

Research on the Path of Digital Economy Empowering the Green Transformation and Upgrading of Jiangsu's Manufacturing Industry

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Abstract: In the era of digital economy, digital technology has become an important force in promoting industrial upgrading. As a pillar industry in Jiangsu, manufacturing plays an important role in promoting Jiangsu's economic development. With the proposal of the "dual carbon" goal, how to enable the digital economy to empower the green transformation and upgrading of Jiangsu's manufacturing industry has become a common concern in the industry. In view of a series of problems currently existing in Jiangsu's manufacturing industry, including the imbalance of regional digital economic development, low integration of digital economy and manufacturing, and "stuck" key core technologies, it is proposed to increase financial investment support, enhance digital innovation, and Strengthening the research and development of key core technologies will be the path to comprehensively enhance the green manufacturing capabilities of Jiangsu's manufacturing industry and deepen digital technology empowerment.

Keywords: Digital economy, Green transformation and upgrading, Manufacturing, Jiangsu.

1. Introduction

General Secretary Xi Jinping emphasized: "We must insist on focusing our economic development on the real economy, further promote new industrialization, strengthen the reconstruction of industrial base and major technological equipment research, promote the development of high-end, intelligent and green manufacturing, and accelerate the construction of To strengthen the province in manufacturing, vigorously develop strategic emerging industries and accelerate the development of the digital economy." The report of the 20th National Congress of the Communist Party of China proposed the task of "accelerating the development of the digital economy, promoting the deep integration of the digital economy and the real economy, and creating an internationally competitive digital industry cluster." The digital economy has become an important force leading China's economic growth and social development. Jiangsu has thoroughly implemented the spirit of General Secretary Xi Jinping's important speech and the decisions and arrangements of the Party Central Committee, regarded the digital economy as a key increment of transformation and development, comprehensively promoted industrial digitalization and digital industrialization, promoted the integrated development of the digital economy and the real economy, and accelerated industrial transformation and upgrading. Efforts will be made to build an advanced manufacturing base with international competitiveness. This article takes the digital economy as the main line, focuses on the transformation and upgrading of Jiangsu's manufacturing industry, analyzes the mechanism by which the digital economy empowers the green transformation and upgrading of the manufacturing industry, and clarifies the digital economy's empowerment of the manufacturing industry's transformation and upgrading on the basis of clarifying the digital economy development opportunities faced by Jiangsu. challenges faced by the digital economy, and proposed an implementation path for the digital economy to empower the green transformation and upgrading of Jiangsu's

manufacturing industry.

2. The Mechanism of Digital Economy Empowering the Green Transformation and Upgrading of Jiangsu's Manufacturing Industry

2.1. The Digital Economy Has a Significant Impact on Reducing Manufacturing Pollution Emissions

By introducing technological means such as intelligence, informatization, and networking, the digital economy can achieve precise matching, optimal allocation, and recycling of resources. In manufacturing, these technologies can be applied to all aspects of the production process, from raw material procurement to product manufacturing to waste disposal, to achieve digital management and optimization. For example, through smart manufacturing systems, companies can monitor energy consumption and emissions in the production process in real time, and make adjustments and optimizations based on data feedback, thereby reducing energy consumption and emissions.

The application of digital technology can also optimize manufacturing production processes and processes, reducing energy consumption and emissions during the production process. For example, product design and simulation through digital models can predict and optimize product performance and environmental impact at the design stage, thereby reducing adjustments and modifications during the production process. In addition, digital technology can also help companies automate and intelligentize their production processes, improve production efficiency and product quality, and reduce the negative impact of human factors on the environment.

The digital economy can also support the research, development and application of new energy technologies and promote clean energy to replace traditional energy. In manufacturing, technologies such as smart grids, electric

vehicles and renewable energy are widely used. These technologies not only reduce fossil energy consumption and emissions, but also improve energy efficiency and sustainability. For example, smart grids can realize intelligent dispatching and management of electricity and improve the access and utilization of renewable energy; electric vehicles can achieve electrification and low-carbonization by using technologies such as batteries and charging piles.

