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Supply chain finance based on blockchain: A case study on JD.com

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ABSTRACT

With the increasing maturity of blockchain technology, its characteristics such as decentralization, data immutability, and consensus mechanisms can effectively address issues in supply chain finance, including high risk control costs, difficulties in credit endorsement for small and medium-sized enterprises, and cumbersome operational processes. By synthesizing research on the integration of blockchain technology into supply chain financial services and analyzing a case study of JD.com's application of blockchain technology in supply chain finance ABS business, this paper proposes future development prospects for "blockchain technology + financial services". The aim is to provide decision-making references for the modern financial services industry to expand operations, improve service performance, and reduce financial risks.

KEYWORDS

Blockchain; Supply chain finance; Asset securitization; JD.com

1. INTRODUCTION

In today's society, with the rapid development of supply chain finance and technological advancements, the transformation of the real economy, particularly digital transformation is accelerating. It has become an unstoppable trend for numerous small and medium-sized enterprises to ride the wave of information technology and gain access to innovative financial services. In recent years, the development of supply chain finance has shown vigorous growth, yet the accompanying risks and challenges require prompt attention and resolution.

According to incomplete statistics and research findings, China's supply chain finance market size exceeds 20 trillion yuan. However, only about 10% of the national accounts receivable successfully obtain financing services. This indicates that many small and medium-sized enterprises (SMEs) in China face difficulties and high costs in accessing supply chain finance. These issues primarily stem from the low credit ratings of SMEs, which fail to meet the credit conditions currently required by financial institutions.

Blockchain is fundamentally a decentralized database. Its distributed ledger stores identical data copies across various nodes in the blockchain, encrypted through asymmetric algorithms and marked with a specific identifier, i.e. a timestamp. This process enables funding parties to obtain unique and highly credible data throughout the lending and fund tracking processes in supply chain finance.

Blockchain technology can integrate well with supply chain finance because it can address the following issues in the application process of supply chain finance: (1) Supply chain finance brings relatively high costs of risk control. As a FinTech-based model, it takes on highly diverse forms and involves a wide range of firm types, covering various aspects of the economic market. While the

development of FinTech has driven progress, it also poses certain risks and pressures to economic security. Blockchain technology, with features such as data immutability and distributed ledger capabilities, can create a reliable trust environment and significantly reduce risk control costs for financial institutions, such as banks. (2) The operational models of supply chain finance still exhibit many inherent flaws. The lengthy and time-consuming credit approval process results in low overall operational efficiency. Moreover, within the framework of traditional financial models, the issue of information asymmetry remains largely unresolved, which has almost become the greatest obstacle to the development of supply chain finance. The emergence of blockchain technology can effectively address this problem. (3) Small and medium-sized enterprises (SMEs) within the supply chain often fail to meet standard credit requirements. In traditional supply chain finance models, lenders primarily focus on and rely on the creditworthiness of core enterprises, consequently providing financing only to these core companies and their directly affiliated high-tier partners. Due to inefficient credit transmission, lower-tier enterprises face high financing costs or may even be excluded from financing entirely. However, by integrating supply chain finance with blockchain technology, it becomes possible to segment and efficiently redistribute the credit of core enterprises. This enhancement in credit transmission efficiency allows businesses at all levels to benefit from the credit endorsement of core enterprises, thereby making financing more flexible and accessible for both upstream and downstream participants in the supply chain.

Thus, exploring the application of blockchain technology in supply chain finance operations can effectively address the risks and challenges faced by the industry amid the development of internet-based financial technology. This approach not only promotes the growth of the internet-driven financial market but also refines and improves its mechanisms, ultimately contributing to the enhancement of the macroeconomic environment.

2. LITERATURE REVIEW

2.1. Supply Chain Finance

Supply chain finance first emerged in the United States. Prior to the enactment of the U.S. Uniform Commercial Code, its business forms encompassed inventory financing, accounts receivable financing, and others (Koch, 1948). In China, the origins of supply chain finance can be traced back to 1999 when Shenzhen Development Bank (now Ping An Bank) pioneered credit services for movable property and rights over goods pledges. By 2006, supply chain finance business was officially launched (Lei and Shi, 2014).

