

Analysis of Development of "Blockchain Technology + Supply Chain Finance" Based on PEST-SWOT Model

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Abstract: The emerging ICT technology is applied in the financial field in the fastest and most common way. Under the background that the development of supply chain finance is encouraged in China to solve the difficulties faced by small and medium-sized enterprises in accessing affordable financing, this study focuses on the application of blockchain technology by analyzing its internal strength and weakness through the PEST-SWOT model as well as the opportunities and challenges in the external politics (P), economy (E), society (S) and technology (T). From the perspective of supply chain finance-related enterprises, we put forward corresponding countermeasures and suggestions for the development of "blockchain technology + supply chain finance" in China.

Keywords: PEST-SWOT Model, Supply Chain Finance, Blockchain Technology

1. Introduction



Figure 1: Scale of China's Supply Chain Finance Market

The Outline of the 14th Five-Year Plan for National Economic and Social Development and the Long-term Goals of 2035 of the People's Republic of China released on March 12, 2021, points out that it is necessary to promote the innovative development of supply chain finance, information data, human resources, and other services and solve the difficulties faced by small, medium-sized and micro enterprises in accessing affordable financing and the problems of being diverted out of the real economy. Under this background, as an important way to promote the integration of industry and finance, supply chain finance has become an important means for finance to serve the real economy. At present, with the empowerment of financial technology, all business entities in the supply chain actively or passively reinforce the innovation and application of financial technology. The emerging ICT technology represented by blockchain transforms and reshapes the supply chain finance business, and solves the relevant problems in the development of traditional supply chain finance. In 2019, the scale of China's supply chain finance market reached RMB 23 trillion, and according to the prediction made by relevant institutions, it will reach RMB 40.3 trillion by 2024 (Fig. 1). The supply chain finance market has a large space for development, and the empowerment of blockchain technology innovates the financing mode of

supply chain finance and further improve the financing service capacity, thus achieving the goal of finance to serve the real economy.

2. Literature Review

According to the domestic and foreign literature, the research on the integrated development of blockchain finance and blockchain technology can be summarized into the following three categories. The first is the research on the review of relevant literature, which shows the research overview and the latest research progress. The second is the research on blockchain technology solving the problems of financial information opacity and trust in the traditional supply chain [10].

The research on the relevant review is introduced below. Queiroz and Telles et al. sorted out 27 articles on the integration of blockchain and supply chain published in peer-reviewed journals from 2008 to 2018 and found that the integration of blockchain technology and supply chain is still in the initial stage. They predicted that the disintermediation provided by blockchain applications may subvert traditional industries (such as health care, transportation, and retail) [3]. Liu concluded that blockchain, big data, Internet supply chain finance, and other relevant words are the research hotspots and keywords through Citespace knowledge mapping analysis [6].

Then, the research on blockchain technology solving the problems of financial information opacity and trust in the traditional supply chain is introduced. Dujak and Sajter introduced that blockchain technology has greatly solved the trust problem and analyzed the basic principles of its application in logistics and supply chain [1]. Hou and Bai used the game theory to conclude that the equilibrium solution always exists in the lending market when blockchain technology exists [4]. Liu analyzed the settlement route of blockchain consensus algorithm and smart contract technology in solving the trust crisis and solidifying supply chain funds [9]. Liu and Li analyzed the problems of blockchain Token technology in achieving credit transfer and split transaction claims [7]. Liu concluded that the decentralized, tamper proof and traceable characteristics of the blockchain technology are complementary and match with the business mode, trading mechanism, and operation mode of supply chain finance [8].

To sum up, scholars have analyzed and researched the application of blockchain in supply chain finance from different perspectives, which has laid the foundation for subsequent research. However, the research on comprehensive analysis from the perspective of supply chain finance-related enterprises and in combination with the internal and external environment is absent. Therefore, by using the PEST-SWOT model as the analysis tool and focusing on the emerging ICT technology such as blockchain, we put forward corresponding countermeasures and suggestions for the development of "blockchain technology + supply chain finance" in China from the perspective of supply chain finance-related enterprises.

