturing industry can use digital technology to achieve intelligent transformation, value chain upgrading, and industrial structure upgrading, so as to achieve comprehensive transformation and upgrading, in the end, gain long-term development momentum.

Keywords: Digital Economy, China's Manufacturing Industry, Transformation and Upgrading of Manufacturing Industry.

1. Introduction

The digital economy is a new economic form after the agricultural and industrial economic forms. On May 22, 2020, former Chinese Premier Li Keqiang clearly pointed out in the government work report: "Promote the upgrading of the manufacturing industry and the development of emerging industries, develop the industrial Internet, and promote intelligent manufacturing. Government will continue to introduce supportive policies, comprehensively promote 'Internet+', and create new advantages in the digital economy." (Li Keqiang, 2020) This indicates that promoting the sustained and rapid development of the digital economy has become an important direction of China's economic development in the future. Manufacturing is an important foundation of the national economy. It is necessary to use digital technology to deeply implement the industrial Internet innovation and development strategy, systematically promote the construction of industrial Internet infrastructure and data resource management system, and give full play to the role of data as a basic resource and innovation engine. (Xi Jinping, 2023) With the help of the digital economy, promoting the transformation and upgrading of the manufacturing industry is an inevitable choice for China to further enhance the status of the global value chain and the competitiveness of economic development, which is of great practical significance to achieve the goal of "Made in China 2025" and promote high-quality economic development.

2. The Meaning of The Digital Economy and The Development of China's Digital Economy

2.1. Meaning of Digital Economy

In 1996, Don Tapscott, a well-known scholar in the field of economics in the United States, first proposed the concept of "digital economy", (Don Tapscott, 1996) which opened the

curtain of digital economy research in the world. After more than 20 years of development, the digital economy has gradually evolved from the initial development trend of the information industry to the third type of economic form that likes the agricultural economy and industrial economy. (Wang weiling, Wang jing, 2019) According to the concept defined in the G20 Digital Economy Development and Cooperation Initiative, The digital economy refers to "a series of economic activities that use digital knowledge and information as key production factors, modern information networks as important carriers, and the effective use of information and communication technologies (ICTs) to improve efficiency and optimize the economic structure". (G20, 2016) With the in-depth development of the digital economy, its extension continues to evolve. From a narrow perspective, the digital economy mainly relies on digital technology to make a large amount of digital information a new factor of production, and then uses new factors of production for production and management, so as to fully release the value of data information and make it a new driving force for economic development. From a broad perspective, the digital economy refers to the economic process of fully integrating industry and digital technology to improve efficiency. In this process, sufficient data information and efficient digital technology can greatly improve the production and operation efficiency of traditional industries, and can also effectively reduce the production costs and risks of enterprise.

2.2. Current Status of China's Digital Economy

China's digital economy started relatively late, but it is developing rapidly. After China put forward the concept of "Internet+" around 2015, at the G20 Hangzhou Summit in 2016, the Chinese government elevated the concept of digital economy to a strategic position for the first time, and issued the "Outline of the Informatization Strategic Plan" in the same year. In the 2017, government work report, the expression

"promoting the accelerated growth of the digital economy" was put forward for the first time. At the meeting of the Political Bureau of the Central Committee held on January 30, 2018, President Xi Jinping proposed to " We will make every effort to develop the real economy, accelerate the development of advanced manufacturing, and promote the deep integration of technologies such as the Internet, big data, and artificial intelligence with the real economy ", He pointed out the direction for the rapid development of China's digital economy.

With the in-depth application of mobile Internet, big data, blockchain and other technologies in various industries, the

digital economy continues to maintain an upward trend. In 2020, under the outbreak of the global epidemic, China's GDP exceeded 100 billion yuan, an increase of 2.3% compared to the same period of the previous year,, becoming the only positive growth economy in the world, mainly due to the digital economy. (China Academy of Information and Communications Technology, 2020) In 2022, the scale of China's digital economy reached 50.2 trillion yuan, ranking second in the world, with the growth of 10.3% , and its share of GDP increased to 41.5%.(Cyberspace Administration of China, 2022). we can see from Figure 1, China's digital economy is growing rapidly.

