The Key Technical Research of Supply Chain Finance Platform Based on the Blockchain Technology

Qiang Li[1], Xinqiang Ma[2,*]

1. Artificial Intelligence College of Chongqing University of Arts and Sciences, Chongqing, 402160 China

2. Artificial Intelligence College of Chongqing University of Arts and Sciences, Chongqing, 402160 China

[*]Correspondence Author: Xinqiang Ma,Email:40462273@qq.com

Keywords: Blockchain technology; supply chains; finance platform technology

Abstract: With the constant development of social economy, the occurrence of the blockchain technology is an inexorable trend. Using the blockchain technology in enterprises can effectively make innovations on data information transmission and risk control of enterprise supply chain finance and achieve the goal of sustainable development. Hence, the author analyzes the supply chain finance service platform construction based on the blockchain, hoping to provide some reference.

1. The supply chain finance of the blockchain technology

1.1 Overview of the blockchain technology

The blockchain technology is the point-to-point distributed database account book. The blockchain is advantaged of concentration with the equality of status among blockchain nodes. Through relevant rules, the corresponding consensus is reached according to the principle majority domination, but it doesn't need mutual trust to confirm the transaction information. It not only has high efficiency, but also shows low costs. The blockchain technology contains some scientific computer technologies, such as the peer-to-peer network technology, consensus mechanism, and asymmetric encryption. It is an innovative application model of the internet era. It is not only applied in bitcoin grass-roots technology, but also is stretched in industrial fields, such as modern medicine, finance, and communication, showing features and advantages of trustworthiness and decentralization [1]. Comparing with the current transaction mode, the blockchain model removes participation of third-party payment platforms. Decentralization realizes perfect solution of the mutual trust issue.

1.2 Overview of the supply chain finance

Supply chain finance emerged at the right moment based on needs of the supply chain management. It enhances efficiency and quality of supply chain management, while vitalizing capital for enterprises. In the long history of developing supply chain finance, various problems including slow efficiency caused by the original supply chain finance system, miscellaneous procedures, easy errors, unbatched customer acquisition, and difficult information generalization between institutions because of asymmetric information are solved. Moreover, small and medium-sized enterprises (SMEs) based on derivative credit of core enterprise as the credit support to get artificial credit granting 1.0 model of financing credit granting and capital pressure, so as to obtain financial service online, on-chain warehousing and payment and other authentic operation information through the ERP system bank for the bank-enterprise direct connection 2.0 model with effective management. Then, it realizes the three-in-one 3.0 model through logistics, information flow, and cash flow with the internet finance mesh development.

  DOI: 10.25236/iccemm.2021.002

Fig.1 Evolution of Supply Chain Finance

Tab.1 Comparison of Various Blockchains

Blockchain type	The chain of public	League chain	The chain of private
Service principal	All the people	Special organization	Separate the individual
Degree of centralization	Decentralized	More centralized	Centralized
Incentive mechanism	Yes	Choose	No
Person of charge to an account	All the people	Participant negotiation	Since the proposed
Speed	3-20A/s	1000-10000A/s	1000-100000A/s
The node is stored	Personal computer	Specific computer	Specific computer
Join the difficulty	Low	Higher	High

2. Application advantages of the supply chain platform based on the blockchain technology

According to the survey, the finance gap of China's SMEs is up to 1.9 trillion USD. Moreover, the capital scale of China's supply chain finance is gradually increasing. Based on the calculation, the capital scale of China's supply chains will be 2 billion in 2020.

