Innovative Data Asset Capitalization and Digital Supply Chain Finance for SMEs: a case study of Uqian Tech

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Abstract. With the advent of the digital economy era, data, as a new production factor, is profoundly changing the way enterprises operate and their financial models. In the field of supply chain finance, the application of data promotes information transparency, reduces information asymmetry and transaction costs, and enables small and medium-sized enterprises (SMEs) to obtain financing more conveniently. However, the traditional supply chain finance model has problems such as difficulty in obtaining information and high cost of risk control, which leads to the low willingness of financial institutions to serve SMEs. This study explores how data asset capitalization empowers SMEs in digital supply chain finance through a case study of Shenzhen Uqian Information Technology Company Limited (Uqian Tech). It is found that data asset capitalization can not only directly provide financing for data service providers, but also indirectly empower SMEs in the supply chain by enhancing the information synchronization upstream and downstream of the supply chain and realizing the digital transformation of the production process and technological innovation.

1 Introduction

Nowadays, the digital economy is the main economic form, following the agricultural economy and industrial economy. Data is a new productive factor after land, labor, capital, knowledge, technology, and management. China is the first country to list data as a production factor. The preliminary estimate for the scale of China's digital economy in 2023 is $7.8 trillion, accounting for over 44% of GDP. Data have become a key driving force for stable economic growth.

With the advent of the big data era and the rise of the digital technology revolution, the combination of data and industrial finance has become the key for enterprises to enhance competitiveness and optimize resource allocation. Moreover, after the release of ChatGPT by Open AI in November 2022, it ignited the wave of research and development in AI large models. So far, the rapid technological progress of AI large models has elevated the position of data elements in the combination of production factors from two dimensions: changing the generation way of data elements and driving enterprise decision-making.

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Under the traditional credit model, SMEs have long faced pain points such as financing difficulties, high financing costs, and long loan approval cycles from banks. In the traditional supply chain finance model, financial institutions highly rely on the main credit of core enterprises. Core enterprises are willing to keep the transaction information private from financial institutions. Moreover, the credit quality of SME suppliers varies greatly. Small scale supplier order management still relies mainly on offline methods, with a low degree of digitalization. Therefore, for financial institutions, due to difficulties in obtaining data, borrowers have a high degree of manipulability in terms of its credit. Their credit risks are high. At the same time, the operating costs and risk control costs are relatively high, and the profit margin is limited. Accordingly, the willingness of financial institutions to provide financial services to SMEs is not strong.

However, the vast majority of upstream and downstream connections in the core enterprises of the supply chain are SMEs, which often need more funding during their operations. Due to interruptions in the funding chain, orders may display a shortage status, which results in problems such as poor hierarchical connection, broken links, delayed user response, inadequate inventory to supply, and high customer refund rate. The flourishing of data elements creates new possibilities for innovative financing models. This study takes Shenzhen Uqian Information Technology Company Limited (Uqian Tech) as an example to explore the empowerment mechanism under increasing digitalization, as well as the mutual promotion between this kind of innovative financing model and digitalization.

2 Empowerment of digital supply chain finance for SMEs

2.1 Digital supply chain finance

The application of Fintech in supply chain finance is mainly used to solve two problems: information asymmetry and high transaction costs, and high transactions are primarily caused by information asymmetry. Stiglitz & Weiss pointed out that the asymmetric information between lenders and borrowers can lead to adverse selection effects and moral crisis effects. Thus, lenders will choose to allocate credit to borrowers instead of raising interest rates when faced with high loan demand [1]. The theory of information asymmetry gave rise to the financial institution. The basic idea of the financial system is to transform asymmetric information into symmetric information, which, therefore, generates transaction costs. According to Berger & Udell, one of the primary reasons for the difficulty of financing for SMEs is the reluctance of large banks to lend, which is caused by the high cost of lending [2].

Digital supply chain finance uses technologies such as blockchain, AI, and big data analytics to complete tasks such as information screening, risk prevention, and in-process and post-event supervision. It ensures the authenticity and reliability of information related to borrowers. Gong et al. proposed that digital supply chain finance embodies the deep integration of digital technology, industrial ecology, and modern finance. It represents the penetration of data and technology in the financial field [3]. Digital supply chain finance enhances data transparency through real-time data sharing. It reduces information lag and distortion, thereby reducing information asymmetry. Zhu et al. used the cash-cash flow model to conduct empirical analysis. They proved that supply chain finance can reduce the degree of information asymmetry through high-quality information disclosure. It further alleviates the financing constraints on SMEs [4]. Tong & Wang indicated that digital supply chain finance can effectively promote high-quality development of the Chinese path to modernization through substantive analysis [5].

