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Research on the Impact of the Digital Economy on the Innovation of Small and Medium-sized Enterprises

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Abstract: In the context of the digital economy, digital finance is becoming an important tool and service model to support the technological innovation of small and medium-sized enterprises. However, insufficient awareness among managers, an imperfect service system, limited supply capacity, and a weak risk prevention and control mechanism have restricted its support effect. To give better play to the role of digital finance, it is necessary to accelerate the construction of a service platform connecting digital finance and technological innovation, promote inclusive development, improve the service system, and strengthen risk supervision. By optimizing resource allocation, enhancing the accuracy and security of services, it can provide strong support for the technological innovation and digital transformation of small and medium-sized enterprises and promote the high-quality development of digital finance.

Keywords: Digital economy; Small and medium-sized enterprises; Technological innovation; Digital finance; Risk supervision

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1. Introduction

The digital economy, relying on cutting-edge technologies such as the Internet, cloud computing, big data, and artificial intelligence, has constructed a new economic form. According to The Research Report on the Development of China's Digital Economy (2024), as of 2023, the scale of China's digital economy reached 53.9 trillion yuan, accounting for 42.8% of GDP[1]. In this context, fintech and digital finance, as important components of the digital economy, are gradually becoming key financial tools for the technological innovation of small and medium-sized enterprises due to their high efficiency, convenience, and flexibility, providing strong support for their digital transformation and innovative development[2].

With the help of big data and artificial intelligence, digital finance has constructed accurate risk assessment models and intelligent service systems, providing customized financing solutions for small and medium-sized

enterprises, reducing innovation costs, optimizing processes, and improving efficiency. At the same time, it helps enterprises gain insights into industry trends and market changes, clarify innovation directions, and enhance their competitiveness [3]. However, technological innovation in small and medium-sized enterprises is usually accompanied by high investment, high risks, and long cycles, and the problems of difficult and expensive financing remain prominent. In response to this, digital finance provides a practical path to alleviate financing constraints and promote technological innovation through innovative financing models and technical means [4, 5].

2. Overview of the digital economy

2.1. Definition and characteristics of the digital economy

The digital economy is a new economic form that takes data as the core production factor, relies on modern information networks, and uses information and communication technology (ICT) to optimize resource allocation and improve economic efficiency. It covers all economic activities that directly or indirectly rely on data-driven resource allocation and productivity improvement. At the technical level, the digital economy includes cutting-edge technologies such as big data, cloud computing, the Internet of Things, blockchain, artificial intelligence, 5G communication, and edge computing. The in-depth integration of these technologies promotes industrial innovation and economic upgrading. At the application level, the digital economy is widely infiltrated into fields such as intelligent manufacturing, smart finance, digital trade, online education, and digital healthcare, greatly improving production and service efficiency [6].

As the main economic form following the agricultural and industrial economies, the digital economy has core characteristics such as data-driven, intelligent development, and full-factor digital transformation, profoundly affecting the production methods, lifestyles, and governance methods of society [7]. The development of the digital economy not only promotes the rise of emerging industries, such as the Internet platform economy and the artificial intelligence industry, but also reshapes the business models and value chain structures of traditional industries, accelerating the global resource restructuring, industrial upgrading, and economic structure optimization and adjustment.

2.2. Development status of China's digital economy

In recent years, the digital economy has become an important driving force for global economic growth. In particular, China has made remarkable progress in this field. According to the data in The Research Report on the Development of China's Digital Economy (2024), in 2023, the scale of China's digital economy exceeded 53.9 trillion yuan, accounting for 42.8% of GDP, becoming a key engine for promoting high-quality development. The government attaches great importance to the development of the digital economy and has issued policies such as The Digital Economy Development Plan (2021–2025) and The 14th Five-Year Plan for the Development of the Digital Economy, proposing to basically build a digital economy system by 2025 [8]. By accelerating the construction of new infrastructure, promoting industrial digital transformation, and improving the data factor market, China is creating an efficient, intelligent, and secure digital economy ecosystem.

