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Original Paper

Research on the Evolution and Path Analysis of China's Industrial Internet Industry Policy

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Abstract

New-generation information technologies have permeated all sectors of the economy and society. With the advancement of the Internet, the digital economy has thrived, rapidly expanding from the consumer domain to the production sector. The industrial economy has progressively evolved from digitalization toward networking and intelligence. In this context, the industrial internet has emerged as a pivotal driver for the transformation and upgrading of the manufacturing industry. Since 2015, the Chinese government has introduced a series of policies to actively promote the development of the industrial internet, establishing a relatively comprehensive policy framework. An analysis of the evolution of China's industrial internet policies reveals a strategic shift in policy focus—from an initial emphasis on supply-side instruments to a more balanced integration of supply-side and environment-side measures—and a refinement of policy objectives, from constructing theoretical frameworks to addressing deeper challenges such as enhancing foundational innovation capabilities. Nevertheless, the development of the industrial internet continues to face significant challenges, including technological innovation bottlenecks, complex market demands, and persistent data security concerns. This paper reviews the evolutionary trajectory of industrial policies, analyzes the developmental pathway of the industrial internet from a macro-level perspective, and proposes an integrated optimization strategy for China's industrial internet policy system.

Keywords

Industrial Internet, Industry Policy, Evolutionary Logic, Path Analysis

1. Introduction

Following the historical trajectory, humanity has experienced the agricultural revolution, the industrial revolution, and is currently undergoing the information revolution era. The new generation of

information technologies have covered all fields of social and economic activities. Against this backdrop, the digital economy has entered a new phase of comprehensive development, with the digital economy represented by the Internet booming. The "Internet +" concept has continuously penetrated into various aspects of people's production and life. With the rapid development of the new round of technological revolution and industrial transformation, the Internet has rapidly extended from the consumption sector to the production sector, and the industrial economy has deeply expanded from digitalization to networking and intelligence. Industrial Internet has emerged as an important force driving the transformation and upgrading of the manufacturing industry.

In recent years, in order to cultivate leading industrial Internet enterprises and empower the development of small and medium-sized enterprises, China has introduced a series of policies. The industrial Internet policy system is gradually taking shape. Since 2015, to accelerate the vigorous development of the industrial Internet industry, the State Council first issued the "Guiding Opinions on Actively Promoting the 'Internet+' Action", laying the policy foundation for the rise of the industrial Internet. In the following year, in response to the demand for the deep integration of manufacturing and the Internet, the State Council issued the "Guiding Opinions on Deepening the Integration of Manufacturing and the Internet", further clarifying the development direction and goals of the industrial Internet industry. In 2020, the Ministry of Industry and Information Technology responded to the requirements of the times and issued the "Notice on Promoting the Accelerated Development of Industrial Internet", aiming to promote the widespread application and rapid development of industrial Internet technologies through detailed policy measures. In 2021, the "Industrial Internet Innovation Development Plan (2021-2023)" was released, which, from a strategic perspective, detailed the development paths and key tasks for industrial Internet innovation in the next three years, aiming to provide precise guidance through industrial policies to encourage manufacturing and various innovative enterprises to actively participate in the construction and application of industrial Internet, accelerating the digital transformation and intelligent upgrading of the manufacturing industry.

Under the impetus of national policies, the technological innovation and industrial application depth and scale of China's industrial Internet have developed rapidly. Since 2018, the economic scale of China's core industrial Internet industry has steadily increased. From 2018 to 2020, within three years, the economic scale of China's core industrial Internet industry was 743.9 billion yuan, 804.0 billion yuan, and 910.0 billion yuan respectively, with year-on-year actual growth rates of 8.1%, 13.2%. In 2023, the scale of China's industrial Internet market reached 984.95 billion yuan, growing by 13.9%, maintaining a high growth rate. It is expected that in the next three years, with the continuous growth of industrial Internet platform solutions and user numbers, as well as the steady progress of dual-platform selection and pilot demonstration projects, China's industrial Internet market is in a strategic opportunity period with great potential. It is expected that by 2026, the scale of China's industrial Internet market will reach 1,486.25 billion yuan. Currently, China's industrial Internet has initially established five systems: network, identification, platform, data, and security. Among them, there are

over 340 influential industrial Internet platforms, with over 96 million units of industrial equipment connected, and over 13,000 “5G + Industrial Internet” projects, covering 41 major industrial categories such as machinery, steel, and electronics.