3. PEST-SWOT Model

PEST analysis includes four factors, such as politics (P), economy (E), society (S), and technology (T). In SWOT analysis, S represents the strength that the organization has, which is an internal factor to achieve the strategic objectives of the organization. W represents the weakness that an organization has, which refers to the negative factors that are not beneficial for the development of the organization. O represents opportunity, which refers to the external environmental factors that are beneficial for the rapid development of the organization. T represents a threat, which refers to the external factors that are not beneficial for the development of the organization and may lead to failure to achieve goals. The analytical paradigm integrating PEST and SWOT is to make further analysis of the organization's internal microenvironment and external macro impact factors as well as the external opportunities and threats from four perspectives of politics, economy, society, and technology, taking into account the internal strength and weakness, thus providing a more scientific decision-making basis for the organization's strategic planning and development, as shown in Fig. 2.

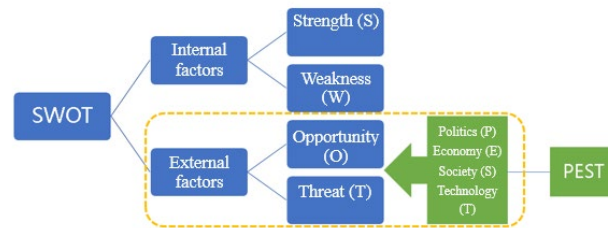


Figure 2: PEST-SWOT Model.

3.1. Strength (S) of "blockchain technology + supply chain finance"

Blockchain technology with supply chain finance can promote information disclosure, guarantee data reliability, increase data security and achieve credit transfer. The essence of "blockchain technology + supply chain finance" is to build a distributed deposit and financing ledger based on blockchain technology. It is also for integrating and uploading the "four flows" of logistics, capital flow, business flow, and information flow in the traditional supply chain to each node of the blockchain in real-time, thus solving the problems of financial information opacity in the traditional supply chain. The supply chain finance based on blockchain technology applies a hash function, timestamp, and other technologies. The hash value of the blockhead of each block in the chain is different, and the different timestamps will be added with the change of time, thus ensuring that the data is tamper-proof and traceable, and the data reliability is increased. In addition, blockchain technology uses the asymmetric cryptographic technique and assigns the corresponding public key and private key through the nodes on the chain, which improves the security of data transmission in the supply chain and avoids the leakage of enterprise core data. The supply chain finance also uses the Token mode of blockchain to split the credit of core enterprises, break through the limitation that the traditional paper vouchers cannot be split, ensure that the credit can be transferred level by level along the supply chain, increase the credit transfer path, and further solve the problems of financing difficulties of remote upstream and downstream enterprises due to lack of credit records.

3.2. Weakness (W) of "blockchain technology + supply chain finance"

The data storage is limited by technology, and the data security is threatened by a 51% hash rate. Data integrity is limited by practical application [2]. In terms of data storage, the supply chain has many semi-structured and even unstructured data. With the development of digitization and the expansion of the financial transaction scale in the future, the data size explosively increases, which brings new challenges to the data storage technology of blockchain and requires the data storage and processing on the blockchain to meet the needs of high-frequency financial trading. In terms of data security, if the hackers obtain more than 51% hash rate, they can tamper with the data stored in the chain, which creates threats to the data security and authenticity. Moreover, with the development of quantum computers and other technologies, the encryption technique still has the risk of being cracked. In terms of data integrity, because the core of the supply chain is logistics, the Internet of Things technology has not been applied to logistics enterprises on a large scale at present. The logistics information cannot be uploaded to the chain in real-time, as a result, the account receivable becomes the main financing mode, and the warehouse receipt financing or pledging of goods in transit and other diversified financing modes are limited.

3.3. Opportunity (O) of "blockchain technology + supply chain finance"

1) Politics (P)

The national policy encourages the innovative development of supply chain finance through emerging ICT technology, such as the blockchain. In 2017, the term "supply chain finance" appeared in the national policy for the first time. The *Guiding Opinions on Financial Support for Construction of Manufacturing Power* proposed to "actively conduct various forms of supply chain finance business such as pledge loans and factoring of accounts receivable, and effectively satisfy the financing needs of upstream and downstream enterprises in the industrial chain". Since then, relevant policies have been implemented successively to promote the development of the supply chain finance industry in China: In March 2021, China Banking and Insurance Regulatory Commission required the five major

state-owned banks to increase loans to small, medium-sized, and micro enterprises by 30% or more. Then, five departments, including the central bank, issued relevant policies to further extend the relevant policies on inclusive finance. Later, they proposed to make full use of big data, blockchain, artificial intelligence, and other financial technologies and build a financial platform of supply chain and industrial chain in key areas and provide convenient and fast online financing services based on legal compliance and controllable risk. In general, the policies for developing supply chain finance are favorable in China, which encourages the innovative development of supply chain finance through emerging ICT technology, such as the blockchain.

