Research on Innovative Development Countermeasures of Manufacturing Enterprises under the Background of Digital Finance

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Abstract: In the era of deep integration of digital economy and technology and finance, digital finance, with its technological advantages such as big data, artificial intelligence and blockchain, effectively eases financing constraints of manufacturing enterprises, optimizes innovation resource allocation and improves production efficiency, becoming a key support for innovation-driven high-quality development and upgrading of manufacturing industry. Combined with CCID Manufacturing Innovation Index report and digital economy related research, this paper systematically sorts out the development status of digital finance enabling manufacturing innovation, deeply analyzes the core problems currently facing, and puts forward targeted countermeasures from the dimensions of technological innovation, talent support, financial services, ecological construction and risk prevention and control. This paper provides theoretical reference and practical guidance for the deep integration of digital finance and manufacturing innovation and the construction of manufacturing power.

***Keywords*:** digital finance; manufacturing enterprises; innovation and development; financial constraints; high-quality development

1. Introduction

Innovation is the primary driving force for the high-quality development of manufacturing industry. Against the background of global industrial chain restructuring and a new round of scientific and technological revolution, China's manufacturing industry is at a critical stage of transforming from a large manufacturing country to a strong one. As a new format of deep integration of digital economy and traditional finance, digital finance relies on data elements and technological advantages to break the time-space limitations and information barriers of traditional financial services, accurately meet the capital needs of manufacturing enterprises in R&D investment, technological transformation, achievement transformation and other innovation links, and reshape the innovation ecology of manufacturing industry.

At present, China's manufacturing innovation index has been steadily improved, and indicators of innovation resources, output and synergy keep growing. However, it still faces problems including unbalanced innovation investment structure, insufficient core technology breakthroughs, financing difficulties of SMEs, and inadequate industry-university-research integration. Digital finance supports manufacturing innovation through financing relaxation, resource matching, risk sharing and ecological coordination, which is significant to break innovation bottlenecks. Based on the features of digital finance and real needs of manufacturing innovation, this paper explores its status, dilemmas and paths to promote the innovation-driven transformation of manufacturing.

2. The current situation of innovation and development of manufacturing enterprises under the background of digital finance

(1) Innovation investment grows steadily with prominent enabling effect of digital finance.

In recent years, R&D investment of China's manufacturing industry has expanded continuously. In 2024, national R&D expenditure reached 3,632.68 billion yuan, up 8.9% year-on-year, and R&D expenditure of regulated high-tech manufacturing reached 766.89 billion yuan, up 10.2%. Digital finance lowers financing thresholds for manufacturing enterprises, especially SMEs, through big data risk control and credit portraits, easing financing dilemmas of light-asset and R&D-focused enterprises. By the end of 2024, inclusive finance covered thousands of manufacturing MSMEs, and products like intellectual property pledge financing and supply chain finance were widely used to support corporate R&D.

From 2013 to 2022, China's manufacturing innovation index grew at an annual rate of 11.6%, with innovation synergy index rising by 19.2% annually. Industry-university-research collaboration and industrial chain linkage boosted by digital finance have achieved remarkable effects.

(2) Innovation output increases steadily with accelerated digital transformation.

Supported by digital finance, manufacturing enterprises improved the transformation efficiency of innovation

achievements. In 2024, China granted 1.045 million invention patents, up 13.5% year-on-year. The industrialization rate of valid invention patents of manufacturing enterprises reached 53.3%. The integration of digital finance with industrial Internet and intelligent manufacturing upgraded production and management models. By the end of 2024, China had 421 national intelligent manufacturing demonstration plants and over 10,000 provincial digital workshops, with 82% penetration rate of digital R&D tools in key enterprises.

Manufacturing provinces such as Guangdong, Jiangsu and Zhejiang took the lead in innovation indicators. Regions with developed digital finance had significantly stronger manufacturing innovation capacity, showing a close correlation between regional innovation difference and digital finance development.

(3) Innovation ecology improves gradually with joint efforts of policy and market.

The state has improved relevant policies, including the Action Plan for Digital Transformation of Manufacturing Industry and Guidance on Financial Support for New Industrialization, supporting digital finance to empower manufacturing innovation and encouraging financial institutions to optimize services via digital technologies.

Digital financial institutions launched customized products such as R&D loans and intellectual property securitization, building a "data + credit + finance" model. Manufacturing has nurtured 14,600 "little giant" enterprises and 1,557 individual champions, becoming the main force of innovation. Digital finance also promoted efficient flow of innovation factors among universities, institutes and enterprises.

(4) Regional innovation pattern is differentiated with obvious echelon characteristics.

Provincial manufacturing innovation in China forms a four-echelon pattern: Guangdong, Jiangsu, Zhejiang and Shandong as the first echelon; Hubei, Anhui, Beijing and Hunan as the second; Jiangxi, Fujian, Chongqing and Liaoning as the third; Shanxi, Guangxi and Guizhou as the fourth. Eastern coastal areas with developed digital finance concentrate innovation resources, while central and western regions lack investment and financial support. The inclusiveness and balance of regional digital finance need to be improved.

