

Analysis of SMEs Supply Chain Financing Based on Blockchain Technology: A Case Study of AntChain Platform

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Abstract. In the current economic background, traditional supply chain finance mainly relies on the credit of core enterprises, but the credit is difficult to be effectively transmitted to small and medium-sized enterprises (SMEs) at the end of the supply chain. This paper examines the application of blockchain technology in SMEs supply chain finance through a case study of AntChain platform. The distributed ledger and smart contract technologies of blockchain can effectively solve the problems of information asymmetry, high financing costs and high financing risks in SMEs supply chain financing. After AntChain platform integrates the data of the upstream and downstream of the supply chain, it can provide more flexible financing for SMEs through the credit transfer of core enterprises. However, there are also certain deficiencies in actual operation. It is suggested to strengthen data privacy security, lower the entry barriers for SMEs and actively expand strategic partnerships to improve the development of AntChain platform.

Keywords: Blockchain technology, SMEs Financing, AntChain.

1. Introduction

Against the backdrop of the accelerating global digital transformation, SMEs, as an important pillar of the national economy, continue to face severe financing constraints. In the traditional supply chain finance models, SMEs have long struggled with information asymmetry, as their financial data are usually less organized. Lenders demand higher return to compensate for the high default risk, resulting in higher financing costs for SMEs. The emergence of blockchain technology provides a breakthrough path for supply chain financing.

First, blockchain technology utilizes the decentralized nature of distributed ledgers to provide comprehensive transaction records for all participants in the supply chain, which achieves information sharing, and solves interoperability, and solving the problem of information asymmetry in supply chain finance. Xu et al. (2022) argue that information sharing in supply chain finance based on blockchain technology far exceeds that of traditional supply chain finance. The new decentralized traceability system of blockchain technology can conduct appropriate real-time information sharing under product safety, reduce information asymmetry, and improve the transparency of the entire supply chain [1]. Wang (2023) demonstrates that blockchain-enabled supply chain finance enhances the authenticity and transparency of transactional environments [2]. Through an analysis of AntChain, Song (2023) reveals that blockchain-powered supply chain finance renders the entire financing process transparent, immutable, and verifiable, thereby alleviating financial institutions' concerns about information authenticity [3]. Padma and Ramaiah (2024) document that the lack of transparency in pharmaceutical supply chains hinders drug access and endangers patient safety. The study demonstrates that the drug supply chain based on blockchain technology can promote product sharing, enhance information transparency, and provide complete supply chain mapping [4].

Second, blockchain technology has reduced the financing costs of SMEs through multiple functions such as broadening financing channels, enhancing credit assessment systems, and optimizing financing terms. Wang (2022) conducts a comparative analysis between traditional corporate financing models and blockchain-enabled supply chain financing, revealing that the latter significantly reduces financing costs across the entire supply chain [5]. Long (2020) empirically demonstrates that blockchain-powered supply chain finance optimizes financing conditions for micro and small enterprises, reducing financing costs by 3.3 percentage points [6].

Third, in the traditional supply chain finance models, when financial institutions provide financial support to SMEs, there may be fraudulent behaviors such as fabricated contracts or duplicate collateral pledges. Blockchain technology, by taking advantage of its immutable ledger and smart contracts, reduces the financing risks of SMEs. Hong and Hales (2024) analyze the direct relationship between blockchain, supply chain risk management and supply chain performance. The study showed that companies adopting blockchain technology are more effective in managing the related risks of the supply chain to ensure financial transaction reliability and information integrity [7]. Lu (2023) proposes that establishing a digital platform for enterprise supply chain finance empowered by blockchain technology can effectively mitigate financing risks and provide guarantees for enterprise financial activities [8]. Choi (2020) conducts a comparative analysis between traditional supply chain finance and blockchain-enabled models, concluding that the latter demonstrates significantly lower systemic risks upon blockchain integration [9].

At present, the existing literature research rarely analyses the integration mechanism of blockchain and supply chain. This paper proposes three integration mechanisms of "blockchain + supply chain": information sharing and transparency improvement, credit transmission and multi-tier circulation, and smart contract and data notarization mechanisms. These mechanisms are further examined through a case study of AntChain.

However, the AntChain platform model still exhibits several limitations. First, while enhancing transaction transparency, the platform's current architecture raises data privacy and security concerns. Firms are exposed to the risk of leaking sensitive corporate information. Second, SMEs face substantial adoption barriers due to technical and operational requirements. Third, partner diversity remains limited, with current collaborations predominantly involving large institutions, core enterprises, and technology firms.

2. Mechanism of Blockchain Technology and Supply Chain Finance Integration

2.1. Information Sharing and Transparency Improvement

The information sharing and transparency improvement mechanism can solve the problem of information asymmetry in supply chain financing for SMEs. The distributed ledger technology of blockchain enables all participants in the supply chain, including core enterprises, suppliers, distributors, and financial institutions, to share transaction data, logistics information, capital flow and other information in real time [10]. All transaction records and data in the supply chain are stored on multiple nodes, each of which keeps a complete copy of the ledger. Data can be viewed and verified in real time without relying on a single centralized database. The decentralized data paradigm method solves the problem of information silos, ensures the sharing and consistency of information, and can fundamentally solve the problem of information asymmetry in SMEs.