Although China’s industrial Internet policy layout has been continuously improved and the innovation application capabilities of related enterprises have been continuously enhanced, there are still problems such as difficult breakthroughs in technological innovation, complex market demands, and difficulties in ensuring data security. Therefore, this article takes industrial Internet industry policies as the research object, by reviewing the evolution of China’s industrial Internet-related industrial innovation policies, proposes the core bottleneck problems faced by China’s industrial Internet industry, providing important ideas and references for improving the transformation of manufacturing enterprises.

2. Literature Review

With the acceleration of the new round of technological revolution and industrial transformation, the integration of the digital economy and the real economy is continuously deepening, creating new infrastructure such as industrial internet, data centers, and 5G. Among them, the industrial internet, as an application model where new-generation information technologies such as the internet, big data, and artificial intelligence are deeply integrated with the real economy, has increasingly attracted the attention of scholars. They have realized that the industrial internet plays a significant role in enhancing the economic efficiency of the manufacturing industry. Chen (2022) believes that the industrial internet is an important engine driving the digital transformation of enterprises and can effectively empower the digital transformation of industries; Wang (2024) believes that the industrial internet is an emerging application model formed by the deep integration of new-generation information communication technologies and advanced manufacturing, and has a significant and far-reaching impact on the global manufacturing industry; apart from the manufacturing sector, the industrial internet also has an enabling effect on other industries; Du (2024) proposed that the industrial internet is an important part of promoting China’s modernization, and mainly from the aspects of enhancing technological innovation, promoting industrial integration, and promoting international cooperation to build an industrial modernization system; Sun (2022) discovered that the industrial internet platform not only promotes the construction of a data-based business ecosystem but also further extends and develops the theoretical content of the business ecosystem. Therefore, the existing literature indicates that the enabling impact of the industrial internet on the macroeconomy is generally recognized, and its enabling objects are primarily the manufacturing industry, but not limited to it.

In current research on industrial internet industry policies, most focus on the application of the industrial internet at the enterprise level, while only a small portion mentions the macro-level impact of industrial internet industry policies. Shang (2023) believes that industrial internet industry policies promote the digital transformation of manufacturing enterprises by alleviating the financing constraints of enterprises, and have a more significant promoting effect on enterprises with intense market

competition, high innovation levels, growth periods, and maturity; Zhang (2024) through the study of the changes in the focus of China's industrial internet industry policies, found that the industrial internet industry policy tools adopted by China have evolved from "supply-side policy tools" to "supply-side and environmental-side policy tools" complementing each other; Wang (2022) evaluated the existing industrial internet industry policies using the PMC index model and found that the existing policies were not sufficiently complete in formulating policy suggestions and goals, and lacked forward-lookingness; Han (2023) from a macro perspective, explored the relevant industrial internet industry policies issued by the central and local governments in recent years, found that the industrial internet industry policies issued by the central and local governments have almost increased in an index form, but the speed of China's industrial digital transformation has not reached the expected level.

3. Evolution Analysis of China's Industrial Internet Industry Policies

3.1 Industrial Internet

In 2017, the State Council issued the "Guiding Opinions on Deepening 'Internet + Advanced Manufacturing' and Developing Industrial Internet", which was the first time to define the concept of "Industrial Internet": Industrial Internet is a brand-new industrial ecosystem, key infrastructure and new application model formed by the deep integration of new-generation information and communication technologies and the industrial economy. Through the comprehensive interconnection of people, machines and things, it realizes the comprehensive connection of all elements, the entire industrial chain and the entire value chain, and will promote the formation of a new industrial production, manufacturing and service system. Different from the traditional Internet, the connection objects of Industrial Internet are not limited to people, but need to connect people, machines, things, systems, etc., and have higher requirements for network performance, requiring a low-latency, low-risk and high-performance Internet platform to meet the needs of industrial production.

3.2 Evolution of Industrial Internet Industry Policies

The evolution of China's industrial internet industry policies can be roughly divided into three stages. The development background of Industrial Internet can be traced back to 2008, when the German government proposed the concept of "Industry 4.0". In response to the concept of Industry 4.0, China established the Ministry of Industry and Information Technology in 2008, aiming to achieve high-quality development of industrial automation and intelligence. In 2012, General Electric of the United States first proposed the concept of Industrial Internet: "Connect people with data and machines", and the concept of "Internet +" was officially proposed. The "Internet + Advanced Manufacturing" was widely concerned. However, due to the limitations of domestic technology and market, China's industrial internet industry is still just a concept, without the support of real economy, and the progress is relatively slow. In May 2015, "Made in China 2025" was released, officially opening a new chapter for China's industrial internet industry, emphasizing the main line of accelerating the deep integration of new-generation information technology and manufacturing to

promote the transformation and upgrading of the manufacturing industry.