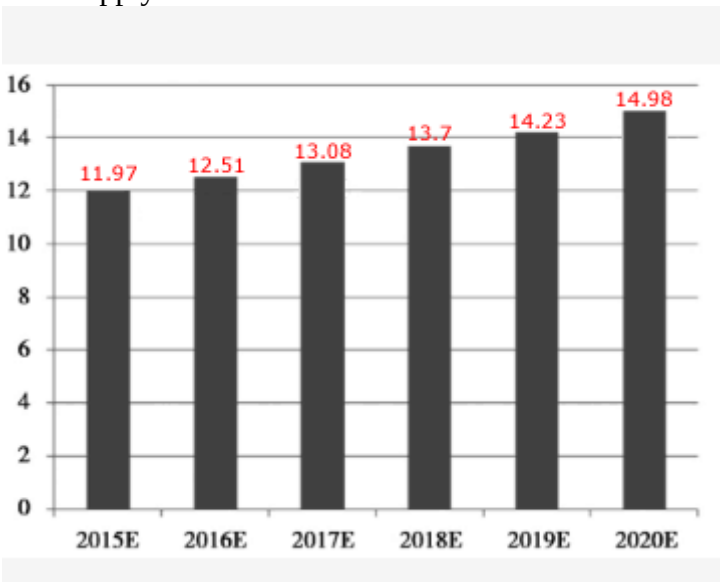

Fig.2 The Capital Scale Prediction of China's Supply Chains

2.1 Completion of trust transmission, reduction of trust costs, and verifiable information authenticity

The application of the blockchain technology in supply chain finance solves the asymmetric information problem in upstream and downstream firms, as well as banks and industrial chains, and expands the range of trust. Core enterprises can transmit credit through blockchains layer by layer and conduct credit endorsement for downstream SMEs. Moreover, the blockchain technology is untamable and traceable, ensuring information effectiveness on blocks. This provides credit guarantee for finance of SMEs, reduces credit costs for participation of third-party institutions, increases financing chances of SMEs, and enhances service and quality of supply chains.

2.2 Electronization of supply chain information interaction

Traditional data bills not only need consume lots of manpower, material resources, and time during the process of circulation. Moreover, the process is complicated. It is easy to make mistakes, resulting in the occurrence of illegal phenomena, such as “dual purpose of one bill” and “fake bills”, obstructing the market development. Integrating with the blockchain technology can realize bill information on-chain and capital digitalization and promote high-speed and safe circulation of information. Entry of smart contracts solves the problem that it is difficult to control bill arrival time and realizes automatic deduction of bills to mature. The whole network maintains and reduces the risks of stealing and losing information since the centralized management system is attacked [2].

3. Key technology application measures of the supply chain finance platform based on the blockchain technology

3.1 Platform information interaction

Transaction information between manufacturers and retailers is conducted according to the mode of private information interaction, stated as follows: when they communicate with each other about (product prices and product quality), manufacturers should conduct the double treatment for communication information. Firstly, communication information uses the communication information ciphertext obtained by manufacturers’ public key encryption. Secondly, communication information conducts hash operation to get the summary. Private keys of retailers are used for digital signature. Then, retailers’ digital signature and communication information ciphertext are reserved by the platform and then they are sent to manufacturers together. Manufacturers use the own private keys to unlock ciphertext and get communication information for hash operation, so as to get the summary. Hereby, this summary and the summary obtained by decoding digital signature are compared. If they are consistent, the summary is judged as correctness, showing the received communication information is authentic and effective.

