

Blockchain Technology Participates in the Path and Mode Optimization of Supply Chain Finance

-- Take Science and Technology Enterprises as an Example

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Abstract: Supply chain finance drives the stable development of supply chain, but there are many risk points and information asymmetry problems in the traditional supply chain finance. In recent years, with the continuous development of blockchain technology, blockchain technology has been introduced in the field of supply chain finance, and its own advantages to solve some problems restricting its development. This paper analyzes the advantages and problems of blockchain technology applied in the process of supply chain finance, and puts forward a new feasible path to optimize the process of blockchain participation in supply chain finance.

Keywords: Blockchain Technology; Supply Chain Finance; Feasibility Path; Model Optimization.

1. Introduction

In recent years, blockchain has set off a wave of technological change and industrial innovation boom in the integrated application of various industries. Both the government and enterprises are actively exploring how to better embed blockchain technology at the supply chain level. We should take blockchain technology as an important driving point of core technology innovation, accelerate industrial investment, and promote the development of blockchain technology. According to the statistics of CCID Blockchain Research Institute, 82 blockchain projects were successfully implemented in the financial field in 2021, accounting for 24.40% of the blockchain application projects in 2021.

In particular, Internet and technology enterprises lead the progress of the blockchain, such as Ant Group's core product ANT CHINA support better performance and better developer-friendly features; Huawei Cloud blockchain business BCS can quickly and efficiently build a safe and reliable blockchain network, realize the efficient circulation of capital, logistics and information flow; Baidu, Tencent Technology, Ali Cloud and other technology giants have launched their own characteristics of blockchain building platform. This enables financial institutions to use blockchain technology to deepen the business application and promotion, while financial institutions to accelerate the in-depth cooperation with enterprises to promote the application and development of blockchain technology in supply chain finance.

Technology enterprises often have a huge supply chain system, and the cost of their business is relatively high, which makes the enterprises in the supply chain face considerable financial pressure. In this case, the role of supply chain finance is very significant. In addition, science and technology enterprises have high requirements for equipment, and some of the key equipment is imported from abroad. Some of the company's core equipment in the future may be in short supply, rising prices, at the same time because the equipment is expensive that the supply chain requires more investment than other industries, makes the supply chain

dependence on loan higher at the same time longer "financing difficulties, financing expensive" problem, at the same time the long supply chain will bring relatively high cost. This paper aims to optimize and analyze the supply chain finance of technology-based enterprises combined with blockchain technology, and build a more efficient and low-cost supply chain finance realization path.

2. Fitness Analysis of Supply Chain Finance and Blockchain Technology

Supply chain finance is a new form of financing for small and medium-sized enterprises, it can realize the capital flow and supply chain, the financing services can cover all the enterprises in the supply chain, but also for those struggling enterprises provides a new type of loan financing, it is based on the core customer, on the basis of real trade, adopt the method of self-compensation trade financing. Compared with the traditional credit service self-compensation, the biggest characteristic of supply chain finance is that it is based on the actual transactions of enterprises, and the income brought by these exchanges is the source of loans paid by supply chain enterprises. It can be seen that the credit of core enterprises and the credit enhancement effect for supply chain enterprises are the internal mechanism of supply chain finance and also its important restricting elements. Therefore, the existing problems of the traditional supply chain finance mechanism include:

2.1. A Unified and Reliable Information Transmission System has Not Yet Been Established

In the information transmission of the supply chain, due to information security and other reasons, the core enterprises fail to connect the core system of ERP to the outside world, resulting in the lack of a unified information system among the participating enterprises, thus forming a "data island". However, financial institutions cannot obtain the relevant data of the supply chain system and verify the authenticity of various transactions in the supply chain, so that they cannot provide fast and effective financing.

2.2. The Credit of Core Enterprises is Difficult to Transfer Effectively, and it Cannot Increase the Credit of Their Supply Chain Enterprises

In the whole supply chain system, the most critical thing is to use the high credit of the core enterprises to improve the reputation of the upstream and downstream enterprises of their supply chain system. Due to the lack of an effective data transmission mode, it is difficult to transmit the most critical credit information in the supply chain, so that the credit of core enterprises cannot improve the credit rating of suppliers, so it is difficult to achieve fast and low-cost financing.

