

The Effect of Internet of Things Technology on Financing of Small and Micro Enterprises

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Abstract: As an important part of digital technology, intelligent Internet of Things has the characteristics of ubiquitous perception, efficient transmission and automatic operation, which can inject innovation vitality into financial services and provide innovation tools. Intelligent Internet of Things technology realizes the collection of all kinds of production and asset data, promotes the transparency of industrial chain operation, breaks through the time and space constraints of small and micro enterprises financing, enriches the supply of financial products, and makes credit investigation evidence to rely on. The application prospect of Internet of Things technology is broad. In the future, we should strengthen the formulation of Internet of Things technology standards, promote the integrated development of technology, strengthen risk prevention and control, and promote the application of Internet of Things technology in the field of small and micro enterprise financing.

1. Introduction

The financing challenge faced by small and micro enterprises is a global issue, commonly referred to as the Macmillan Gap. The development of financial technology has brought new opportunities for small and micro enterprises to obtain financing. Intelligent Internet of Things technology, characterized by pervasive perception, reliable transmission, and intelligent processing, facilitates the visualization and transparency of enterprise production and operations^[1]. It mitigates information asymmetry, provides credit references for small and micro-enterprises, and aids financial institutions in reducing risk control costs. To this end, we advocate promoting the integrated development of technology, strengthening risk prevention and control, and accelerating the application of Internet of Things technology in financing.

2. Financing difficulties of small and micro enterprises

Small and micro enterprises are an indispensable and important part in China's national economic and social development, accounting for more than 90 percent of the enterprises and contributing more than 60 percent of GDP^[2]. They play an important role in expanding employment, increasing National income and maintaining social harmony and stability. However, from the perspective of individuals, small and micro enterprises belong to vulnerable groups and face different development constraints. The "China Regional Financial Operation Report (2022)" of the People's Bank of China points out that small and micro enterprises are still facing certain difficulties in financial services.

The financing dilemma of small and micro enterprises is intertwined inside and outside, including the factors of weak resilience of small and micro enterprises and non-standard management, as well as the problems of moral hazard and adverse selection caused by information asymmetry and inverted loan income and cost^[3].

2.1. Information asymmetry

According to the credit rationing theory of Stiglitz and Weiss (1981), the main reason for the financing difficulties of small and micro enterprises lies in the information asymmetry between financial institutions and small and micro enterprises. In the traditional lending model, commercial banks pay more attention to the analysis of financial statements and infer the solvency of enterprises based on them. However, small and micro enterprises generally have problems such as imperfect system and non-standard finance, and lack accurate and detailed financial statement information. Therefore, commercial banks can only support credit decisions based on the analysis of historical business performance of small and micro enterprises. However, the operation of small and micro enterprises is affected by market fluctuations, and the performance of small and micro enterprises fluctuates greatly, which makes commercial banks unable to accurately analyze and judge the credit status of small and micro enterprises, resulting in information asymmetry. In this case, commercial banks will generally eliminate the adverse impact of information asymmetry by raising loan interest rates, which will lead to the problem of "bad money driving out good money", that is, some high-quality small and micro enterprises withdraw from the credit market, while enterprises with relatively poor performance occupy the market, resulting in the decline of bank capital return, resulting in the phenomenon of "loan reluctance". In addition, information asymmetry is easy to cause moral hazard, and some small and micro enterprises default to transfer capital investment direction and get involved in high-risk areas, which leads to the decline of loan recovery rate and the increase of bad debt risk. Therefore, in order to prevent adverse selection and moral hazard, financial institutions implement strict credit management strategies at their discretion to exclude small and micro enterprises, which makes it difficult for small and micro enterprises to obtain financial support.

2.2. High loan cost

Small and micro enterprises are small in scale, large in number, wide in geography, small in demand for funds and high in frequency. Some small and micro enterprises are located in remote areas, and the cost of acquiring customers is relatively high for banks, making it difficult to grant credit centrally. The loan amount of small and micro enterprises is only 0.5% of that of large enterprises, while the number of loans is up to 5 times that of large enterprises. Because financial institutions have fixed sunk costs in corporate loans, generally speaking, the loan cost of small and micro enterprises is often equivalent to six or seven times that of large enterprises. Small and micro enterprises cannot submit standardized financial reports, so commercial banks have to find alternative data to evaluate the credit of small and micro enterprises, which increases the cost of information search. At the same time, small and micro enterprises are widely distributed, and commercial banks need more branches and personnel to grant credit to small and micro enterprises, which leads to the increase of operating costs. In addition, when commercial banks grant credit, pre-loan assessment, loan review and post-loan supervision will generate corresponding risk management costs, which are not related to the loan scale, resulting in the inverted cost and income of small and micro enterprises' loans. Therefore, in order to balance the profitability and risk, commercial banks will adopt prudent strategies when lending to small and micro enterprises.