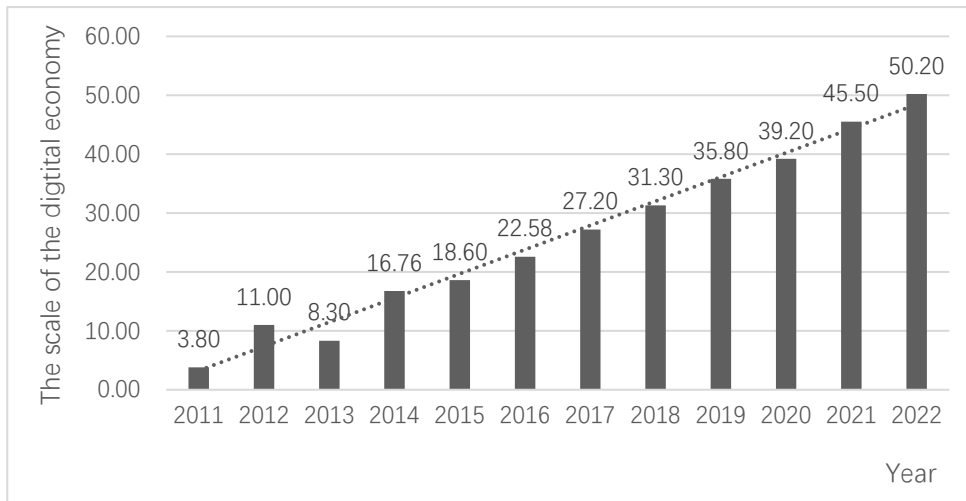


Figure 1. 2011-2022 The size of China's digital economy (trillion Yuan)

3. The Development Status and Existing Problems of China's Manufacturing Industry

3.1. Development Status

Manufacturing is the backbone of China's economy. Since 1978, China's manufacturing industry has entered a stage of rapid development. The development process can be roughly divided into four stages. The first stage, from 1978 to the early 90s of the 20th century, the manufacturing system was basically completed, mainly heavy industry; the second stage, from the early 90s of the 20th century to the end of the 90s of

the 20th century, a large amount of foreign capital and private capital were introduced, and the manufacturing industry developed rapidly; the third stage, at the beginning of the 21st century, China's accession to the WTO made China's manufacturing industry successfully integrate into the global value chain. In the fourth stage, from 2018 to the present, the manufacturing industry has developed in an all-round way, more than 200 industrial industries rank first in the world. This is enough to highlight the prominent position and important role of the manufacturing industry in China's economic system. we can see from Figure 2, the contribution of China's manufacturing sector to GDP has been consistently higher than 30%.

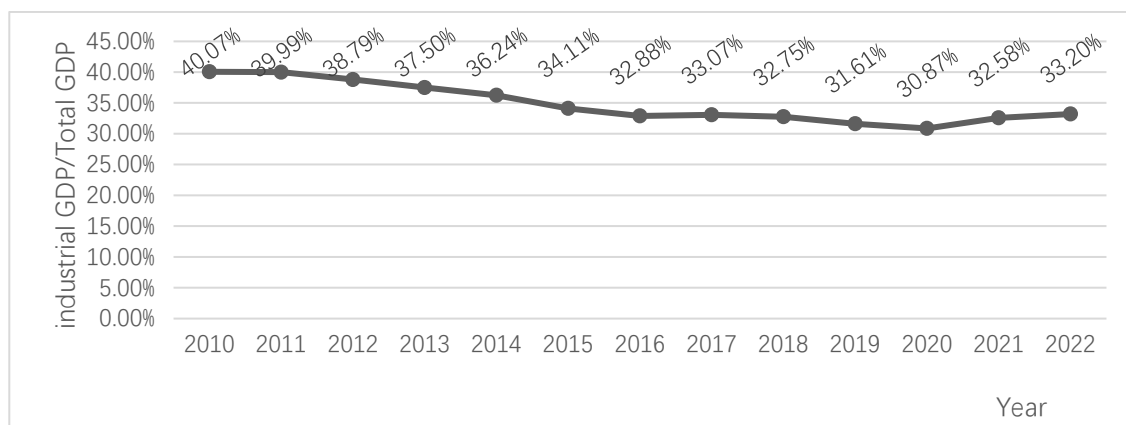


Figure 2. 2010-2022 Industrial GDP/Total GDP in China

3.2. Existing Problems

Although China's manufacturing industry has made

remarkable achievements, it is still facing factors such as technology, factors, internal and external environment in the process of continuous development