2.2. The Digital Economy Has a Significant Role in Promoting the Structural Upgrading of The Manufacturing Industry

Through the collection and analysis of massive data, the digital economy can more accurately understand market demand and supply conditions, thereby optimizing resource allocation. In the manufacturing industry, this means that companies can arrange production plans and inventory management more rationally, reduce production costs, and improve production efficiency. At the same time, the digital economy can also help companies discover new market opportunities and potential growth points, and promote the development of manufacturing in the direction of higher added value. The digital economy provides strong support for technological innovation in the manufacturing industry. On the one hand, digital technologies such as artificial intelligence, big data, cloud computing, etc. can be applied to all aspects of manufacturing, including R&D, design, and production, to improve product innovation capabilities and quality levels. On the other hand, the digital economy also promotes cross-border integration and collaborative innovation, and promotes the continuous emergence of new technologies, new processes and new products. These technological innovations not only enhance the competitiveness of the manufacturing industry, but also promote the optimization and upgrading of the manufacturing structure. The digital economy promotes information sharing and collaborative cooperation between upstream and downstream enterprises in the industrial chain. In the era of digital economy, enterprises can achieve close connections and efficient collaboration with suppliers, customers and other partners through technological means such as the Internet and the Internet of Things. This collaborative cooperation not only reduces transaction costs and information asymmetry risks, but also promotes the optimization and upgrading of the industrial chain.

2.3. The Digital Economy Has a Significant Role in Promoting Green Total Factor Productivity in The Manufacturing Industry

The digital economy has promoted the optimization and upgrading of the manufacturing industrial structure and given birth to new formats and business models. In the era of digital economy, manufacturing companies can achieve industrial upgrading and green transformation through digital transformation. For example, we should develop new business formats such as intelligent manufacturing and industrial Internet to promote the development of manufacturing industry in a high-end, intelligent and green direction. These new formats and business models not only improve the production efficiency and product quality of the manufacturing industry, but also promote the deep integration of the manufacturing industry with the service industry and

information industry, and promote the optimization and upgrading of the industrial structure. The digital economy has improved the total factor productivity of the manufacturing industry by promoting technological progress, optimizing resource allocation, and promoting industrial structure upgrading. At the same time, the application of digital technology has also promoted the green development level of the manufacturing industry, reducing the environmental impact of the manufacturing industry through energy conservation, emission reduction, resource recycling and other methods. This improvement in total factor productivity and the level of green development provides strong support for the sustainable development of the manufacturing industry.

3. Challenges Faced by The Green Transformation and Upgrading of Jiangsu's Manufacturing Industry Under the Digital Economy Empowerment System

3.1. Unbalanced Development of Digital Economy

There are differences in the development of digital economy in different regions in Jiangsu Province. An industrial echelon with rational layout and differentiated competition has gradually formed along the Yangtze River Economic Belt. However, central Jiangsu and northern Jiangsu are still constrained by bottlenecks such as low industrial agglomeration and insufficient digital integration. In addition, although Nanjing and Suzhou, as highlands of digital economic innovation, have achieved remarkable results in building digital industry clusters and accelerating digital industry coupling, the development of other regions is relatively lagging behind and they have not been able to fully enjoy the dividends brought by the digital economy.

From the perspective of industrial structure, Jiangsu's digital economy has developed rapidly and formed advantages in the fields of software, electronic information, intelligent manufacturing and artificial intelligence. However, in the fields of e-commerce, digital finance, industrial Internet and other fields, although it also ranks among the top in the country, However, there is still a certain gap with Beijing, Shanghai, Zhejiang, Guangdong and other provinces and cities. In addition, the digital transformation of agriculture is relatively weak, and progress is slower than that of the service and industrial sectors.

Although Jiangsu Province has many digital technology companies, it lacks leading companies with strong leadership roles. The innovation capabilities of local enterprises need to be improved, especially in core technology research and development, original technological breakthroughs, etc. There is still a large gap compared with the advanced levels at home and abroad. This has caused Jiangsu's competitiveness in the digital economy to be affected to a certain extent.

3.2. The Integration of Digital Economy and Manufacturing Is Not High

The deep integration of manufacturing and digital economy is the key to promoting high-quality development of the manufacturing industry. The digital economy provides benign support for the green and intelligent transformation of the manufacturing industry. Although Jiangsu has achieved

remarkable development results in both the digital economy and manufacturing fields, the integration between the two is not deep enough. Although some manufacturing companies have adopted digital technologies, they have only applied them superficially and failed to fully realize the potential of the digital economy. In the process of integrating the digital economy and manufacturing, there are limitations in technology application. Although some enterprises have introduced advanced digital equipment and technologies, in actual applications, the technology application results are often poor due to the lack of corresponding technical support and talent reserves. Jiangsu's manufacturing industry chain is relatively complete, but in the process of integrating the digital economy and manufacturing, the problem of insufficient industry chain coordination still exists. Information sharing and collaboration between different links are not close enough, which affects the improvement of overall efficiency and competitiveness. In the era of digital economy, data is the core resource. However, in some manufacturing companies in Jiangsu, the phenomenon of data islands still exists. Poor data sharing and circulation among various departments results in the inability to effectively utilize data resources and affects the development of the digital economy [1].