The second stage was from 2016 to 2018. With the rapid development of industrial internet industry, the government first introduced a series of industrial internet policies to encourage enterprises to develop industrial internet, and increased the government's support for the development of industrial internet industry. In May 2016, the State Council issued the "Guiding Opinions on Deepening the Integration of Manufacturing and the Internet", clarifying the development direction and goals of industrial internet industry; In November 2017, the "Guiding Opinions on Deepening 'Internet + Advanced Manufacturing' and Developing Industrial Internet" was promulgated, this guiding document was the first to interpret the concept of "Industrial Internet", establishing the strategic development position of Industrial Internet in the current and the next five years, and clearly proposing to shift from focusing on technology research and infrastructure construction to promoting application demonstrations. Under this background, some industrial internet platforms in various industries have been established, covering manufacturing, energy, transportation and other fields. At the same time, some innovative enterprises have also joined the construction of industrial internet platforms, promoting the rapid development of the platforms.

The third stage is from 2019 to the present, which is the stage of in-depth application of industrial internet platforms. In 2020, the "Notice on Promoting the Acceleration of Industrial Internet Development" was issued, establishing clear development goals and completion schedules, improving various industrial internet standard systems, cultivating new models and new business forms, and building an industrial internet industry ecosystem. In 2021, the "Industrial Internet Innovation and Development Action Plan (2021-2023)" was released, it is expected that by 2023, the construction of new industrial internet infrastructure will be advanced in parallel, and the comprehensive strength of new industries will be significantly improved. The "National Industrial Internet Platform Application Data Map (2022)" shows that the industrial internet platform system in China has continued to be improved, and the number of cross-industry and cross-domain platforms has significantly increased, with the application level accelerating. The report indicates that the national industrial internet platform application penetration rate rose to 22.2% in 2022. The eastern economic provinces performed exceptionally well, with Guangdong and Zhejiang provinces ranking at the forefront. At the same time, industrial internet platforms have achieved remarkable results in promoting regional integrated development, enabling enterprise equipment to be connected to the cloud and business to be cloud-based. Regions such as the Beijing-Tianjin-Hebei, Yangtze River Delta, and Sichuan-Chongqing urban agglomerations have become application hotspots. Additionally, the application and knowledge innovation levels of national industrial big data have continued to improve, with distinctive business cloudization in key industries such as petrochemicals, textiles, and power. The report also reveals that new models based on industrial internet platforms are flourishing, platform technologies are constantly innovating, the standard system is continuously improving, and application scenarios are accelerating expansion. Overall, China's industrial internet platforms have entered a key stage of large-scale

application promotion, and have great potential for future development.

3.3 Macro Analysis of Industrial Internet Industry Policies

The development of China's industrial internet has been closely aligned with the formulation and implementation of national strategies concerning the integration of informatization and industrialization, digital transformation, intelligent manufacturing, and the broader industrial internet ecosystem. At the national level, a series of policies have been introduced, collectively establishing the foundational framework for industrial internet governance. From a macro perspective, China's industrial internet policy system exhibits two defining characteristics: government leadership and a focus on technology system design.

3.3.1 Government Leadership

Throughout the development of China's industrial internet, the government has consistently assumed a leading role—this serves as both the theoretical foundation and strategic starting point of the policy framework. Central planning has centered on "enabling the transformation and upgrading of the manufacturing sector," adopting a top-down approach to strategic design. Over time, the policy scope has expanded from a primary emphasis on industrial internet platforms to encompass the entire industrial internet ecosystem. For instance, since 2018, the development of the industrial internet has been included in China's Government Work Report for five consecutive years as a key national priority. Specifically: in 2018, the strategic concept of developing industrial internet platforms was formally introduced; in 2019, the focus shifted to building such platforms and promoting the broad application of "intelligent+" to drive manufacturing transformation; in 2020, the vigorous development of the industrial internet was explicitly designated as a core task, with an emphasis on advancing intelligent manufacturing; in 2021, the strategic focus evolved to include the development of common technological R&D platforms, aiming to enhance innovation capacity and specialization among small and micro enterprises; and in 2022, the urgency of accelerating industrial internet development was further emphasized, with targeted support for key digital industries such as integrated circuits and artificial intelligence, aiming to strengthen the innovation capabilities and supply capacity of critical software and hardware technologies. Central government departments have successively issued pivotal policies in this domain, underscoring the government's strong leadership. Since 2018, the Ministry of Industry and Information Technology (MIIT) has released triennial industrial internet development action plans, signaling that the sector has entered a phase of deep and structured advancement. Notably, the "Industrial Internet Innovation and Development Action Plan (2021-2023)," released in 2021, placed greater emphasis on comprehensive innovation, expanding upon previous plans by incorporating new initiatives related to industrial internet data, technology development, and industrial ecosystem advancement—reflecting a more holistic and integrated policy orientation.