3. Problems existing in the innovation and development of manufacturing enterprises under the background of digital finance

(1) Insufficient core technology innovation and low precision of digital financial support.

China's manufacturing relies heavily on foreign technologies in high-end chips, aero-engines and industrial software, with slow breakthroughs in core technologies. Digital finance lacks long-term support for cutting-edge R&D and basic research, preferring short-term profitable projects. Financial products do not match manufacturing innovation scenarios well, and the intellectual property system is incomplete, restricting original innovation.

(2) Shortage of innovative talents and missing integration mechanism of digital finance talents.

Manufacturing innovation is short of interdisciplinary talents. It is estimated that by 2025, ten key fields will face a talent shortage of nearly 30 million with a 48% gap rate. Talents with digital, financial and industrial capabilities are scarce. Talent training and college majors lag behind industrial demands, and enterprises have imperfect incentive mechanisms. Digital financial institutions fail to match talents, capital and technology efficiently.

(3) Financing constraints of SMEs still exist with insufficient inclusiveness of digital finance.

Manufacturing SMEs account for more than 90%, but light assets and lack of guarantees lead to financing difficulties. Digital finance coverage is not deep enough, and some MSMEs are excluded. Regional development is unbalanced, with weak financial infrastructure in central, western and northeastern regions. The risk control system is imperfect, leading to low credit evaluation accuracy and low capital inflow to innovation fields.

(4) Low efficiency of industry-university-research collaboration and unreasonable allocation of innovation resources.

The deep integration mechanism of industry-university-research-application is immature, resulting in blocked achievement transformation and "disconnection" between research and industry. Digital financial platforms have limited ability to integrate resources, and factors like technology and capital flow poorly. Innovation resources concentrate in leading enterprises and eastern regions, while SMEs and central-western enterprises are insufficiently supported. Government funds lack guidance, and social capital participation is low.

(5) Imperfect risk prevention and control system and lagging digital finance supervision.

Digital finance brings data security, credit and technical risks while enabling innovation. Some platforms collect data non-standardly, risking leakage of trade secrets. Immature technologies and flawed risk control models may cause credit defaults. The supervision system lags behind technological innovation, with insufficient cross-departmental coordination and gaps in innovative product supervision.

4. Strategies for innovation and development of manufacturing enterprises under the background of digital finance

(1) Strengthen core technology research and enhance precision support capacity.

Focus on key technological fields and set up special digital finance innovation funds to guide long-term capital into R&D of high-end chips, industrial mother machines and new materials. Promote the "R&D loan + intellectual property securitization" model and build a patent value-centered risk control system. Improve the intellectual property financial system via blockchain to enhance patent liquidity. Develop full-cycle sci-tech innovation financial products and integrate digital finance with industrial Internet to match capital and innovation needs accurately.

(2) Improve talent training mechanism and build cross-border talent team.

Establish a "university + enterprise + financial institution" training model and set up interdisciplinary majors to cultivate compound talents. Strengthen digital skill training for employees. Innovate incentive mechanisms such as equity incentives and technology shares to attract high-end talents. Build talent docking platforms via digital finance to allocate talents, technology and capital efficiently. Launch a talent innovation point system linked to credit and policies to stimulate innovation vitality.

(3) Optimize digital financial services and ease financing constraints of SMEs.

Develop digital inclusive finance, break data barriers and build a data credit system for SMEs to promote unsecured credit loans. Expand industrial chain finance based on core enterprises' credit to provide order loans and receivables financing for upstream and downstream firms. Promote balanced layout of digital financial infrastructure and increase investment in central, western and northeastern regions to narrow regional gaps.

(4) Build collaborative innovation ecosystem and optimize resource allocation.

Build industry-university-research-application carriers relying on digital financial platforms and set up digital achievement transformation platforms to improve collaboration efficiency. Give play to government guiding funds to direct social capital to manufacturing innovation and tilt resources to advantageous enterprises, key chains and central-western regions. Cultivate innovation clusters and launch "one chain one policy" services to form a collaborative innovation pattern of large, medium and small enterprises.

(5) Improve risk prevention and control system and strengthen digital finance supervision.

Improve data security and privacy protection rules, standardize data management and use privacy computing to protect enterprise information. Build an intelligent risk control system using big data and AI to monitor risks in real time and improve risk sharing mechanisms. Establish a cross-departmental supervision mechanism, perfect regulatory rules, balance innovation and risks, and ensure the healthy development of digital finance to support manufacturing innovation.

5. Conclusion

Digital finance injects strong impetus into manufacturing innovation, easing financing constraints, optimizing resource allocation and improving collaboration efficiency. China's manufacturing innovation capacity is improving, but still faces challenges such as insufficient core technologies, talent shortage, financing difficulties, low collaboration efficiency and weak risk control. In the future, we should take technological innovation as the core, talent support as the key, financial services as the guarantee, ecological synergy as the path and risk prevention as the bottom line, to deepen the integration of digital finance and manufacturing innovation, enhance innovation capacity and boost China's transformation from a manufacturing giant to a manufacturing power.

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