Blockchain technology has the characteristics of decentralization, imtamability and traceability, which are complementary and matching with the business model, transaction mechanism and operation mode of supply chain finance. In sharp contrast, the optimal effect of the block chain + supply chain finance model is to solve the data island problem in the traditional supply chain model and realize the credit transfer between core enterprises and supply chain enterprises, as shown in Table 1.

Table 1. Comparative analysis of block supply chain finance and traditional supply chain finance

	Blockchain supply chain finance	Traditional supply-chain finance
Information circulation	The whole chain is through	The information island is obvious
information transfer	Up to multilevel suppliers	Only to a tier 1 supplier
Business scenario	Full chain penetration	Core enterprises and level 1 suppliers
Collection control	Closed and controllable	Uncontrollable
Small and medium-sized enterprise financing	More convenient and lower price	Financing is difficult and expensive

As can be seen from Table 1, the adaptation of supply chain finance and blockchain technology is mainly reflected in the following three aspects:

2.2.1. Match between Blockchain and the Business Model of Supply Chain Finance

With the development of supply chain finance, the supply chain financing chain will become longer. If the traditional financing method is used, it will inevitably bring higher financing costs and lower benefits. However, due to the support of blockchain technology, the participants of supply chain finance are scattered, and there is no need for a unified management of all the data. Block chain technology can make the transaction data between enterprises have tamper-resistant, to ensure the authenticity of data node, each node can provide strict, complete transaction information, to avoid the financial institutions repeatedly review and check, so as to establish a good trading mechanism and create a new business model.

2.2.2. The Matching of the Interaction Mode between Blockchain and Supply Chain Finance

In the traditional financial business, manual operation is unavoidable, but too much human participation may lead to

operational errors. The advantage of blockchain technology is that through the automatic recording and storage of data, the frequency of manual participation is greatly reduced. Therefore, the supply chain finance transaction mechanism based on blockchain technology will no longer be constrained by a single institution, which greatly improves its fairness. With the support of blockchain technology, the supply chain finance transactions based on asymmetric cryptographic technology can be conducted in more stable and secure transactions when the two parties reach an agreement.

2.2.3. The Matching between Blockchain and Supply Chain Finance Operation Mode

Identity authentication and data security are the two most critical aspects in the operation mode of supply chain finance, and its security is the key to ensure the service quality of supply chain finance. Under the traditional business model, financial institutions have insufficient ability to identify financing companies. However, due to the support of blockchain technology, the identity information of all participants can be open and transparent, which saves the process of financial institutions to verify the target enterprises. In terms of authenticity, the hash pointer and chain structure in the blockchain can ensure that the data in the node will not be tampered with at will. Compared with the traditional supply chain financing process, it can save a lot of operation costs and reduce operational risks.

3. "Blockchain + Supply Chain Finance" Model Innovation

3.1. Two Business Models of "Blockchain + Supply Chain Finance"

Blockchain technology and supply chain finance are the key topics of current research, which belong to the new Internet technology and the new financial model respectively. Therefore, in order to realize the organic combination of the two, it is necessary to build on traditional supply chain finance and embed blockchain technology into the supply chain management system of core enterprises, and upstream and downstream enterprises also need to participate in it, so as to form a new business model of "blockchain + supply chain finance". With the continuous improvement and development of Internet finance, the security and efficiency of Internet finance have been continuously improved, and more Internet financial subjects will participate in the supply chain finance model. Thus, Internet financial enterprises will serve as an important platform to realize the innovation of "blockchain + supply chain finance", and create rich and diversified business models in the future:

3.1.1. Core Enterprises as the Leading, Blockchain as the Technical Framework of the Supply Chain Finance Model

Core companies play a role in linking the downstream companies on the industrial chain. Therefore, the blockchain system based on the core enterprises can better record and track the information flow in terms of integrating resources, transmitting information, and providing supply chain management. In terms of blockchain construction, by integrating blockchain technology into the underlying architecture of the supply chain system, business vouchers are digitized to form digital vouchers that can be circulated efficiently, and the transaction data generated by each transaction subject is saved as shown in Figure 1:

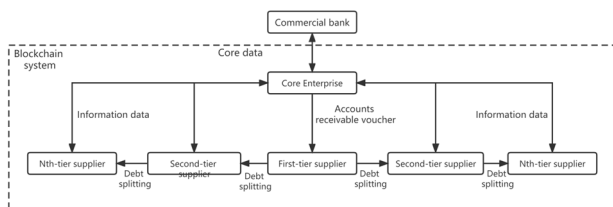


Figure 1. The "blockchain+supply chain finance" model based on core enterprises

Take accounts receivable business as an example: first, on the basis of cooperation with the primary supplier, the data vouchers that can be split operation can be generated; second, when each primary supplier has business transactions with the lower supplier, the data vouchers from the superior supplier can be split, so that the digital documents can be circulated downstream. Finally, the information of each member of the supply chain is concentrated in the supply chain system of the core enterprise, and the financing of each member enterprise of the supply chain is realized through the data circulation with the commercial banks. Its advantages are that the use of blockchain technology to achieve the efficiency and traceability of information circulation, and improve the transparency of the supply chain financing system.

3.1.2. Based on the Internet Financial Enterprises, the Block Chain Technology as the Means to Realize the Supply Chain Finance Mode

With the rise of Internet finance, the birth of a new model of "block chain + supply chain finance" with Internet finance as the carrier has been promoted. This model can better provide services to the lower-level end enterprises in the supply chain. Because the Internet financial enterprise business is often to provide service credit relatively low small and medium-sized enterprises, so the real-time risk assessment of small and medium-sized enterprises is necessary, so before the Internet financial enterprises with independent third-party risk regulation reached strategic cooperation, to prevent the occurrence of financial risks, the operation process as shown in figure 2.

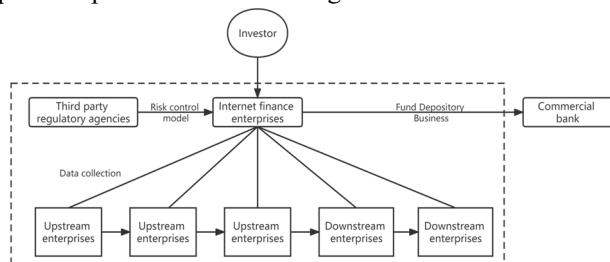


Figure 2. The "blockchain+supply chain finance" model based on internet finance enterprises

In this model, Internet finance companies can replace other financial institutions such as commercial banks as providers of financing funds. In this process, we must also cooperate with the banks effectively to ensure the rights and interests of the investors. The advantages of this approach are that Internet financial companies have strong technical advantages, and can build a perfect blockchain system faster and with higher quality.

3.2. Three Main Financing Modes of "Blockchain + Supply Chain Finance"

In general, the operation of the supply chain starts when the core enterprises initiate purchase orders to upstream small and medium-sized enterprises, and on this basis sign supply and

sales contracts with downstream small and medium-sized enterprises, first for upstream and downstream suppliers. In such a market background, the upstream and downstream small and medium-sized enterprises with high financing pressure, for its often does not have enough to mortgage the plight of the real estate, on the basis of real trade, the core enterprise as the center, the design developed using enterprise movable property to financing mortgage three patterns, namely accounts receivable financing, inventory financing and prepaid accounts financing.

3.2.1. Blockchain Realizes the Optimization of the Accounts Receivable Financing Mode

Core enterprises are in an extremely important position in the supply chain, which can efficiently integrate all kinds of information flow, capital flow and other aspects in the supply chain in a short period of time. Therefore, the core enterprises lead and call on the supply chain enterprises to cooperate with the mode of "blockchain + supply chain receivables financing", which can greatly improve the financing efficiency of the supply chain and reduce the financing cost. The specific financing process is shown in Figure 3:

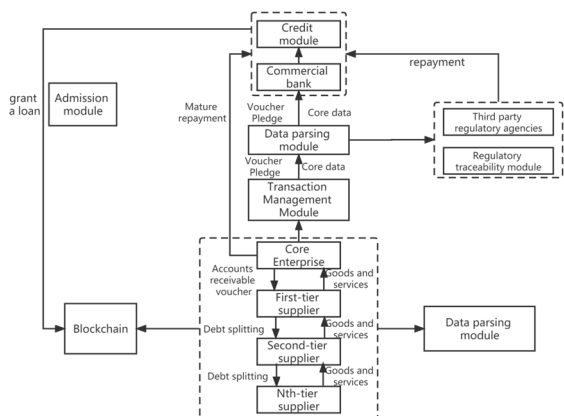


Figure 3. Accounts receivable financing model supported by blockchain

With the business transactions between enterprises, the core enterprise needs to issue unified accounts receivable vouchers for the supply chain enterprises. Meanwhile, the internal data analysis module will split the electronic vouchers, and finally the core enterprise will upload them for archiving through the transaction management module. After that, through the external data analysis module, the core data is automatically transmitted to the data processing center of the banks and the third-party regulatory agencies, and the certificates are pledged to the commercial banks, through which the banks can issue loans, and readjust the blockchain access list. After these payments are due, they will be paid off by the center's business unit in the public business management module. In the whole process of financing, the regulators control the transaction of the whole process through the regulatory traceability module, and provide the basis for the judgment of the credit investigation module. This model is suitable for the core enterprises in the supply chain that are in the leading position in the industry.