3.3.2 Focus on Technology System Design

The state places significant emphasis on the role of the industrial internet in driving high-quality development in manufacturing. Policy priorities have progressively transitioned from macro-level

strategic planning to targeted guidance on micro-level technology system design. Increasing attention has been directed toward fundamental challenges such as core technological innovation, indicating a shift from conceptual formulation to practical implementation. Early-stage policies primarily focused on the architectural blueprint of the industrial internet, as exemplified by the State Council's 2015 "Guiding Opinions on Promoting the 'Internet+' Initiative," which first called for in-depth research into the industrial internet network architecture and laid the groundwork for the development of basic and key technical standards. However, these early measures remained largely at the level of strategic research and directional guidance, without detailed implementation mechanisms. They served instead as forward-looking frameworks to guide future development. In 2017, the State Council issued the "Guiding Opinions on Deepening 'Internet + Advanced Manufacturing' and Developing the Industrial Internet," widely regarded as a foundational document that defined the long-term strategy for integrating industry and the internet and established clear development goals. Subsequent national policies have systematically prioritized the three-pillar architecture of industrial internet—networking, platform systems, and security—providing comprehensive planning for key focus areas, long-term objectives, and specific implementation pathways. As the industrial internet architecture has matured, policy attention has increasingly concentrated on core technological domains, with a strong emphasis on systematic technology design aimed at fostering breakthroughs through precise and targeted measures. For example, in 2018, multiple policy documents were issued focusing on industrial internet applications (Apps) and cybersecurity, offering guidance on evaluation mechanisms, pilot programs, and large-scale promotion. Furthermore, standardization and practical application of industrial internet technologies have gradually become integral components of the policy agenda.

4. Analysis of Industrial Policy Paths and Existing Issues

4.1 Path Analysis

With the vigorous rise of new-generation information technologies, the global economic system has witnessed unprecedented innovation breakthroughs and coordinated progress in technological innovation, industrial upgrading, and application expansion. Against this backdrop, how to deeply integrate and mutually promote industrial internet and advanced manufacturing has become an important topic for countries around the world to explore and practice. Various countries are seeking effective paths, aiming to promote the transformation and upgrading of manufacturing towards intelligence, networking, and service-oriented directions through integrated innovation, and thereby gain an advantageous position in global economic competition. Currently, China's industrial internet industrial policy adopts a dual-track implementation path of supply-side and environment-side, as well as collaboration among multiple stakeholders. Demand-oriented industrial policies are relatively lacking. Supply-oriented policy tools manifest as policies providing fundamental support for the development of industrial internet industries, mainly covering technical, talent, and financial element support, as well as infrastructure construction, industry norms establishment, and public service

provision; demand-oriented policy tools manifest as policies creating market demand for industrial internet industries to drive the development and utilization of the industry, including government procurement, outsourcing, trade control, etc. In addition, environmental policy tools are also crucial for the industrial internet industry, creating a fair, orderly, and secure market environment for industrial internet industries, which is conducive to promoting the development of industrial internet industries, mainly involving target planning, tax incentives, guiding strategies, and regulatory measures.