2.2 Innovative financing model - data asset capitalization

Zhao (2024) analyzed the impact mechanism of data asset inclusion on the quality of financial reports and found that data asset entry can significantly enhance the value reflection of financial statements [6]. It demonstrates the core competitive advantages and future development prospects of enterprises. Talwar et al. believed that, in the era of data, the effective application and management of data will play an important role in the stable operation and profitability of enterprises [7]. Yang et al. verified through model equilibrium and comparative analysis, as well as numerical simulation, that big data can improve the quality level of intermediate products and promote production technology progress for a long time through the "multiplier effect" [8]. Big data has a significant effect on economic growth, which is magnified by the increasing degree of application of big data.

The 2023-2024 Chinese Data Asset Development Research Report has defined data capitalization as the mining of independent financial value attributes of data assets in financial reports based on assetization. Capitalization is based on the consensus of data asset returns and values, endowing data with financial attributes. Report on Value Realization of Data Asset defined capitalization that capitalization of data assets refers to the implementation of input-output management through various resource allocation or circulation methods, which enables data assets to be value-added assets.

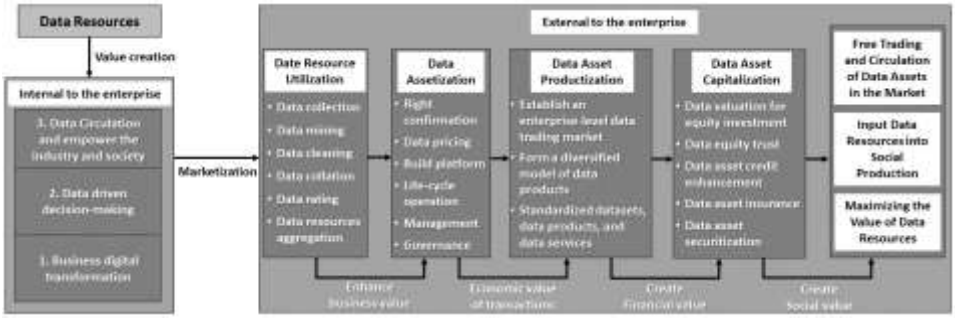

Fig. 1. Value creation chain of data resources.

Figure 1 illustrates the value creation chain of data resources. The value creation chain is divided into internal and external value creation for the enterprise. The value created for internal enterprise mainly lies in digital transformation, data-driven decision-making, and operational process improvement via data circulation. Following the release of data resources onto the market, data resource utilization, data assetization, data asset productization, and data asset capitalization-which, in turn, realize business value, economic value, and financial value-are among the value created by data external to the company. Finally, the social value of data resources can be realized through highly developed data asset capitalization technologies and mature data capitalization markets.

The ways to achieve data asset capitalization include equity investment, equity trust, credit enhancement, insurance, securitization, etc. Furthermore, credit enhancement contains information enhancement, entry enhancement, and collateral enhancement.

Additionally, tech-based companies are supposed to rely more on the direct marketization of data assets than are traditional industry organizations, which employ data assets internally to increase operational efficiency. In order to increase transparency and attract capital investments in technology innovation, their data assets are frequently entered in a way that reflects their technological and data processing skills. It has been in the forefront of this innovation because of its business nature and strong compatibility with the demands of the current economic development regarding digital transformation. SME data service providers

might employ unique competitive tactics to adapt as much as possible to new developments in data asset capitalization.

2.3 Empowerment mechanism between different entities

In the digital age, the internal digitalization level and information transparency of SMEs in the supply chain are low. Meanwhile, SME data service providers face the challenge of data not being able to realize its monetary value. Data resources that remain within the enterprise cannot effectively reflect the operational status of the enterprise at the financial statement level. They, therefore, are unable to obtain favourable loan conditions under the traditional economic model.

Data asset capitalization can empower both types of SMEs above in digital supply chain finance. To be more precise, the empowerment of SMEs on the chain is indirect, while the empowerment of data service providers is direct. It aims to enhance the degree of digitalization of digital supply chain finance. By connecting the upstream and downstream information synchronization of the supply chain, the flow of enterprise data on the chain has also been achieved.

Fig. 2. Digital supply chain finance empowerment mechanism.

Figure 2 summarizes the empowerment mechanism in digital supply chain finance between different entities. First and foremost, data asset capitalization empowers SME data service providers, enabling them to finance directly. Then, they must to focus more on researching and developing data services, providing greater technical support to SMEs on the chain. Lee et al. stated that by digitalizing production and management, data analysis can be utilized to create value and improve product and supply chain technology innovation [9]. After obtaining sufficient data, service providers will perform data resource utilization, assetization, and productization, and finally, capitalize the data asset products to financial institutions.