3.2.2. Optimization of the Inventory Financing Model by Blockchain

Under the condition of blockchain as the underlying technology support, the goods of downstream enterprises are stored in the warehouses of logistics enterprises. At the same time, the two parties sign the electronic storage agreement, and automatically generate the digital debt certificates of

inventory assets. Downstream enterprises can then request loans to the bank, and authorize the bank to check the electronic deposit information. After the bank verifies the electronic deposit certificate information, the bank can initiate the transfer transaction of the digital debt certificate of the inventory assets. After the three parties confirm the transfer transaction, the implementation conditions of the smart contract will be triggered, so that the digital debt certificates of the inventory assets will be automatically transferred to the bank, and the loans will be automatically issued to the downstream enterprises. Eventually, the downstream enterprises will follow the repayment procedures stipulated in the smart contract. After the loan is repaid to the bank, the inventory digital debt certificate will automatically return to the downstream small and medium-sized enterprises, and then they can withdraw the pledged inventory from the logistics enterprises. The trading process is shown in Figure 4.

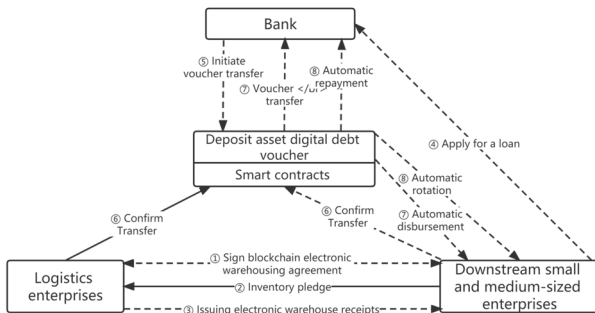


Figure 4. Inventory financing model supported by blockchain

3.2.3. Blockchain's Optimization of the Prepayment Financing Model

In a system designed fundamentally by the blockchain, Supply chain enterprises can apply for loans from commercial banks after signing blockchain electronic purchase and sales contracts with core enterprises, The bank shall review the deposit information of small and medium-sized enterprises, Then the launch of prepayment financing smart contract; After joint confirmation by the three parties, Smart contracts will be automatically triggered, Small and medium-sized enterprises will be automatically transferred to the bank for the deposit, At the same time, the banks will also automatically pay the full payment to the core enterprises; follow, According to the smart contract protocol procedures, While small and medium-sized enterprises automatically renew the deposit to the bank, The bank will automatically notify the enterprise of the shipment, Repeat the process until the money and goods are cleared. The whole transaction process is shown in Figure 5.

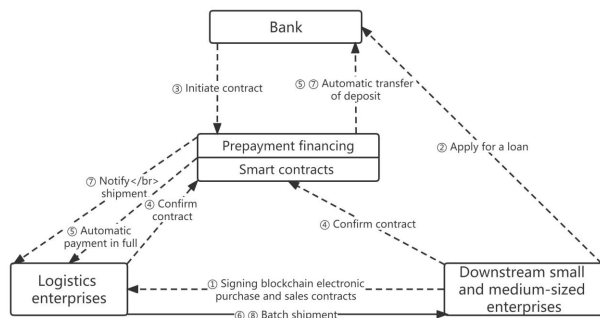


Figure 5. Prepayment financing model supported by blockchain

4. A Feasible Path for Technology Enterprises to Apply Blockchain Technology to Participate in Supply Chain Finance

As a technology-based enterprise, we use blockchain technology to create application value for enterprises participating in the supply chain through the following three paths:

4.1. Realize the Digital Circulation of Accounts Receivable

According to the level of supplier accounts receivable value conversion, the core enterprise can through the supply chain management system to suppliers at all levels based on block chain technology generated accounts receivable digital vouchers, and support multi-level suppliers, multi-level factoring circulation of digital vouchers, on the basis of the core enterprise credit voucher payment, financing and repurchase services, reduce the supply chain enterprise financing costs, the supply chain capital use efficiency is greatly improved. From a technical point of view of block chain synchronous bookkeeping, encryption, the block chain verification and accounting link and transaction link, can greatly guarantee the authenticity of online digital assets, avoid double flower problem, both guarantee the chain between enterprise business system has relative independence, avoid the risk of information security, and realize the instant data sharing and storage, improve work efficiency.