2.2. Credit Transmission and Multi-tier Circulation

The credit transmission and multi-tier circulation mechanism can reduce the financing costs of SMEs. On the blockchain platform, the credit of core enterprises can be split and circulated in the form of digital tokenized credit certificates such as electronic account receivable vouchers. These certificates can be passed among multiple levels of suppliers in the supply chain, enabling SMEs far from the core enterprises to also obtain low-cost financing. At the same time, it also reduces the intermediate links, significantly lowering the risk assessment costs and operating costs of SMEs.

2.3. Smart Contract and Data Notarization

Smart contracts and data notarization mechanisms can reduce the financing risks of SMEs. Smart contracts are an automatic execution mechanism. When the conditions set in the contract are met, corresponding operations will be automatically executed [11]. This can effectively reduce human intervention, avoid operational risks caused by human errors, and enhance the security of financing. Data preservation takes advantage of the immutability of blockchain technology. All transaction records and financing operations can be permanently saved and traced. Financial institutions can also conduct real-time monitoring and analysis through transaction data, identify potential risks in advance, and provide a safer environment for supply chain financing.

3. Case Study of AntChain

3.1. AntChain Financing Model

AntChain platform is an innovative platform that combines blockchain technology and supply chain financing. The platform solves the financing problems of SMEs in the supply chain through the credit transmission of core enterprises. Specifically, AntChain records all transaction data such as orders, contracts, and invoices between core enterprises and suppliers at all levels on the blockchain for evidence storage, ensuring the authenticity and immutability of the transactions. After SMEs hold the accounts receivable vouchers confirmed by the core enterprises, they can split and transfer the credit assets through AntChain, and then apply for financing from cooperative financial institutions. Financial institutions can view transaction data and credit information in the supply chain in real time based on the data stored on the blockchain, assess risks more accurately, reduce reliance on mortgage guarantees, and provide more flexible financing for SMEs.

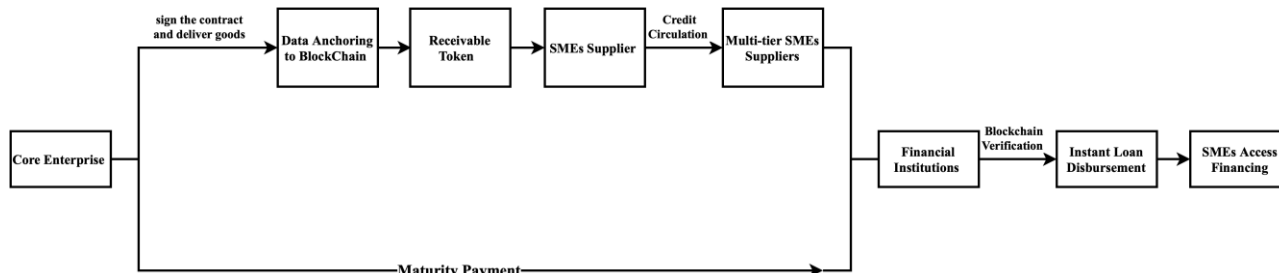


Fig. 1 AntChain Platform Financing Process

3.2. Financing Advantages of AntChain

By leveraging blockchain technology, AntChain aims to overcome the problem of information asymmetry in traditional supply chain financing for SMEs. It reduces financing costs and risks of SMEs, and offers more effective and accessible financing solutions.

3.2.1. Mitigate information asymmetry

AntChain has built a decentralized, tamper-proof and highly transparent information sharing network based on blockchain technology. Through the distributed ledger, AntChain can record and synchronize the data of each link in the supply chain in real time to all participants, covering every process from raw material procurement, production processing to product sales. All relevant information is completely stored on the blockchain, and no party can tamper with the data alone. Financial institutions can access authentic transaction records, financial status and partnerships with core enterprises of SMEs, enabling accurate credit risk assessments and more rational, efficient financing solutions. Meanwhile, SMEs can also clearly understand the financing policies and requirements of financial institutions, avoiding misunderstandings or increased communication costs caused by information opacity. This financing process can reduce trust barriers, improve financing efficiency, and ensure SMEs fairer and more equitable opportunities in supply chain financing.

3.2.2. Reduce financing costs

AntChain can reduce the costs for SMEs in supply chain financing. Under the traditional financing model, SMEs typically face higher risk premiums and guarantee fees due to their low credit ratings and opaque financial information [12]. Additionally, the complex approval process increases both time and labor costs. With AntChain's distributed ledger technology, key supply chain data—including orders, logistics, and cash flow—are recorded in real time, encrypted, and immutably stored, ensuring data authenticity and tamper-proof security. Financial institutions can leverage this trusted data to rapidly assess creditworthiness, reducing the need for manual due diligence and lowering risk management costs. Furthermore, smart contracts automate loan approvals, disbursements, and repayments, minimizing intermediary friction and improving capital turnover efficiency. By enhancing information transparency, blockchain technology eliminates SMEs' reliance on costly third-party guarantees. Instead, they can secure financing based on verifiable supply chain transaction records, effectively addressing high financing costs and enabling access to fairer interest rates.