In terms of infrastructure, China has made significant investments in fields such as 5G, cloud computing, big data centers, and artificial intelligence, building a globally leading digital infrastructure system. By the end of 2023, there were more than 3 million 5G base stations, achieving full coverage in major cities and some rural areas. Through the "Eastern Data and Western Computing" project, China optimizes the national data resource

allocation and computing power layout, helping the digital economy operate efficiently. At the same time, the wide application of gigabit optical networks and the Beidou Navigation System, as well as the rapid development of domestic chips and intelligent hardware, continue to enhance the independent and controllable capabilities of China's digital economy [9–11].

2.3. Industrial digital transformation and integrated application

The digital economy accelerates the transformation and upgrading of traditional industries, forming a two-wheel-driven model of digital industrialization and industrial digitalization. In the manufacturing industry, technologies such as industrial Internet, intelligent manufacturing, and digital twins have improved production efficiency and resource utilization rates, promoting the digital and intelligent development of manufacturing. In the financial field, technologies such as blockchain, artificial intelligence, and big-data risk control have promoted innovative services such as digital payment and intelligent investment advisory, enhancing the intelligence and inclusiveness of financial services [12]. In the agricultural field, technologies such as the Internet of Things and big-data analysis have helped the development of smart agriculture, improving the precision of agricultural production.

Digital trade and cross-border e-commerce are developing rapidly, reshaping the global trade pattern. In 2023, China's cross-border e-commerce import and export volume reached 2.3 trillion yuan, with a year-on-year growth of over 10%. Platforms such as Alibaba's AliExpress and ByteDance's TikTok Shop have expanded into international markets, enhancing the status of Chinese enterprises in global digital trade. At the same time, the pilot promotion of the digital yuan (e-CNY) helps the application of the yuan in cross-border payments, promotes the internationalization of the yuan, and provides an efficient and convenient payment solution.

2.4. Market-based allocation of data factors and digital security supervision

As a new type of production factor, the market-based allocation of data is crucial for the development of the digital economy. In 2023, China issued the "Reform Plan" for the Market-based Allocation of Data Factors, proposing to accelerate the promotion of data rights confirmation, circulation, trading, and value-added utilization to enhance the market value of data. Currently, cities such as Beijing, Shanghai, and Shenzhen have established data exchanges to promote the circulation and market-based pricing of data assets, improving the allocation efficiency of data resources [13]. The government is also accelerating the promotion of data security legislation to ensure the legality and compliance of data transactions and promote the healthy development of the data factor market.

With the rapid development of the digital economy, issues such as data security, network security, and personal information protection have become more prominent. To address network security threats, China has successively introduced laws and regulations such as the "Data Security Law" and the "Personal Information Protection Law", strengthened data security supervision, and established a network security review mechanism to ensure the safe and stable development of the digital economy. At the same time, the country actively promotes the research of technologies such as "trusted artificial intelligence" and "blockchain-based trusted authentication", aiming to build a safe and trustworthy digital economy environment [14].

2.5. The digital economy facilitates rural revitalization and sustainable development

The digital economy not only promotes urban industrial upgrading but also provides new impetus for rural revitalization. Models such as e-commerce, live-streaming e-commerce, and smart agriculture have entered rural areas, improving the circulation efficiency of agricultural products and farmers' incomes. Platforms such as Taobao

and Pinduoduo's "Rural Revitalization Plan" help local agricultural products sell online, enhancing the digital level of the rural economy. Technologies such as 5G and the Internet of Things have promoted the intelligentization of rural infrastructure and agricultural modernization.

The digital economy also promotes green and sustainable development. Intelligent manufacturing, the sharing economy, and low-carbon industries have improved resource utilization efficiency, reduced carbon emissions, and promoted green development. For example, cloud computing and artificial intelligence optimize energy scheduling and carbon emission monitoring, while the transparency of blockchain helps establish a green supply chain.

In general, the digital economy is reshaping the economic growth model. China has achieved remarkable achievements in digital infrastructure, industrial digitalization, digital trade, the data market, and digital security supervision, and has promoted rural revitalization and sustainable development. However, technological innovation, data security, and market supervision still face challenges. In the future, it is necessary to strengthen technological breakthroughs and data security governance to promote the high-quality development of the digital economy.