The evolution of supply chain finance has progressed through four distinct developmental phases. Phase 1: Manual credit assessment era. This initial stage was characterized by a ecosystem comprising core enterprises and their upstream/downstream partners. Operations relied predominantly on manual evaluation processes, which partially addressed financing constraints for SMEs. However, this approach demonstrated limited customer retention capabilities and exposed financial institutions to substantial risk management vulnerabilities. Phase 2: Digital integration period. Technological advancements enabled the systematic integration of information flows across core enterprises, supply chain partners, and financial institutions. This digital transformation reduced customer acquisition costs and facilitated operational scalability through core enterprise collaboration. Nevertheless, information asymmetry persisted due to core enterprises' continued control over critical data, complicating comprehensive risk evaluation. Phase 3: Platform-centric model. The emergence of unified platforms enabled holistic management of supply chain operations through digital channels. This integration harmonized information flow, capital flow, logistics, and commercial transactions, creating opportunities for innovative financial solutions. While this phase demonstrated improved cost efficiency and risk mitigation for financial institutions, technological barriers continued to limit financing accessibility for certain market segments. Phase 4: Blockchain-enabled framework. The

current paradigm leverages decentralized architectures supported by financial technology. This framework enhances risk assessment capabilities through advanced data analytics and processing technologies, representing the contemporary standard for supply chain finance implementation.

Supply chain finance has consistently garnered extensive attention from domestic and international commercial banks, serving not only as an innovative financial business but also as a natural extension and deepening of trade finance initiatives (Shi, et al., 2015). Song and Lu (2017) characterized supply chain finance as an innovative financing mechanism that, supported by supply chain networks, has progressively evolved into an effective approach for SMEs and micro-enterprises to access funding. They further noted that with the rapid advancement of network technologies and continuous improvements in corporate digitalization, risk management requirements for supply chain finance have become increasingly stringent. Yang, et al. (2016) described the relationship between supply chain finance and supply chain management as a trunk-and-branch relation. In contrast to supply chain management, which focuses on holistic planning and coordination of the supply chain, they emphasized the particular significance of supply chain finance's inherent flexibility, cost-effectiveness, and operational efficiency in financial products and financing models.

In contemporary society, small and medium-sized enterprises (SMEs) generally face financing challenges due to their high credit risk, making supply chain finance one of their crucial financing alternatives. However, information asymmetry risks persist in supply chain finance and can easily propagate across the supply chain, rendering risk management in this domain particularly important (Fan, et al., 2017). Krell and Erick (2019) examined the growing value of supply chain finance, noting that it provides effective support for enterprises experiencing sudden cash flow disruptions. Furthermore, as highlighted by Roberts (2019), with the increasing demand for advanced technologies and the ongoing information technology revolution, manufacturing leaders confront a critical operational challenge. Their research indicates that supply chain finance optimizes cash flow by enabling demand-side entities to strategically collaborate with suppliers in payment management to enhance the cash conversion cycle, while also noting that manufacturers' switching costs continue to rise significantly.

2.2. Blockchain

The concept of blockchain technology was first postulated in 2008 within Satoshi Nakamoto's seminal paper “Bitcoin: A Peer-to-Peer Electronic Cash System”. Rong (2021) delineates that blockchain technology has now evolved into a crucial component of information communication technology systems. He further posits that blockchain technology has undergone transformative development through three distinct phases: progressing from Blockchain 1.0 represented by digital currencies, to Blockchain 2.0 characterized by smart contracts, and ultimately to the current Blockchain 3.0 era exemplified by virtual machine implementations. Concurrently, Wei, et al. (2021) emphasize that the blockchain environment demonstrates immutability, ensuring stored data remains unalterable by any single user. Furthermore, they highlight its distributed nature, which enables data replication and transaction tracking across all network nodes, thereby ensuring operational fault tolerance in blockchain-based applications. Blockchain technology employs cryptographic methods to ensure data tamper-resistance while enabling data storage and information sharing among participating enterprises. Zhang and Wu (2020) demonstrate that blockchain technology integrates consensus mechanisms, smart contracts, and distributed ledger technologies, playing an indispensable role in the new wave of technological transformation.

2.3. Blockchain Applied in Supply Chain Finance

Du et al. (2020) indicate that in traditional supply chain finance, core enterprises hold a highly competitive and irreplaceable position in integrating information flow, logistics, and capital flow. To address the issues inherent in traditional supply chain finance, Du et al. (2020) propose the

establishment of a novel blockchain-based supply chain finance platform. This platform is designed to resolve trust deficits among participating enterprises, enhance the efficiency of information and capital flows, and reduce costs simultaneously. In a related study, Osmani et al. (2020) investigate the application of blockchain technology in supply chain finance and the banking sector, aiming to highlight its advantages and opportunities while also analyzing associated costs and risks.