3.2.3. Control financing risks

AntChain can more effectively prevent and control the financing risks of the supply chain of SMEs. Traditional supply chain financing models are often plagued by information opacity, asymmetry, and delays. It is difficult for financial institutions to accurately assess the creditworthiness and transaction authenticity of SMEs, thereby exposing them to significant financing risks. Firstly, AntChain leverages blockchain technology to help reduce financing risks. AntChain records and stores real-time, authentic supply chain transaction data on distributed ledgers. Financial institutions can identify fraudulent behaviors such as false trades and duplicate financing through the blockchain platform [13]. Secondly, the smart contract function of blockchain can set financing conditions and repayment rules. Once the contract terms are triggered, the fund transfer or risk alerts can be automatically completed, reducing the risk of human operation. Thirdly, the traceability of blockchain enables all participants in the supply chain to view previous transaction records within the authorized scope, forming a multi-party supervision mechanism and further reducing the risk of default.

4. Improvement Measures for AntChain

4.1. Strengthen Data Privacy and Security

While the AntChain platform enhances transaction transparency, it also raises concerns about the potential information leakage of sensitive business data, thereby necessitating robust data privacy and security measures. First, at the technical level, a blockchain permission management system can be implemented to establish differentiated access controls for various users. This ensures only authorized personnel can access core business data. Second, at the management level, the platform operator can formulate strict data usage norms and procedures, clearly define the permissions and scope for data collection, storage, use and sharing, and ensure the legal and compliant use of data. Moreover, strengthening training and education for platform users can enhance their awareness of data privacy and information security, helping to prevent data breaches caused by improper user operations. Third, at the legal level, legislation and regulatory frameworks can be improved to intensify punitive measures against unlawful activities, including data breaches. Besides, blockchain platforms should be incentivized to adopt self-regulatory mechanisms for enhanced data privacy protection and information security governance.

4.2. Reduce the Adoption Barriers for SMEs

Although the AntChain platform is designed to provide financing support for SMEs, many SMEs may lack the technical expertise or financial resources to access and use the platform effectively. Moreover, due to their weaker position in the supply chain, SMEs often struggle to secure cooperation from core enterprises. To address these challenges, several strategies can be implemented to lower the barriers for SME adoption. First, technical training and guidance can be provided. The platform operator can organize regular training sessions specifically designed for SMEs' technical staff, helping them quickly learn how to access and use the platform. Additionally, an online customer service system should be established to offer SMEs technical consultation and support. Second, governments or industry associations could introduce relevant subsidies or preferential policies. For instance, a dedicated support fund can be established to partially subsidize or discount platform access fees for SMEs, thereby increasing their incentives to participate. Third, the platform's operational procedures should be streamlined to enable SMEs to complete financing applications or transaction operations with greater ease. Emphasis should be placed on user experience design, to ensure a simple and intuitive interface.

4.3. Expand Partnership Networks

Currently, the AntChain platform has a limited number of partners, primarily consisting of large institutions, core enterprises, and technology companies, and has yet to establish a complete ecosystem. This may hinder its competitiveness in the supply chain finance sector. Multifaceted measures are needed to attract more partners to join the platform. Firstly, market promotion efforts should be intensified. This can be achieved by organizing industry seminars, participating in trade exhibitions, and other approaches to attract more core enterprises, financial institutions, and suppliers to join the platform. Special emphasis should be placed on promoting the platform to SMEs, helping them understand how it can address their financing challenges. Secondly, success stories of SMEs obtaining financing through the platform should be collected and showcased. Demonstrating tangible results will help attract potential partners and boost market confidence. Thirdly, preferential policies should be offered to new partners, including reduced transaction fees, tax incentives, and value-added services, to attract more SMEs and financial institutions to join the platform.

5. Conclusion

This study analyses supply chain financing for SMEs based on blockchain technology, using AntChain platform as a case study, and arrives at the following conclusions. Firstly, blockchain technology offers significant advantages for SMEs supply chain financing. AntChain platform effectively addresses information asymmetry issues through distributed ledger technology and smart contracts, thereby reducing financing costs and risks. Secondly, AntChain platform provides SMEs with transparent, low-cost, and low-risk financing channels, while also creating better development opportunities for them in market competition. Thirdly, while AntChain platform has achieved remarkable results in application, it still faces several operational challenges. These include data privacy and information security concerns, relatively high adoption barriers for SMEs, and a currently limited number of platform partners. In response to these limitations, this study proposes corresponding improvement measures. Looking ahead, as blockchain technology continues to mature and improve, it is expected to play an increasingly vital role in promoting the development of SMEs and driving socioeconomic progress.

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