3. The impact of the digital economy on enterprise innovation

3.1. Solving funding constraints and expanding the sources of technological innovation funds for small and medium-sized enterprises

Under the traditional financial model, financial institutions such as banks have strict credit reviews for small and medium-sized enterprises, and the financing procedures are complex. This not only reduces the financing efficiency but also increases the cost of innovation and research, and development. Digital finance, through technologies such as big-data risk control and artificial-intelligence credit assessment, can more accurately identify and analyze the credit risks of enterprises, alleviate information asymmetry, optimize the allocation of financial resources, and promote the flow of funds to enterprises with innovation potential. For example, Tianjin Jincheng Bank launched the "Jincheng Loan". Enterprises can apply for credit online through WeChat official accounts or APPs, and the funds can be received in as fast as 1 minute, greatly improving the capital turnover efficiency and providing strong support for technological innovation [15].

Relying on big-data analysis, machine learning, and other technologies, digital finance constructs accurate profiling models, deeply explores enterprise needs, and precisely matches financial products and services. The intelligent risk-control system can also provide customized financing solutions according to different stages of enterprises. This personalized service not only optimizes the financing environment but also provides a stable source of funds for technological innovation and business upgrading.

3.2. Increasing operating income and strengthening the internal driving force for technological innovation of small and medium-sized enterprises

With the popularization of digital payment tools such as Alipay and WeChat Pay, the market transaction efficiency has been significantly improved, the capital liquidity has been enhanced, and consumption has accelerated, promoting the increase of the operating income of small and medium-sized enterprises. The increased income not only improves the financial situation but also accumulates funds for technological innovation. For example, digital payments enable enterprises to achieve convenient capital transfer, enhancing their ability to invest in technological innovation.

Digital finance also optimizes the market matching degree of products and services through intelligent

marketing, user profiling, and other means, increasing market share. At the same time, it promotes the upgrading of the consumption structure and changes in demand, prompting enterprises to continuously carry out technological innovation and product research and development. The development of digital finance not only accelerates the process of enterprises optimizing their income structure but also becomes an important driving force for accelerating innovation.

3.3. Optimizing the innovation environment and strengthening the external pull for technological innovation of small and medium-sized enterprises

The rapid iteration and wide application of digital technologies provide a good external environment and technical support for enterprise innovation. In addition, digital finance, through technical means, alleviates information asymmetry in the financial market, promotes the rational allocation of resources, accelerates the process of market survival of the fittest, and enhances the competitive pressure and innovation motivation of enterprises. Facing fierce competition, small and medium-sized enterprises must enhance their competitiveness through technological innovation. At the same time, rich technical tools and innovation models further stimulate the innovation vitality of enterprises and promote the continuous development of technology.

3.4. Strengthening risk control and improving the security management mechanism for digital finance to serve small and medium-sized enterprises

With the rapid development of digital finance, information security and data risks have become more prominent. Small and medium-sized enterprises need to establish an information security management system, strengthen the protection of financial and core business data, and ensure the security of data during collection, transmission, and use. At the same time, they should develop emergency plans, monitoring systems, and conduct regular drills to improve their ability to respond to sudden risks.

The cognitive level of enterprise managers and employees affects their ability to use digital finance securely. Regular information and data security training should be carried out to enhance security awareness, master risk prevention knowledge, and improve the ability to prevent fraud, data leakage, and other issues. By constructing safe operation specifications and internal control mechanisms, human-induced security risks can be reduced, and the overall security management level can be improved.

The government and regulatory authorities should strengthen the supervision of digital finance, improve regulations, and establish a prudential supervision mechanism to ensure its standardized development. Regulatory agencies can use technical means such as big-data monitoring and artificial-intelligence risk control to accurately identify financial risks, ensuring that small and medium-sized enterprises can develop steadily while enjoying the digital dividend. In addition, the construction of an industry self-regulatory mechanism should be promoted, and enterprise compliance management should be strengthened to create a safe, efficient, and fair financial ecosystem, providing a stable and reliable support environment for the technological innovation of small and medium-sized enterprises.

4. Conclusion

The development of the digital economy provides comprehensive support for enterprise technological innovation. Especially through the innovative application of digital finance, it has successfully solved the funding constraints of small and medium-sized enterprises, broadened financing channels, increased operating income, optimized the

innovation environment, and strengthened the risk management capabilities of enterprises. In the future, the digital finance service system should be further improved, financial supervision strengthened, and the digital economy governance framework optimized to promote the technological innovation and digital transformation of small and medium-sized enterprises and provide a more solid support for high-quality economic development.

Disclosure statement

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