First, "Big but not strong". From the perspective of industrial status, although the development scale of China's manufacturing industry has ranked first in the world for many years, the embarrassing situation of low status of the global value chain (GVC) has not been broken. This shows that although China's manufacturing industry is highly involved in the international division of labor system, it is still in a low-end position. Specifically, the proportion of high-tech industries in the entire manufacturing industry is low, currently only reaching about 18.2%. The supply of high-quality, high-performance, and high-value-added products is slightly insufficient.

Second, the level of innovation is relatively backward. In 2022, China's investment in basic research and development accounted for only 6%, while the United States and France reached 19% and 26.3% in 2010. There are few high-tech talents in China's enterprises, and the proportion of high-skilled talents in skilled talents is about 30%, and there is a large talent gap. That makes it difficult for China to build an integrated innovation and development system in the short term. (Chen Jin, 2018)

Third, the industrial chain and the innovation chain are not well coordinated. In the field of traditional manufacturing, many enterprises only regard scientific and technological innovation as an auxiliary tool for production and operation, ignoring the key role of the new generation of scientific and technological change in the upgrading of the industrial chain, which leads to the poor connection between the industrial chain and the innovation chain, and the disconnection between technical basic research and industrialization practice. At present, 36.7% of China's large-scale industrial enterprises carry out R&D activities, which is a low percentage.

4. The Mechanism of The Digital Economy to Promote the Transformation and Upgrading of The Manufacturing Industry

4.1. The Mechanism of Digital Technology Innovation to Promote the Transformation and Upgrading of The Manufacturing Industry

4.1.1. Technological Innovation Promotes the Upgrading of The Manufacturing Value Chain

4.1.1.1 Process Upgrade

Automation and intelligence. Digital technology can realize the automation and intelligence of the manufacturing production process, and improve production efficiency and quality. Through data analysis and optimization, enterprises can precisely control the production process, reduce waste, reduce energy consumption, and improve production efficiency. For example, through intelligent robots and automated equipment, companies can reduce manual intervention and reduce production costs.

4.1.1.2 Product Upgrades

Personalization and customization. Digital technology enables companies to tailor production to customer needs. Through data analysis and user behavior research, enterprises can better understand customer needs, provide personalized products and services, and increase product added value.

4.1.1.3 Department Collaboration Upgrade

Cross-departmental collaboration. Digital technology can

help businesses collaborate and share information across departments. Through the digital management system and platform, all departments can understand the production progress, inventory, customer demand and other information in real time, and improve the efficiency of collaboration.

Supply chain collaboration. Digital technologies can help companies achieve coordinated relationships with suppliers and customers. Through the digital supply chain management system, enterprises can understand the supply status of suppliers, customer order demand and other information in real time, optimize supply chain management, and reduce inventory costs.

4.1.2. Technological Innovation Promotes the Intelligence of The Manufacturing Industry

4.1.2.1 Intelligent Production

Predictive maintenance. Digital technology enables real-time monitoring of equipment and predicts the maintenance needs of equipment. By analyzing equipment operating data, companies can identify potential problems before they occur, avoid production interruptions, and reduce maintenance costs.

4.1.2.2 Intelligent Service

Online support. Digital technology enables businesses to provide real-time online support services. Customers can query product information and submit service requests through the online platform, and enterprises can respond quickly and provide solutions.

Remote service. Technologies such as the Internet of Things and cloud computing, which allow businesses to carry out remote service and maintenance. This reduces the need for on-site service, lowers service costs, and increases customer satisfaction.

4.1.2.3 Intelligent Operation

Human resource management. Digital technology can help enterprises realize intelligent human resource management. For example, with data analytics tools, businesses can recruit, train, and manage employees more effectively.

Financial management. Through an automated and intelligent financial management system, enterprises can carry out financial management and cost control more efficiently. This helps to improve the economic efficiency and competitiveness of the enterprise.