4.2 Existing Issues and Constraints

Although China has issued numerous industrial policies to encourage the development of industrial internet platforms, the effectiveness of its industrial internet policy has been limited. At the same time, it is also constrained by technology, market, and talent, hindering the further development of the industrial internet industry. From the perspective of reality, the industrial internet industry mainly has three problems:

4.2.1 Technological Innovation Challenges

China started late in the Internet era, unlike other Western countries, and overall, it has been in a follower position in the development of industrial internet industries. Especially in the manufacturing sector, it has long been at the middle and low-end of the global industrial value chain, with excessive low-end production capacity and insufficient effective supply of high-end products, resulting in the "choking" phenomenon of high-end equipment in the manufacturing industry, such as high-end CNC machine tools. In the tide of globalization, high-end CNC machine tools are undoubtedly of great importance, and the "choking" problem of high-end machine tools has once become a bottleneck restricting China's industrial development. Although China is the world's largest manufacturer and consumer of machine tools, in the high-end machine tool field, we have long been subject to foreign technology blockades and market monopolies. Meanwhile, due to the lack of policy-based financial subsidies and support, manufacturing enterprises are facing huge financial pressure in technological innovation and the transformation of achievements, making it difficult for them to survive and develop.

4.2.2 Complex Market Demand

Compared with traditional Internet industries with low application thresholds and large market demand, industrial internet industries have higher standards and more specialized applications. It is difficult to find a universal development model. On one hand, the traditional Internet industries are mainly led and promoted by Internet enterprises, and the investment payback period is short, making it easy to obtain social capital support. In industrial internet industries, manufacturing enterprises occupy the main position, and the investment return period is too long, making it difficult to attract social capital investment, resulting in a sluggish market demand. On the other hand, the development of industrial internet platforms has strong industry attributes, complex user demands, and high development and implementation costs. Due to significant differences in business among different industries, an industrial internet platform for one industry can only serve one industry, for example, the industrial internet platforms for discrete manufacturing and process manufacturing are very different and cannot

simultaneously meet market demands. Meanwhile, the users of the industrial internet platform include various small and medium-sized enterprises at all levels of the industrial chain. The common and individual complex demands of different types and scales of enterprises bring high development and implementation costs.

4.2.3 Data Security Risks

The industrial internet involves various and complex equipment, networks, and platforms, and the difficulty of technical integration is high, which increases the complexity of security management. The laws and regulations and standards in the field of industrial internet data security are not yet complete, making it difficult to effectively supervise and guarantee data security. At the same time, the lack of awareness of industrial internet information security and the shortage of talents are also important factors restricting the improvement of data security guarantee capabilities.

5. Conclusion and Suggestion

Based on the evolution process and implementation path of China's industrial internet industry policies, this paper analyzes the problems and constraints existing in the future development of industrial internet. The overall optimization strategy for China's industrial internet policies is proposed as follows:

First, in the supply side of the industrial internet industry, optimize the industrial internet infrastructure, improve the public service level, and complete the technical standard system. Many key technologies of industrial internet, such as high-end PLC, industrial network protocols, and intelligent sensors, are still monopolized by foreign manufacturers. At the same time, there are still deficiencies in the coordinated development of China's industrial internet industries, lacking effective integration and coordination mechanisms. Encourage enterprises to carry out industrial internet innovation applications and demonstration promotion projects, verify the feasibility and effectiveness of the technology through practical applications. Support the construction of industrial internet innovation centers, test beds, and other infrastructure platforms to provide strong support for technological innovation. At the same time, strengthen policy guidance and financial support to promote the application and promotion of industrial internet technology in a wider range of fields.

Second, in the demand side of the industrial internet industry, the market demand has not been fully stimulated. The low digitalization level of enterprises leads to a lack of urgency in demand, and many enterprises are still in the transition from Industrial 2.0 to Industrial 3.0 stage, and the demand for intelligent transformation is not urgent. There is still a large space for improvement in the procurement demand for platform services of small and medium-sized enterprises, and there is a gap compared with European and American countries. Currently, China's demand-oriented policies for industrial internet are relatively lacking. The government should enhance the awareness and procurement willingness of small and medium-sized enterprises for industrial internet platform services through policy guidance and financial support. Increase support for the digital transformation of enterprises, and promote more

enterprises to achieve intelligent transformation.

Third, the security issues of industrial internet will become increasingly prominent as industrial internet develops in depth. Data security and privacy protection problems have emerged. Industrial internet platforms need to handle a large amount of sensitive data. How to ensure the security of these data during transmission, storage, and processing is an important issue to solve data security risks. Strengthen the data security and privacy protection capabilities of industrial internet platforms, establish a complete data security management system and protection mechanism. Adopt advanced encryption technology, access control technology, and auditing technology to ensure the security of data during transmission, storage, and processing. At the same time, introduce relevant policies to ensure the information security of users when using the internet platform, and strengthen the education on user privacy protection awareness to improve the ability of users to protect their data security.

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