The application of blockchain technology in supply chain finance can ensure data security, as its distributed ledger technology prevents data from being tampered with. Zhang and Ma (2020) demonstrated that blockchain technology can effectively address the credit deficiencies in traditional supply chain finance and facilitate the formation of a new "blockchain + supply chain finance" model. Liu and Li (2019) argued that blockchain technology can optimize the credit investigation system in supply chain finance due to its reliable characteristics of decentralization, data transparency, and immutability.

3. COUPLING BLOCKCHAIN TECHNOLOGY WITH SUPPLY CHAIN FINANCE

The application of blockchain technology can effectively address relevant issues in traditional supply chain finance. This section will analyze the coupling points between supply chain finance and blockchain technology, clarifying the problems in supply chain finance and how blockchain technology can resolve them (see Figure 1).

3.1. Intelligent Capabilities of Blockchain Technology Enabling The Cost Reduction of Risk Control In Supply Chain Finance

Smart contracts represent a critical functionality embedded in blockchain technology. They are contractual clauses composed of digital agreements, programmed using computer algorithms and codes, capable of automatic execution. The concept was initially proposed by Nick Szabo in 1994. Essentially, it enables the digital automation of traditional paper-based contracts. The automated execution and information traceability of smart contracts are achieved through the shared distributed ledger technology inherent in blockchain, which can effectively reduce transaction costs.

Supply chain finance risks primarily encompass credit risk and transaction risk. Credit risk fundamentally stems from whether the constituent enterprises within the supply chain finance system execute contracts according to the agreed-upon quality and quantity standards, as well as from the potential occurrence of fraudulent or deliberately concealed activities during execution. Transaction risk predominantly refers to market risk, which includes factors such as the enterprise's own operational performance and sustainability, unforeseen incidents during the logistics and transportation phase, and adverse changes in the condition or value of pledged collateral.

The distributed ledger technology of blockchain can record behavioral data of participating entities in supply chain finance, including operational status, contractual transactions, and accounting relationships. The recorded data possesses the attributes of authenticity and shared accessibility, allowing for synchronization and updates across all nodes within the blockchain network. Furthermore, any node can access and trace the data. Therefore, the application of this technology can effectively mitigate credit risks in supply chain finance.

Smart contract technology can also effectively mitigate market risks, primarily those related to supply chain finance costs and trade risks. The costs in supply chain finance are mainly reflected in auditing processes, including high labor expenses and significant challenges in verifying data authenticity. By leveraging automated execution capabilities, smart contracts can substantially reduce labor costs and enhance the efficiency of data authenticity verification. Trade risks largely arise from fluctuations in collateral value. Smart contracts enable real-time monitoring of current market conditions affecting

collateral and can autonomously execute adjustments and operations as stipulated in contract terms, thereby reducing trade risks.

3.2. Consensus Mechanism of Blockchain Technology Enhancing The Regulatory Oversight of The Supply Chain Finance

The supply chain finance regulatory system exists to ensure that all participating entities execute contracts in a timely manner and in accordance with specified quality and quantity standards. In traditional supply chain finance, this role is primarily undertaken by commercial banks. However, the regulatory process is prone to the following challenges: First, commercial banks struggle to accurately grasp fund flows and product flows, mainly due to the independent operations of enterprises within traditional supply chain finance, resulting in insufficient transparency of transaction information. Second, commercial banks cannot effectively monitor the authenticity of transactions in real time, primarily because most documentation regarding transaction information is obtained passively, and the verification process is highly time-consuming. Third, commercial banks are unable to effectively supervise the authenticity of logistics information, as issues such as false shipments and cargo detention by primary suppliers may occur.

The consensus mechanism of blockchain ensures the immutability of the distributed ledger, thereby preventing unauthorized transactions among supply chain participants. Since individual nodes cannot unilaterally alter data without collective validation - even with consensus from a proportional majority (typically 51% or more under Proof-of-Work settings)—new data entries are updated comprehensively while original records remain intact and coexist persistently on the chain. Leveraging this consensus framework, blockchain establishes a unified regulatory system for all entities in supply chain finance, enabling effective oversight at every stage. It facilitates real-time monitoring of commercial flows, logistics, and capital movements. Simultaneously, the distributed ledger technology enhances the authenticity and reliability of transactional data, allowing commercial banks to trace historical trajectories with improved efficiency. This reduces operational delays, strengthens regulatory capacity, and mitigates overall risks.