3.3. The "Stuck Neck" Problem of Key Core Technologies

Jiangsu's manufacturing industry is indeed facing a "stuck" problem in key core technologies. Many industries in Jiangsu focus on the middle and back ends of the industrial chain. The main reason is that key core technologies have not been fully mastered and core components have not been fully "localized." For example, in the field of high-end equipment manufacturing, some key components such as engines and control systems still rely on imports. In the core information technology industry, high-end control systems for intelligent robots still mainly rely on imports, and computing architecture still relies on authorization from international architecture. Although Jiangsu is a major manufacturing province, some companies still have insufficient R&D investment in key core technologies. In 2020, the R&D investment of industrial enterprises above designated size in Jiangsu accounted for an average of 1.9% of their main business revenue, which is far behind the 5% to 10% level of international advanced enterprises. Overall, Jiangsu's manufacturing industry is still at the middle and lower end of the value chain, and the problem of "stuck" key core technologies is prominent. This has led to challenges to the security and stability of Jiangsu's industrial and supply chains. As key core technologies rely on imports, Jiangsu's manufacturing industry faces certain risks in the supply chain. Once the international situation changes or the supply chain is interrupted, it will have a serious impact on Jiangsu's manufacturing industry and seriously restrict the green transformation and upgrading of the manufacturing industry.

4. Digital Economy Empowers the Implementation Path of Green Transformation and Upgrading of Jiangsu Manufacturing Industry

4.1. Increase Fiscal Investment Support and Implement Fiscal and Tax Incentives

As an important province in China's economy, Jiangsu is at an important stage of accelerating its transition to the digital economy. In the manufacturing segment, the collaborative transformation of digitalization and greening has become a trend. However, during the transformation process, enterprises face many challenges such as capital, technology, and talent. Especially in the northern Jiangsu region, digital transformation is more difficult due to its relatively weak economic foundation. In order to support digital transformation projects in the manufacturing industry, the government should further increase the scale of special funds for digital transformation. This will not only help alleviate financial pressure on enterprises, but also encourage more enterprises to actively participate in digital transformation. At the same time, the government should pay attention to regional differences, increase support for relatively backward areas such as northern Jiangsu, and ensure the balance and rationality of fiscal science and technology investment.

The government should formulate and introduce policies to support the development of the digital economy, including open sharing of data resources, construction of digital infrastructure, and training of digital economy talents. This will help provide strong policy support and market environment for the digital transformation of the manufacturing industry. In order to promote the green and low-carbon development of the manufacturing industry, the government should introduce energy conservation and environmental protection policies to encourage enterprises to adopt energy-saving technologies and equipment to reduce energy consumption and emissions. At the same time, the government can also set up special funds for energy conservation to support enterprises in carrying out energy-saving renovation and energy efficiency improvement projects. In addition, the government can provide preferential tax reduction and exemption policies to qualified manufacturing companies to reduce their transformation costs. These preferential policies can include value-added tax exemptions, income tax exemptions, etc. The government should support qualified manufacturing companies in applying for recognition as high-tech enterprises and provide corresponding tax incentives and financial support. This will help improve the innovation capabilities and market competitiveness of enterprises [2, 3].

4.2. Promote Innovative Applications of Industrial Internet and Strengthen Talent Support and Intellectual Security

The integration of digital economy and manufacturing green innovation is an important trend in current economic development. This integration not only helps promote the green transformation and upgrading of the manufacturing industry, but also promotes the sustainable and healthy development of the digital economy. The digital economy provides strong technical support for green innovation in the manufacturing industry through advanced technologies such as big data, cloud computing, the Internet of Things, and

artificial intelligence. These technologies can help the manufacturing industry realize intelligence, automation and refinement of the production process, thereby improving production efficiency, reducing energy consumption and reducing emissions. Green innovation in the manufacturing industry requires the continuous introduction of new technologies, new processes and new equipment, which provides a broad market space for the development of the digital economy. At the same time, the technical needs in the green innovation process of the manufacturing industry have also promoted the continuous innovation and upgrading of the digital economy.