4.1.3. Technological Innovation Promotes the Upgrading of The Industrial Structure of The Manufacturing Industry

4.1.3.1 Create New Industries

New products and services. Digital technologies can give rise to new products and services. For example, technologies such as the Internet of Things, artificial intelligence, and big data have provided new products and services for the manufacturing industry, such as smart manufacturing, personalized customization, etc.

New business models. Digital technology can drive business model innovation in the manufacturing industry. For example, through e-commerce and digital marketing, manufacturing companies can interact more directly with consumers and offer more personalized products and services.

4.1.3.2 Reform Old Industries

Reform of the mode of production. Digital technology can change the traditional production mode and realize automated and intelligent production. This can improve production efficiency, reduce costs, and improve product quality.

4.1.3.3 Supply and Demand Structure Upgrade

Upgrading of demand structure. Digital technology can

better meet the individual needs of consumers. Through data analysis and user behavior research, companies can better understand market demand and provide products and services that are more in line with consumer needs. This can drive market demand to a higher level.

Upgrading of the supply structure. Digital technologies

can improve the quality of supply in the manufacturing industry. Through intelligent production and refined management, enterprises can improve product quality, reduce costs and improve supply efficiency. This can promote the upgrading of the supply structure of the manufacturing industry.

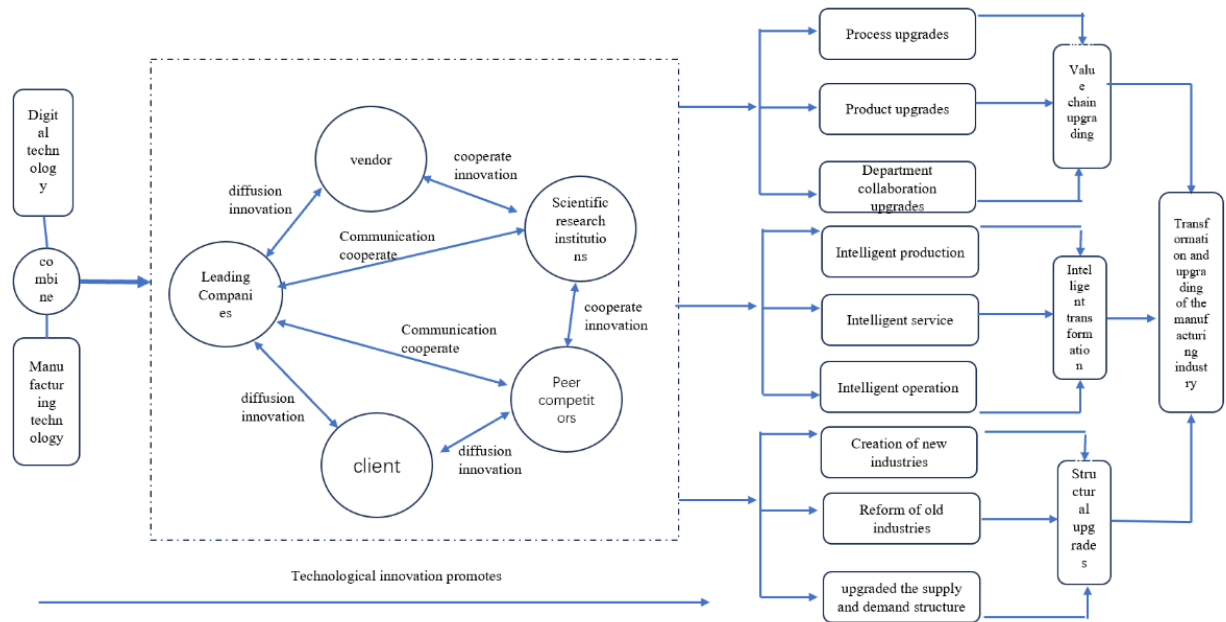


Figure 3. The mechanism of technological innovation to promote the transformation and upgrading of the manufacturing industry

4.2. The Mechanism of Digital Element Innovation to Promote the Transformation and Upgrading of The Manufacturing Industry

4.2.1. Digital Element Innovation Promotes the Upgrading of The Value Chain

4.2.1.1 Improve the Utilization Rate of Raw Materials

Through digital technology, manufacturing companies can more accurately predict and plan the demand for raw materials and reduce inventory costs. At the same time, digital technology can help enterprises achieve refined management, improve the efficiency of raw material utilization in the production process, and reduce waste. This not only reduces production costs, but also helps to reduce the environmental burden.