3.3. Distributed Ledger Technology of Blockchain Improving The Efficiency of Information Transmission in Supply Chain Finance

During the operation of supply chain finance, transactional records such as accounts receivable and accounts payable are generated among participating entities. These records are primarily concentrated within core enterprises engaged in peer-to-peer transactions, while the accessibility of information for upstream/downstream enterprises or financial institutions (e.g., banks) depends entirely on the disclosure willingness of core enterprises, resulting in extremely low efficiency in information transmission.

In contrast, blockchai's distributed ledger technology immutably preserves transactional information among all participants. Once recorded, data can be encrypted and automatically synchronized to every node. Enterprises within the blockchain network can access and trace data in real-time, thereby enabling effective multi-party information sharing while significantly enhancing both the efficiency of information transmission and data security.

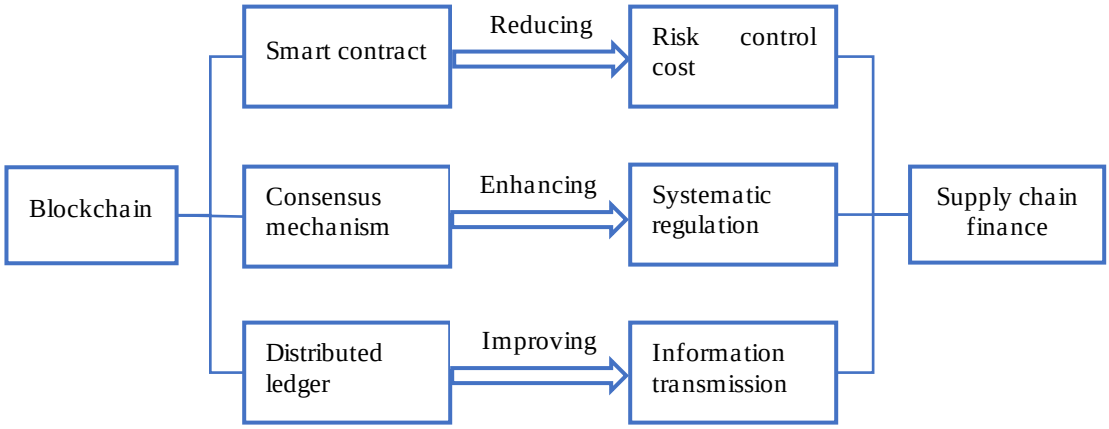

Figure 1. Coupling between supply chain finance and blockchain technology

4. APPLICATION OF BLOCKCHAIN TECHNOLOGY IN SUPPLY CHAIN FINANCE: CASE OF JD.COM

Building upon its existing blockchain technology, JD.com is actively pursuing far-reaching strategic deployments in the blockchain domain. Through the research, development, and design of a high-performance blockchain framework, JD.com aims to create a blockchain platform that addresses the practical needs of businesses and society. By enhancing operational efficiency to solve enterprise challenges, the company seeks to contribute to the rapid growth of China's economy.

JD Chain and JD BaaS (Blockchain as a Service) platform represent the two core components of JD's holistic blockchain framework. The former serves as its core service engine, while the latter functions as a bridge connecting the engine with businesses across society. Through their synergistic interaction, these two components collaboratively address the needs of enterprise users.

4.1. JD Chain

JD Chain, developed by JD.com, is comprehensive public blockchain featuring a data ledger model and application programming interfaces, while employing cryptographic intelligent algorithms and incorporating a consensus mechanism. Its objective is to establish an infrastructure-grade system that leverages blockchain technology to address common enterprise scenarios, drive business innovation, and enable organizations to operate with greater security and efficiency.

JD Chain re-architects the functions and layers of traditional public blockchains, encompassing gateway services at the outermost layer, core consensus services, hierarchically managed data ledgers, and a functional toolkit. The gateway layer, also referred to as the access layer, is primarily responsible for terminal access while providing relevant security assurance functions. The consensus service manages node operations, including processing transactions between nodes and executing smart contracts. The data ledger facilitates detailed account management by configuring and storing blocks and account information, enabling hierarchical and categorized account administration. The toolkit offers a range of development and monitoring tools to achieve inter-connectivity and real-time responsiveness among nodes on the blockchain.