Through the deep integration of 5G and the industrial Internet, real-time monitoring, intelligent scheduling and refined management of the manufacturing production process can be achieved. For example, in the operation and maintenance of hydropower stations, the 5G+ industrial Internet platform can realize real-time monitoring and intelligent early warning of equipment status, improving the operating efficiency and safety of equipment. Smart factories realize the automation and intelligence of the production process by integrating advanced sensors, controllers, actuators and other equipment. At the same time, smart factories also promote the green development of the manufacturing industry by optimizing production processes, improving resource utilization, and reducing energy consumption. As an important infrastructure of the digital economy, green computing power provides efficient computing support for green innovation in the manufacturing industry. By developing green computing power, the energy consumption and emissions of data centers can be reduced, and the green integration of the digital economy and manufacturing industry can be promoted [4].

Jiangsu should make full use of the advantages of universities, gather the innovative strength of education, science and technology talents, and build an innovation-driven mechanism for the digital transformation of traditional industries. Strengthen school-enterprise cooperation and cultivate comprehensive talents in traditional manufacturing and digital transformation. Jiangsu Province has given full play to the industrial advantages of integrated circuits, new displays, intelligent equipment and other places in Nanjing, Wuxi, Suzhou, Changzhou and other places to cultivate a number of "chain master" enterprises in ecologically-led industrial chains. Support "chain owner" enterprises to carry out applications such as collaborative procurement, collaborative manufacturing, collaborative sales and collaborative distribution based on the industrial chain collaboration platform to improve the efficiency of industrial chain collaboration.

4.3. Increase Investment in Research Funds and Strengthen Research and Development of Key Core Technologies

The digital economy empowering the green transformation and upgrading of Jiangsu's manufacturing industry requires increasing investment in research funds and strengthening the research and development of key core technologies. Increasing investment in research funds through government support, corporate investment, diversified financing, etc., and at the same time strengthening the research and development of key core technologies by breaking through "stuck" technologies, strengthening industry-university-research cooperation, promoting the transformation of scientific and

technological achievements, and introducing and cultivating talents will help To improve the green level and international competitiveness of the manufacturing industry. Specific measures are as follows:

(1) In terms of government investment, the Jiangsu Provincial Government has issued various action plans at all levels, clearly proposing to provide no less than 500 billion yuan in new financing in the next five years to invest in the green transformation and development of the manufacturing industry. Finance departments at all levels are also continuing to strengthen funding guarantees and support the development of key core technologies and basic research. At the level of corporate investment, manufacturing companies, as the main body of green transformation and upgrading, need to increase their own R&D investment to promote technological innovation and industrial upgrading. Enterprises can improve the efficiency and effectiveness of the use of R&D funds by establishing R&D funds and cooperating with universities and scientific research institutions. In addition to the investment from the government and enterprises themselves, it can also attract diverse financing methods such as social capital and venture capital to provide more financial support for the green transformation and upgrading of the manufacturing industry.

(2) Break through the "stuck neck" technology. In view of the key technical bottlenecks in the green transformation and upgrading of the manufacturing industry, it is necessary to increase research and development efforts to break through "stuck neck" technologies. This includes high-efficiency energy-saving technology, clean production technology, resource recycling technology, etc. Breakthroughs in these technologies will help improve the green level of the manufacturing industry. To further strengthen industry-university-research cooperation, universities, scientific research institutions and enterprises in Jiangsu Province need to strengthen industry-university-research cooperation and form a collaborative innovation mechanism. Promote the research, development and application of key core technologies through sharing resources and joint research. Vigorously promoting the transformation of scientific and technological achievements and strengthening the transformation and application of scientific and technological achievements are the key to improving the effect of green transformation and upgrading of the manufacturing industry. Jiangsu Province has established a number of scientific and technological achievement transformation platforms, such as Jiangsu Industrial Technology Research Institute, etc. These platforms can provide strong support for the transformation of scientific and technological achievements. In-depth introduction and cultivation of talents, talents are an important factor in promoting the research and development of key core technologies. Jiangsu Province needs to increase the introduction and cultivation of talents, attract domestic and foreign talents to innovate and start businesses in Jiangsu, and provide talent guarantee for the green transformation and upgrading of the manufacturing industry.

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