4.2. Realize the Digital Circulation of Assets

Participate in the supply chain on the assets into the regulatory pledge, regulators according to the asset value to the enterprise assets digital vouchers, enterprise assets digital vouchers can be used to pay transactions with other units and pledge financing business, on the chain of digital assets and circulation, effectively reduce the capital share of the enterprise, activate the ecological supply chain. This mainly uses the synchronous bookkeeping, consensus mechanism, smart contract and other technologies of blockchain to ensure the authenticity and reliability of digital assets and transactions. At the same time, it is also necessary to connect with third-party electronic authentication service agencies to conduct real-name authentication for enterprises and users, so as to ensure that all transactions have compliance and legal effect.

4.3. Realize Credit Digital Circulation

With the help of encryption algorithm and consensus mechanism characteristics, blockchain technology can build a highly credible supply chain system. And the asymmetric encryption algorithm can effectively protect the transaction account. Science and technology enterprises can work with the third-party financial institutions to establish specialized financial companies based on the chain of member companies of accounts receivable, asset pledge, credit data, generate digital credit vouchers for the enterprise, support the circulation of digital credit vouchers between member enterprises, effectively promote the development of financial business and improve the maximization of enterprise strategic cooperation value.

5. Technology-based Enterprises Apply Blockchain Technology to Achieve Business Model Innovation

Relying on the characteristics of blockchain to capture and store and verify the data in the system in the time dimension, it can realize the decentralization and automation of business processes, thus forming a business model based on blockchain technology. The market has formed the traditional business model, digital business model and emerging block chain business model, the three business models in different levels of market competition, business process differentiation and business diversified market environment have different characteristics, these characteristics make the enterprise in strategy and business process will appear some differences.

Science and technology enterprises often have higher information sensitivity to high and new technologies, and use new technologies to create a more efficient data asset mode for them, which mainly involves the following three elements.

5.1. Data Value Creation and Realization

Data as a decisive factor can build the semiconductor industry Internet ecosystem. The data generated by different subjects in the semiconductor industry chain can only be transformed from its closed-testing capability data into visual data assets through value realization. In the process of testing and sealing level data assets, data service products are directly generated with data products as the core, and data are converted into data assets through value-added ways such as application, circulation and derivative services.

5.2. Platform Value Innovation of Data Assets

Data asset platform based on blockchain technology is a variety of business models, with data asset process as the business orientation, carrying out the transaction and circulation of data products, so as to realize the storage and application of data assets. The circulation of data assets can bring more rapid and convenient financial services to the core enterprises and their participants in the supply chain.

5.3. Customer Value Realization of the Data Assets

The data asset-based process design of testing and sealing level data based on blockchain, while combining the existing data asset business model, adopts a variety of ways to reduce costs, improve efficiency, and promote the sustainable development of the semiconductor industry chain. Through the introduction of high quality data service providers to meet the needs of users and suppliers, promote the development of data chain, and establish the appropriate charging mechanism to support the supply chain participants, in order to reduce the cost of sealing level data assets, also need to establish reliable information sharing mechanism between enterprises, enable

them to effectively cooperate in the form of low cost, high efficiency, realize the effective use of sealing level data assets.

6. Conclusion

Under the current market background, the credit sales mode is prevalent in the supply chain enterprises. The small and medium-sized enterprises in the upstream of the supply chain often have financing difficulties and high financing costs. Without the credit of the downstream high-credit enterprises, it is difficult to obtain high-quality loans from banks. Science and technology enterprises is expected to build supply chain finance based on block chain architecture platform, relying on the integration of "double chain" to improve enterprise sensitivity to the supply chain, at the same time for the supply chain upstream enterprise credit to solve financing problems for the supply chain, it is also for customers, to achieve authors efficiency, improve the operation level of the overall supply chain, operational efficiency.

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