2) Economy (E)

Small and medium-sized enterprises have a strong financing need and a large market scale. According to the research and prediction made by Essence Securities, the scale of China's supply chain finance market will reach RMB 40.3 trillion by 2024. Compared with the large enterprises, the small, medium-sized, and micro enterprises lack credit records and mortgages, resulting in fewer financing channels and higher financing costs. According to China's social financing cost index, the average financing cost is generally between 10 and 20%. Therefore, the significance of developing the supply chain finance industry is more outstanding. It is urgent to empower the emerging ICT technology such as the blockchain to support more institutional entities, more extensive financing channels, and a larger financing scale to be included, thus supporting the development of small and medium-sized enterprises.

3) Society (S)

The ecosystem of supply chain finance is relatively mature and complete. The essence of supply chain finance is to provide financing facilities for upstream and downstream small and medium-sized enterprises in its ecosystem by the credit of core enterprises. The "blockchain technology + supply chain finance" meets the needs of small and medium-sized enterprises, core enterprises, and financial institutions but also satisfies the financing needs of remote small and medium-sized enterprises that the traditional supply chain finance cannot reach. At the same time, the informatization and digital transformation of small and medium-sized enterprises in the supply chain will be anti-driven through "blockchain technology + supply chain finance", and intelligent decision-making will be developed in the future, thus forming a benign and complete ecosystem of supply chain finance.

4) Technology (T)

The blockchain and relevant technologies help to achieve the online and automated business process of supply chain finance. The business process of the traditional supply chain finance is long, and a large number of documents are required to be processed. The "blockchain technology + supply chain finance" connects the funders, core enterprises, suppliers, and other participants to achieve the online and automated business process. The penetration of actual business and trade information can be realized by introducing big data, artificial intelligence, cloud computing, computer vision, natural language processing, process automation, AIoT, and other technologies, thus laying a solid foundation for providing accurate and refined supply chain finance services.

3.4. Threat (T) of "blockchain technology + supply chain finance"

1) Politics (P)

The joint supervision mechanism has not been established yet, and the compliance and legal risks are at a high level. The "blockchain technology + supply chain finance" involves many roles and corresponds to many supervision agencies. For the business provider and platform builder of the "blockchain technology + supply chain finance", the development and application of important technologies are involved, and strong technical risks exist. Its supervision agency is the science and technology department and the industry and information department; For the core enterprises and its associated small and medium-sized enterprises, the supervision agency is the industrial and commercial administration department. For the financial institutions (such as banks, insurance companies, small loan companies, and asset management companies), the supervision agency is the People's Bank of China and the China Banking and Insurance Regulatory Commission. At present, the joint supervision mechanism has not been established yet for the "blockchain technology + supply chain finance" in China, which makes the "blockchain technology + supply chain finance" platform and its trading entities faced with higher supervision compliance and legal risks.

2) Economy (E)

The development of blockchain technology increases the economic burden on small and medium-sized enterprises. Supply chain finance requires upstream and downstream enterprises to integrate and upload relevant transaction information into the chain. However, in China, most of the small and medium-sized enterprises in the supply chain have poor information technology environment and technical capacity, and lower levels of business and transaction informatization. This causes difficulties in integrating and uploading information into the chain for such enterprises, and a high technical threshold exists. According to the estimation made by relevant institutions, the upfront cost of RMB 30–40 million and annual upgrading and maintenance expense of RMB 5–15 million are generally required for independent research and development of "blockchain technology + supply chain finance" system. It increases the additional economic burden on small and medium-sized enterprises.

3) *Society (S)*

There is a larger gap in the inter-disciplinary professional talents. On the one hand, there is a large gap in the blockchain technology talent market in China, and many blockchain enterprises lack core technologies and professional personnel. On the other hand, not only technical staff who are familiar with blockchain and supply chain finance business are required for the "blockchain technology + supply chain finance", but also inter-disciplinary knowledge to integrate technology and financial business are required.