4.2.1.2 Promote the Sharing of Digital Infrastructure

Through cloud computing and Internet of Things technology, enterprises can share production equipment, warehousing facilities and logistics resources to improve resource utilization efficiency. This sharing model not only reduces the operating costs of enterprises, but also helps to promote collaboration between enterprises and promote the development of industrial clusters.

4.2.1.3 Enhance the Added Value of Products

On one hand, digital technology can help enterprises to innovate in product design and functionality, and provide products that are more in line with market demand. On the other hand, digital technology can improve the intelligence and personalization of products, and increase the uniqueness and competitiveness of products. For example, smart home products and wearable devices have benefited from the

support of digital technology to achieve an increase in the added value of products.

4.2.2. Digital Element Innovation Promotes Intelligent Transformation

4.2.2.1 Intelligent Production

Automation and intelligent production. Digital elements promote the automation and intelligence of the manufacturing production process through the introduction of advanced automation equipment and intelligent systems. For example, the application of industrial robots, automated production lines and other equipment can greatly improve production efficiency and quality, and reduce labor costs.

Data-driven decision-making. Digital elements provide a wealth of real-time production data, and through data analysis, companies can better understand the production process, identify potential problems, and optimize the production process. This helps to achieve refined production and further improve production efficiency.

4.2.2.2 Intelligent Management

Supply chain optimization. Digital elements can realize the digital management of the supply chain, monitor suppliers, inventory and logistics information in real time, optimize the supply chain process, reduce inventory costs, and improve logistics efficiency. This helps to improve the operational efficiency and competitiveness of the enterprise.

4.2.2.3 Intelligent Operation

Information management. Through the introduction of information management system, digital elements have realized the rapid circulation and sharing of information within manufacturing enterprises. This helps to improve management efficiency and strengthen synergy between departments.

4.2.3. Digital Element Innovation Promotes the Upgrading of Industrial Structure

4.2.3.1 Increased Technology Intensity

Driven by technological innovation. By promoting technological innovation, digital elements promote the development of industrial structure to a higher level of technology intensity. Digital technology provides enterprises with powerful R&D tools and innovation platforms, and stimulates the vitality of technology R&D and innovation, Ultimately improves the technical content and added value of products.

4.2.3.2 Labor Productivity Improvement

Automation and intelligence. Digital elements have driven the automation and intelligence of the manufacturing industry, reducing the dependence on labor in the production process. Through the application of automation equipment and intelligent systems, enterprises can reduce labor costs, improve production efficiency, and then improve labor productivity.

Skill upgrading. The development of digital elements has also led to the upgrading of workers' skills. In order to meet the needs of intelligent production, workers need to continuously learn and master new technologies and skills, which will help improve their labor productivity.

4.2.3.3 Return on Capital Increased

Efficient resource allocation. Through technologies such as big data and cloud computing, digital elements have realized the accurate allocation and efficient utilization of resources. Companies can better understand market demands and consumer behavior, optimize product design and production processes, and improve return on capital.

Business model innovation. Digital elements drive innovation in business models, providing businesses with new revenue channels and growth opportunities. For example, through e-commerce and digital marketing, companies can expand their sales channels, increase brand presence, and increase their return on capital.