2.3. Risk control difficulty

Financing of small and micro enterprises is a high-risk business, small and micro enterprises have low resilience, most small and micro enterprises are in a weak position in the market competition, weak ability to resist risks, unstable operation, high probability of default, and once default occurs, the capital recovery rate is relatively low. Therefore, compared with large enterprises, the loan supplier needs to increase the loan reserve to make up for the loss caused by the default of small and micro enterprises. Most small and micro enterprises are asset-light industries, generally lack collateral, and due to information asymmetry, it is difficult for banks to evaluate the credit status of small and micro enterprises, and it is difficult to control the risk.

3. The advantages of intelligent Internet of Things

Intelligent Internet of Things is the use of the network to connect intelligent equipment, through the combination of software and hardware, the use of global positioning system, infrared sensors and other sensing equipment, so that the hardware equipment has intelligent functions and information exchange ability, to achieve intelligent positioning, tracking, monitoring and management of goods. The Internet of Things technology has the characteristics of comprehensive perception, reliable nodes, intelligent processing, low energy consumption and high efficiency, and has certain advantages in promoting the financing of small and micro enterprises^[4].

3.1. Expand the scope of financing services

Due to the limitation of technology and cost, the subject matter of loan mortgage is generally limited to real estate. The Internet of Things technology makes vehicles, inventory, living assets and other digital characteristics. Intelligent Internet of Things technology uses perception technology to form ubiquitous perception of various subjects, which can realize the visualization of movable property, so as to effectively monitor and evaluate movable property, and avoid the risk of timely warning of movable property appropriation and repeated mortgage in traditional business. Taking auto financing as an example, the intelligent Internet of Things can realize the technical problems such as trusted supervision of automobiles and dynamic supervision of assets in the warehouse. The intelligent platform based on intelligent equipment and dynamic supervision warehouse can break the barriers of traditional auto finance inventory financing^[5].

3.2. Optimize financial services

At present, the intelligent Internet of Things has the initial ability to intervene in the Internet of everything, and has a broad space in industrial digital application. By improving the access mode, the Internet of Things enables the digital transformation of all aspects of enterprise operation and the discontinuity point of business process to be continued. In recent years, financial institutions can use radio frequency identification technology, 5G, narrowband Internet of Things and other technologies to effectively collect information related to financial objects, track the production and operation process of enterprises, provide a basis for financial institutions to analyze enterprise information, and promote financial institutions to do pre-loan review, in-loan approval and post-loan management more effectively.

3.3. Enrich the data of financial products

The smart Internet of Things expands the scope of financial targets, provides financial institutions

with a large amount of useful data and information, and optimizes the process of financial services. Intelligent Internet of Things technology has laid a solid foundation for the development of digital economy, realized the Internet of everything, diversified the dimensions of data acquisition, and the scale of acquisition is huge. At present, intelligent Internet of Things technology is widely used in industrial Internet, smart medical care, Internet of vehicles and other fields, forming a huge data set, providing data support for financial institutions to judge the credit of small and micro enterprises. At the same time, financial institutions also enrich data sets through various intelligent terminals such as ATMs. The industrial Internet of Things platform provides electronic debentures that can be split, circulated and financed based on the background of the real industrial chain for enterprise credit evaluation, and transfers the credit of core enterprises to small and medium-sized enterprises, helping the industrial chain to "strengthen the chain and supplement the chain". At the same time, through the industrial Internet of Things platform to obtain real-time water and electricity, gas, key equipment and other data, help financial institutions to monitor the real-time operation status of enterprises, real-time early warning of abnormal production and operation, adjust lending strategies, fully alleviate the financing difficulties of small and medium-sized enterprises industry chain.

4. Typical scenarios

4.1. Manufacture financing

Financial institutions collect equipment current information, capacity, energy consumption and other information from the enterprise side through the Internet of Things technology, grasp the real operation of the enterprise, and provide real and effective data for the assessment of business risks through cross-verification with financial data. In addition, the Internet of Things platform has the function of order matching, which provides more business opportunities for the platform enterprises to expand their business.

Taking Ping An Bank's "Nebula Iot Initiative" as an example, in 2020, Ping An Bank launched its first satellite, Ping An 1. Inheriting the traditional data platform architecture, Xingyun iot platform uses fintech such as iot, blockchain and edge computing technology to enrich data collection, modeling and application, and realize the perception, identification, location, tracking, monitoring and management of practical assets. The platform is highly integrated, convenient for output, composable and replicable, and supports digital transformation and upgrading. By the end of 2022, the number of devices connected to the Internet of Things under the "Nebula Iot Plan" officially exceeded 20 million, which have been applied to six scenarios, including smart manufacturing and smart vehicle connectivity, supporting a total of 640 billion yuan in financing for the real economy.