4) *Technology (T)*

The basic technology and security of blockchain is still to be improved. First, the authenticity of data proposed to be uploaded into chain cannot be guaranteed by the blockchain. Only the data can be guaranteed not to be tampered with in the process of data transmission. Therefore, the problems such as enterprise falsification and fraud cannot be solved from the source. Second, with the Token technology of blockchain, the credit of enterprises at all levels of the supply chain is promoted to realize "changing from splitting into financing", but the credit cannot be directly provided to the small and medium-sized enterprises, and credit is still provided by core enterprises. Therefore, the blockchain enhances trust rather than provide additional credit.

3.5. *Brief Summary of PEST-SWOT Analysis*

Based on the above PEST-SWOT analysis, the following conclusions can be made. At present, the development of "blockchain technology + supply chain finance" business has the internal strengths of promoting information disclosure, guaranteeing data reliability, increasing data security, and achieving credit transfer, but it also has the internal weakness, for example, the data storage is limited by technology, the data security is threatened by 51% hash rate and the data integrity is limited by practical application. Moreover, it brings opportunities such as favorable policies and a large market scale, a supply chain ecosystem, and the realization of online and automated business processes. In addition, it is also faced with threats, such as compliance and legal risks, heavy economic burden on small and medium-sized enterprises, a larger gap in the inter-disciplinary professional talents, and basic technology and security of the blockchain to be improved, as shown in Table 1.

Table 1: *PEST-SWOT Analysis Matrix*

SWOT	Internal	Strength (S)	promote information disclosure Guarantee data reliability Increase data security Achieve credit transfer			
		Weakness (W)	Data storage is limited by technology Data security is threatened by 51% hashrate Data integrity is limited by practical application			
	PEST		Politics (P)	Economy (E)	Society (S)	Technology (T)
	External	Opportunity (O)	Favorable policies	Large market scale	Compete supply chain ecosystem	Online and automated business process
		Threat (T)	Supervision and legal risks	Heavy economic burden on small and medium-sized enterprises	Large gap in inter-disciplinary talents	Basic technology and security of the blockchain to be improved

4. **Development Strategies and Suggestions**

According to the above analysis, taking into consideration of the internal strength (S) and

weaknesses (W) of supply chain finance-related enterprises, the SOT and WOT development strategies are proposed in combination with the external opportunities (O) and challenges (T).

4.1. SOT gives full play to the strength, grasps opportunities and eliminates threats

With the empowerment of blockchain technology, supply chain finance expands the cooperation and transaction boundaries of enterprises on the chain, forming a new commercial ecological mode of cross-chain, cross-ecological integration, symbiosis, and win-win. For example, AIoT integration technology collects massive data from different dimensions through Internet of Things, stores them in the cloud and the edge, and then realizes the digitization and intelligent connection of all things through big data analysis and higher forms of artificial intelligence [5]. However, due to the limited business volume of single core enterprises or financial institutions in the supply chain, the small and medium-sized enterprises cannot afford the corresponding development and maintenance costs of blockchain. Thus, the independent development and maintenance of the "blockchain technology + supply chain finance" system are not economical. Therefore, third-party platforms need to be encouraged to provide such services.

4.2. WOT improves the weakness, makes full use of opportunities and resists threats

Supply chain finance has the 2B business attribute, long business chain, many participants, and entry barriers in the vertical industries. Therefore, the priority can be given to developing the consortium chain technically supported by blockchain. Then, cross-chain technology can be tackled to solve the intercommunication and interconnection of the consortium chain, promoting the further development of supply chain finance from "chain type" to "network type". At the same time, the relevant supervision departments need to be urged to form unified and joint supervision to reduce the compliance and legal risks of the third-party platforms and participants. Meanwhile, it is necessary to strengthen the training of inter-disciplinary professional talents, reinforce technological innovation and encourage the further integration and development of blockchain and cloud computing, big data, Internet of Things, artificial intelligence, 5G and other emerging technologies.

5. Conclusion

In this study, the internal strength (S) and weakness (W) of the application of blockchain technology to supply chain finance as well as the opportunities and challenges in the external politics (P), economy (E), society (S), and technology (T) are comprehensively analyzed through the PEST-SWOT model. Finally, taking into consideration of the internal strength (S) and weakness (W) of supply chain finance-related enterprises, the SOT and WOT development strategies are specifically proposed in combination with the external opportunities (O) and challenges (T).

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