4.2. JD Baas Platform

The JD BaaS platform effectively lowers the barriers to implementing blockchain systems, enhances the flexibility of JD Chain, and provides comprehensive management for enterprises on the chain. This significantly reduces the cost for businesses to adopt blockchain technology, allowing enterprise users on the platform to focus on their core operations without being burdened by the complexities

of blockchain implementation. Consequently, it plays a vital role in promoting the widespread adoption and development of blockchain technology.

4.3. Blockchain ABS

In June 2019, JD Group introduced China's first standardized blockchain-based ABS solution. This solution significantly optimizes traditional ABS operations, with key improvements focusing on cash flow management, transparent and efficient securities trading, and cost reduction. According to JD's official documentation, it can reduce time costs by 85% and labor costs by 30% compared to conventional ABS processes.

First, the solution's functionalities include calculating and segmenting asset pools, secondary market trading, ongoing management, and structured management. Second, its implementation requires the prior establishment of a consortium chain, which is composed of all relevant entities within the blockchain that collaborate to conduct the asset securitization.

During the front-end financing phase of ABS, participating entities input real-time cash flow data into the blockchain, ensuring all nodes have immediate access to the information. This guarantees transparency while maintaining data immutability.

In the smart contract consensus drafting phase, data digitization is leveraged to automatically generate due diligence reports, ensuring data integrity and authenticity while reducing procedural costs. During the structuring and issuance phase, all participants receive the designed transaction structure and can review product rating results. Upon obtaining approval, the transaction structure and rating results are recorded on the blockchain, with participant information updated accordingly. When the exchange receives the product issuance application, it can directly retrieve authentic information from the blockchain, streamlining the verification process and accelerating the decision on whether to approve the product issuance. In the post-issuance management phase, product information—including repayment data and purchase records - can be promptly disclosed following timely updates and consensus among blockchain participants. This facilitates effective monitoring and supervision by quality regulatory authorities. During the secondary market trading phase, the detailed information on the blockchain assists both transacting parties and individual investors in confirming trading strategies and making subsequent investment decisions. Figure 2 depicts the flow of data and funds in JD.com's blockchain-based ABS business, with all transaction processes and data information fully integrated into the blockchain.