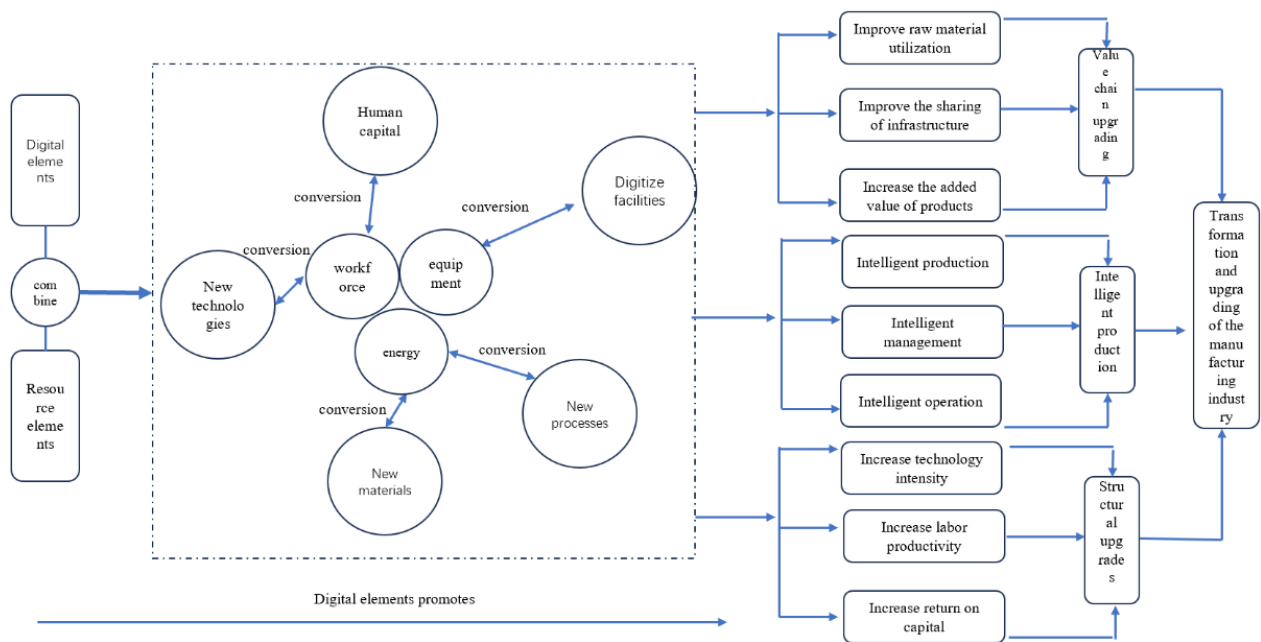


Figure 4. The mechanism of digital elements to promote the transformation and upgrading of the manufacturing industry

5. Policy Recommendations

5.1. Government Policy Support for The Development of The Digital Economy

R&D investment and public infrastructure construction play the most obvious role in the promotion of technological innovation capabilities in the manufacturing industry, and are the foundation of enterprise technological innovation, so increasing investment in enterprise R&D funds and accelerating the construction of digital infrastructure is an indispensable support policy. At the same time, through a series of policy measures such as tax incentives, financial subsidies, low-interest loans, joint investment and risk sharing, Guide enterprises to invest limited resources in technological innovation, and promote enterprises to carry out more research and development activities based on independent innovation.

Digital assets are the core competitiveness of enterprises

in the digital economy era, It should be fully protected. Therefore, the government should strengthen data security, establish data security management systems, laws and regulations, and ensure that enterprises can handle data legally and safely in the process of digital transformation.

5.2. Cultivating The Digital Skills of The Workforce

From the perspective of cultivating talents in colleges and universities, colleges and universities should adjust majors or courses related to digital economy, digital technology, artificial intelligence, etc., to ensure that the teaching content keeps pace with the times, so that students can master the basic knowledge and skills of digital R&D and application; Cooperating with digital technology companies to provide students with practical opportunities to enhance their practical operation and problem-solving skills; improving the quality of teachers, train and introduce teachers with digital technology background, and improve the digital technology

level of the teaching team so that they can better guide students.

From the perspective of enterprise skills training, enterprises should set up a long-term plan for talent training to provide more learning and participation opportunities from both theoretical and practical aspects. At the same time, companies should set up incentive mechanisms to encourage salary increases and job promotions for workers who take the initiative to improve their skills.

5.3. Cultivate an Innovative Organizational Culture

Enterprises should advocate the cultural atmosphere of openness, innovation, cooperation, encourage employees to actively embrace digital transformation, cultivate employees' digital thinking, apply digital technology to all aspects of the enterprise, provide trial and error space and fault tolerance mechanism; strengthen internal communication and collaboration, break down departmental barriers, form a cross-departmental collaboration work model, improve work efficiency; strengthen external cooperation, actively cooperate with external partners, integrate resources, and develop together, cultivate a customer-oriented culture, pursue excellence, pay attention to details and quality, continuously improve product quality and production efficiency, always be guided by customer needs, and

continuously improve customer experience and service quality.

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