3 Data asset capitalization case study: Uqian Tech

Uqian Tech was founded in May 2016 in China. In 2023, it received a rating of SRDI (specialized, refined, differential, innovative) SME. With cutting-edge clever artificial intelligence technology and a robust database, this technology-driven national high-tech

company has successfully served over 7.87 million SMEs by offering high-quality digital inclusive financial solutions.

3.1 Uqian Tech's data asset capitalization practices

In February 2023, Uqian Tech passed the qualification review for data providers by Shenzhen Data Exchange and became a data provider. In October of the same year, it was also qualified to be a data provider in the Shanghai Data Exchange. In May of 2024, Shenzhen Data Exchange partnered with Bank of Communications Co., Ltd. Shenzhen Branch to establish a "data asset hierarchical classification model" for sci-tech innovation enterprises. This model promotes Uqian Tech to complete the entry of data assets and the successful listing of data products on the Shenzhen Data Exchange trading platform. Thereupon then, Uqian Tech obtained a 10-million-yuan data asset financing loan. This financing case creates a new model for credit enhancement of sci-tech data asset capitalization. In June of 2024, Shenzhen Data Exchange and Guoren Property and Casualty Insurance Co., Ltd. jointly organized market research to design and develop the first batch of domestic data loss insurance. The first temporary insurance policy for data asset loss expenses was successfully issued for Uqian Tech, which marks the first nationwide data asset loss insurance policy to be implemented. One month later, Shenzhen Data Exchange deeply cooperated with the Bank of China Shenzhen Branch to successfully issue a data asset financing loan of 10 million yuan for Uqian Tech. This marks the first nationwide implementation of inclusive finance data asset-secured loan credit granting in Shenzhen.

The several capitalization projects of Uqian Tech's data assets are innovative practices by Shenzhen Data Exchange for data elements value creation. This aims to embrace the data element market, apply the innovative model of tech data, and attempt to expand innovative credit enhancement measures. This kind of financial innovation not only activates the data value of Uqian Tech as an SME but also empowers the high-quality development of its SME clients.

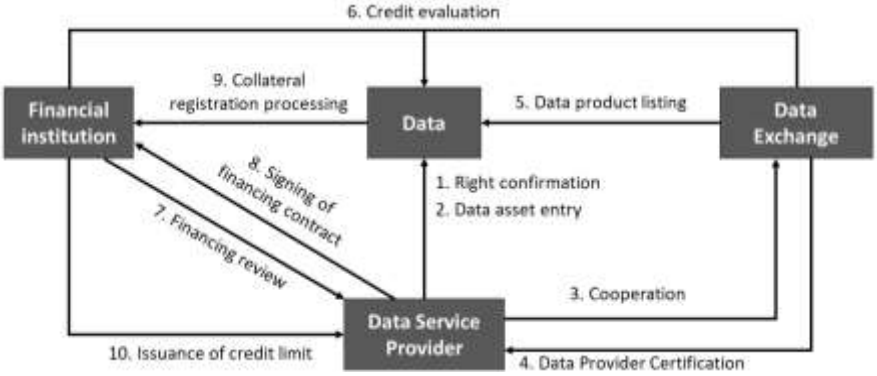

Fig. 3. Data asset-secured loan financing model.

Figure 3 formularizes the procedure of the data asset-secured loan financing model. The entire procedure of data asset secured loan for Uqian Tech includes 10 steps in total, which require the data to be respectively resourceful, assetized, productized, and capitalized. Firstly, the company took inventory of its data assets and utilized them as resources. Secondly, after inventory, third-party evaluation agencies (law firms, CPA firms) issued relevant audit reports, legal opinions, and analysis reports on the data assets. They confirmed ownership and performed data asset entry, which was considered as data assetization. Thirdly, the data asset came to Data Exchange. For Uqian Tech, Shenzhen Data Exchange executed data asset authentication, data product listing, and data merchant certification. The data asset was turned

into a product. Ultimately, the product that was listed would be capitalized. Uqian Tech submitted financing applications to banks. Banks and Shenzhen Data Exchange conducted credit evaluations on Uqian Tech. The bank conducted an internal financing process examination and evaluated the finances. Next, the bank signed the financing contract with Uqian Tech and completed data asset collateral registration. Following the registration, Uqian Tech was able to obtain the secured loans.

3.2 Digital supply chain finance empowerment analysis based on Uqian Tech

Continuously innovating credit reporting methods based on big data mining technology can significantly reduce the credit reporting and financing costs for SMEs [10]. Electronic marketplaces reduce the inefficiencies caused by buyer search costs, reducing the ability of sellers to extract monopolistic profits while increasing the ability of markets to allocate productive resources optimally [11].