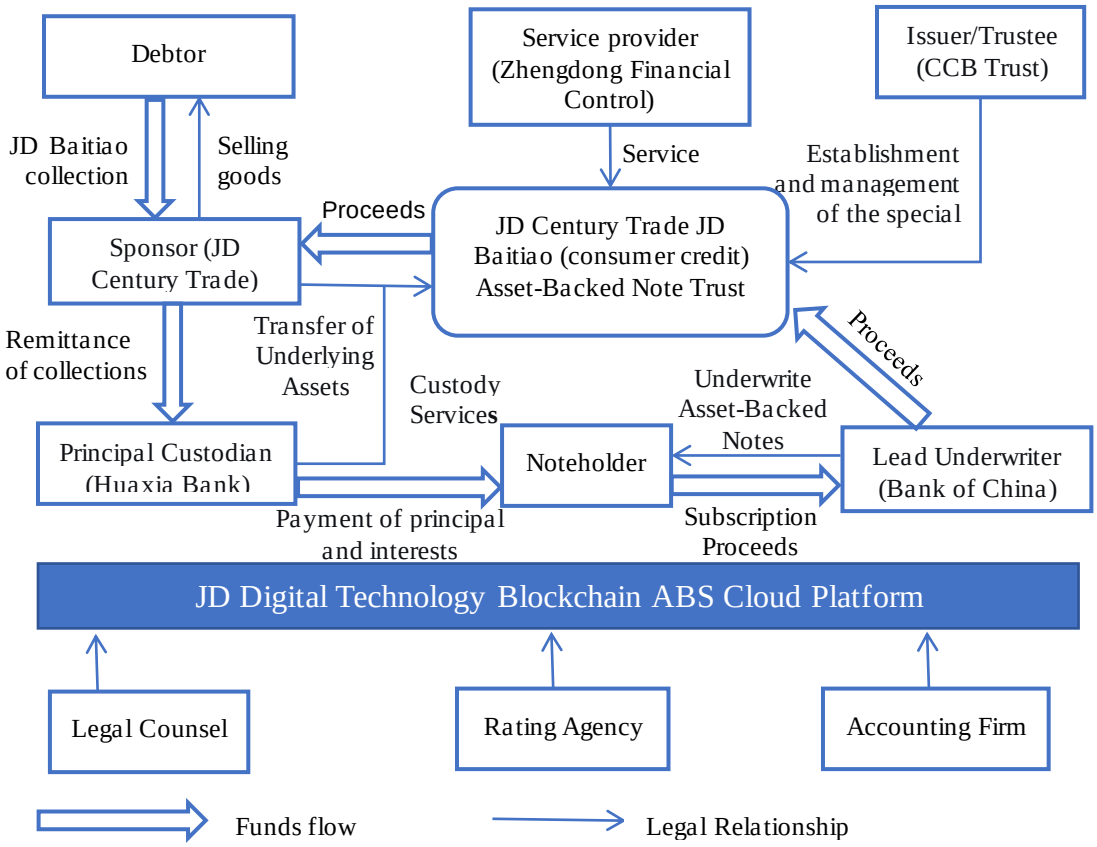

Figure 2. JD blockchain ABS implementation workflow

5. DISCUSSION

The case analysis in this article demonstrates the advantages of blockchain-based ABS from two perspectives: the optimization of the transaction structure and the impact on investors' default intention. These advantages also reflect some of the benefits of applying blockchain technology to supply chain finance services. The successful implementation of blockchain technology by JD Group in supply chain finance provides valuable analytical and research insights for blockchain-enabled supply chain finance.

Since its emergence, blockchain technology has consistently attracted significant attention. Both governments and large enterprises have been strategically deploying blockchain technology, achieving considerable successes alongside increasing investment efforts. China's application of blockchain technology began with the use of virtual currencies in transactions and has now expanded to comprehensive implementations. The application of blockchain technology in asset-backed securitization business signifies the arrival of the "blockchain technology + financial services" era. The author of this article anticipates that blockchain technology will bring even more profound transformations to financial markets in the future.

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REFERENCES

[1] Du, M., Chen, Q., Xiao, J., Yang, H., and Ma, X. Supply chain finance innovation using blockchain [J]. IEEE Transactions on Engineering Management, 2020, 67(4): 1045-1058.

[2] Fan, F., Su, G. and Wang, X. Study on assessment and management of SMEs' credit risk under the model of supply chain finance [J]. Journal of Central University of Finance & Economics, 2017(12): 34-43. In Chinese.

[3] Koch A. R. Economic aspects of inventory and receivables financing [J]. Law and Contemporary Problems, 1948, 13(4): 566-578.

[4] Krell, and Erick. The growing value of supply chain finance [J]. Treasury & Risk, 2019(9): 2-7.

[5] Lei, L. and Shi, J. Theoretical review and research prospects on supply chain finance [J]. East China Economic Management, 2014(6): 158-162. In Chinese.

[6] Liu, S. and Li, H. On the optimization of supply chain financial credit reporting system by embedding blockchain technology [J]. Credit Reference, 2019, 37(8):16-20.

[7] Osmani, M., El-Haddadeh, R., Hindi, N. Blockchain for next generation services in banking and finance: cost, benefit, risk and opportunity analysis [J]. Journal of Enterprise Information Management, 2020.

[8] Rong, Z. Public service supply-side reform based on block-chain technology: Application and looking forward [J]. Journal of Shanghai University of International Business and Economics, 2021(1): 88-102.

[9] Robert, T. Three ways supply chain finance can fund the future [J]. Material Handling & Logistics, 2019, 74(2): 29-31.

[10] Shi, J., Guo, J. and Yan, W. Study on the incentive contract between banks and B2B platforms based on the online supply chain finance [J]. Journal of Management Science, 2015(5): 79-92. In Chinese

[11] Song, H. and Lu, Q. The innovation of supply chain finance pattern based on virtual clusters: A case study of SJET [J]. China Industrial Economics, 2017(5): 172-192. In Chinese.

[12] Wei, Y., Deng, Z., Guan, Y. and Hu, Z. A method of secure provenance of scientific data based on blockchain and smart contracts [J]. Journal of Modern Information, 2021, 41(1): 32-38. In Chinese.

[13] Yang, B., Zhu, W. and Zhao, H. Theoretical study on upstream party initiated finance [J]. Journal of Financial Research, 2016(12): 175-190. In Chinese.

[14] Zhang, Z., and Ma, Y. The development of Blockchain + Supply Chain Finance in China: Modes, challenges and the countermeasures [J]. Journal of Financial Development Research, 2020(8): 48-54.

[15] Zhang, L. and Wu, M. The model construction of lifelong learning system based on blockchain technology [J]. Journal of Northwest Minzu University (Philosophy and Social Sciences), 2020(6):123-131. In Chinese.