Taking the smart infrastructure scenario as an example, Ping An Bank and construction machinery manufacturers jointly launched customized digital loan products to provide financing support for micro, small and medium-sized enterprises (Msmes) or self-employed people with terminal equipment of construction machinery. Relying on the iot solution of construction machinery terminal equipment, Ping An Bank uses iot, big data and other technologies to automatically approve the quota, monitor production, control equipment and manage risks for borrowers, realizing the online and automatic approval of the whole process, solving the financing problems of enterprises and giving full play to the value of digital assets such as daily production and operation data of enterprises. This not only enables rapid lending to upstream and downstream enterprises in the supply chain, but also greatly improves the quality of enterprises' own assets and truly reflects the production and operation of enterprises. In the past, banks can only provide high amount of financing support for enterprises through loans, pledges or endorsement of core enterprises. However, "Nebula Iot Plan" breaks through the traditional financing conditions and effectively solves the problem of financing difficulty and high cost for small, medium and micro enterprises.

4.2. Agriculture financing

Network technology enables the monitoring of crops and breeding objects by collecting agricultural breeding and planting scene information, as well as monitoring the growth status and environment of the target. For example, in intelligent cattle breeding financing, data collection is conducted through intelligent collars, cameras, digital platform scales, ear tags, sensors and other Internet of Things devices to monitor the growth of cattle. Simultaneously, the environment of cattle farms can be automatically monitored to reduce the risk of cattle mortgage financing.

The Agricultural Bank of China's credit model for "Internet of Things + smart livestock" serves as an exemplary case. By utilizing dynamic monitoring of intelligent ear tags, big data credit modeling, and closed-loop management of funds, the bank has successfully piloted innovative live livestock mortgage loan business. This initiative effectively addresses the challenges related to live livestock mortgage, supervision, and financing.

4.3. Supply chain financing

In the realm of supply chain financing, the Internet of Things can not only trace the provenance of damaged goods to mitigate logistical blind spots, but also optimize inventory utilizing technologies such as RFID and EPC, or adapt routes based on transportation conditions to minimize delays and effectively ameliorate risks across various nodes in the supply chain industry.

For example, the Internet of Things supply chain project cooperated by China Citic Bank and Haier Group has achieved great success. The transaction volume of its supply chain finance platform has reached 10.1 billion yuan, and the user scale has exceeded 2 million. Minsheng Bank has also borne fruit in the field of Internet of Things finance. The balance of assets in auto finance, commodity finance and other movables pledge business has exceeded 20 billion yuan. Since December 2017, Bank of Jiangsu has launched a full-line iot movable property pledge financing business by using the Internet of Things and blockchain technology. Through real-time collection of warehouse and customer flow, collection of production energy consumption, access to enterprise pledge information, master the operation ability and debt paying ability, realize the one-to-one correspondence between pledge and loan, eliminate the ownership risk of past pledge pooling and information transmission problems, greatly save the time and capital cost of financial services, timely solve the demand of production and operation capital turnover. According to the feedback of a steel trade enterprise, with the support of Internet of Things finance of Bank of Jiangsu, the sales volume in 2018 has increased by 20% year on year.

5. Conclusion and prospect

Intelligent Internet of Things technology has a broad application prospect. Through its ubiquitous perception, reliable transmission, intelligent processing and other characteristics, it can realize the transparency and visualization of the production and operation process of enterprises, which helps financial institutions to more accurately grasp the actual operation status of enterprises, reduce the degree of information asymmetry, and thus enhance the credit support for small and medium-sized enterprises^[6].

In the future, promoting the application of intelligent Internet of Things technology requires joint efforts from various aspects such as technology research and development, cost control, data security, scene exploration, policy support and market cultivation, so as to create more efficient, intelligent and secure solutions for small and micro enterprises.

Firstly, it is essential to promote the integrated development of technologies. Mastering the core key technologies of the Internet of Things is crucial for advancing the application of smart Internet of

Things technology. This technology encompasses sensors, cloud computing, communication technology, big data technology, and other fields. In the future, there should be increased research and development efforts in key technological areas such as smart sensors and big data analysis to allocate more resources for R&D in order to enhance the performance and accuracy of Internet of Things systems. Furthermore, exploring the integration and development of Internet of Things technology with Block chain, Digital twin, and other technologies will enhance financial institutions' ability to gain insight into scenarios.

Secondly, we should establish technical standards for the Internet of Things. The development of unified technology standards for the Internet of Things can enhance connectivity between different enterprises and financial institutions, drive innovation and implementation of Internet of Things technology, lower the deployment, development, and maintenance costs of Internet of Things systems, standardize data quality and format, enhance data processing efficiency and accuracy, as well as reduce risks in financial services.

Thirdly, Risk control should be strengthened. The core of the Internet of Things technology application lies in data security and risk control. It is necessary to standardize the application of Internet of Things technology, unify data exchange and processing norms for enterprise production and operation data, prevent data leakage and abuse, strengthen data encryption and standardization, and strengthen data monitoring and risk warning.

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