This study takes the "E-commerce Merchant Portrait Series Data Product - Basic Version", which is listed on Shenzhen Data Exchange, and the digital product "Enterprise Panoramic Analysis Report" created based on big data models as examples. The merchant portrait series products are a tool dedicated to providing accurate and comprehensive merchant basic information services for the e-commerce industry. It can be used for business risk identification, data analysis, and business forecasting. It can also be used to assist financial institutions in accurately matching more personalized and differentiated financial products for e-commerce SMEs while targeting customers and developing effective marketing strategies. In addition, the "Enterprise Panoramic Analysis Report" focuses on big data to help SMEs accurately identify their business operation capability. It in great detail interprets the reasons for financing bottlenecks in the financial context, clearly focuses on the problems existing in SME users, and finally outputs an interpretation report for users.

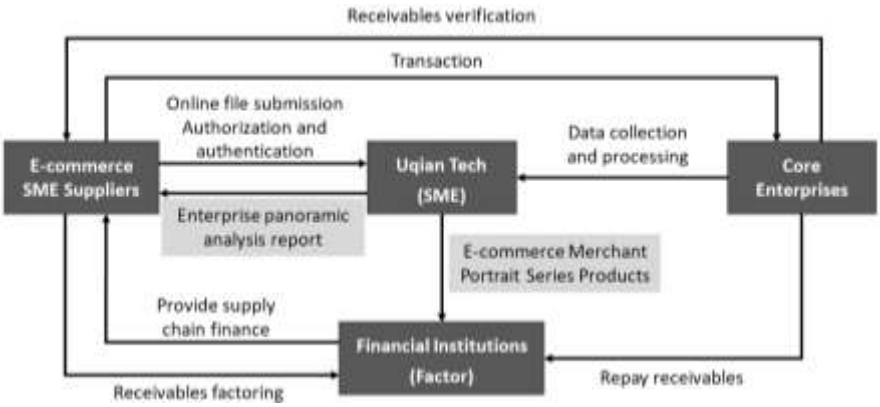

Fig. 4. Data asset capitalization in e-commerce digital supply chain finance.

Figure 4 takes receivable supply chain financing for example. SME suppliers use receivables generated from transactions with core enterprises to conduct receivables factoring with financial institutions. SME suppliers authorize and authenticate their information on Uqian Tech's platform and pay to obtain a comprehensive analysis report. After receiving information authorization, Uqian Tech constructs its portraits and forms an e-commerce merchant portrait series of products. The products can be capitalized to realize the monetary value of data assets, or they can be sold immediately. Therefore, Uqian Tech will be empowered. Financial institutions afterwards employ clear portraits to evaluate risks and develop financing plans that are more precise for SMEs.

In the entire supply chain finance, the level of digitalization is promoted with the introduction of innovative data asset capitalization. Under this innovative model, digital supply chain finance is empowered by forming a favorable circulation of data and funds, promoting overall economic development.

In addition, with the penetration of big data and financial technology in the financial field to various links of supply chain finance business, technology companies rely on their own accumulation and technological advantages to enter the market and develop supply chain finance platforms. Data empowers supply chain links such as order financing and movable property financing. The situation of information asymmetry has been greatly improved. Data can become a powerful tool for solving the financing difficulties faced by SMEs.

4 Suggestions

SMEs in the supply chain should constantly take advantage of market demand and policy dividends. In furtherance of actively investing in digital financial innovation and digital transformation, they should comprehensively integrate supply chain finance with cutting edge technology like big data.

SME data service providers should raise management and investment efforts in data asset capitalization thus recognizing the full value of data assets. To meet the challenges and seize the opportunities, they need to utilize the most of their internal data assets for financing, data activation, and exploring the formation of effective and long-lasting business models for the operation of data assets. To ensure the ongoing flow of data, they should also proactively develop data resources and make use of funding to conduct further research and development.

Last but not least, various entities in the digital asset market should foster resource cooperation and channel expansion to form a development synergy and cultivate a data asset ecosystem. Providers and users of data assets need to enhance their compliance and security awareness of applications and upgrade system standards. Regulatory authorities are supposed to expedite the formulation of clear policies and regulations to promote the lawful and compliant construction of the data asset market. The cornerstones of the sustainable development of data assets are compliance and regulation indeed.

5 Conclusion

Empowered by big data, the financing difficulties faced by SMEs have once again been effectively overcome. The case study of Uqian Tech in this article demonstrates how data asset capitalization empowers digital supply chain finance for SMEs. At the same time, financial innovation can assist in the digital transformation of SMEs on the chain and the technological reinvestment of SME data service providers. In the entire positive cycle, the essence of empowerment is to accelerate the flow of data elements and promote the release of data asset value. All in all, with the increasing digitalization of supply chain finance, data resources become more valuable not just for informational purposes and decision-making support, but also as a key factor in stimulating innovation and advancement of supply chain finance. Data asset capitalization is expected to become an important trend in the era of digital supply chain finance.

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