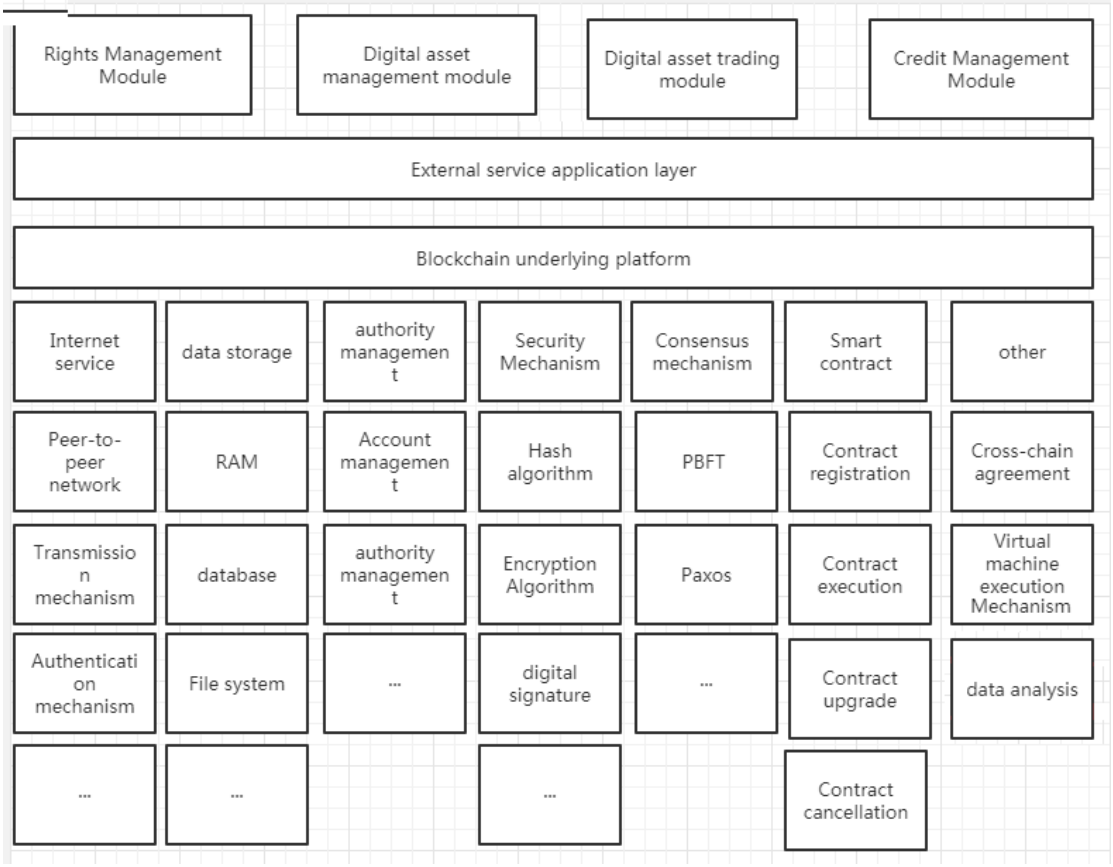

Fig.3 Blockchain-based supply chain financial service platform architecture

3.2 The financing process of the platform

(1) In the financing stage, smart contracts need traders to meet specific requirements before making financing judgement. Once traders have poor records, transaction should be forbidden and then reasons should be reported to the interested traders. Forbidden traders only can recover transactions in the credit system through the complicated application. After smart contracts make a financing decision, the system enters into the module.

(2) In the capital transfer stage, suppliers supply raw materials to manufacturers for product production. And then, products are transferred with commercial flow, logistics, and information flow. If retailers are satisfied with products or production contracts expire, smart contracts automatically scratch out capital for suppliers and manufacturers and change debtors as retailers. After smart contracts judge capital transfer and traders confirm it, the system enters into the module.

(3) In the goods pick-up stage, retailers inquire pick-up conditions and give out pick-up application according to self-state. Then, smart contracts will automatically judge it. After retailers sell goods, the system enter into the module [3].

(4) In the repayment stage, smart contracts can automatically remind retailers to repay in accordance with financing agreements. Retailers will start repaying in line with repayment conditions. Then, smart contracts will automatically transfer capital from retailer accounts to financial institutions. If failed, it will inform financial institutions to negotiate with retailers. After successful negotiation, it will start repayment again. Otherwise, retailers are judged as breach of contract. Finally, the situation of successful repayment or breach of contract will be recorded in the credit system[4]. The system utilizes continuous operation of four modules to make capital flow on supply chains reach the closed loop and clear division of financing liabilities for breach of contract.

3.3 The logistics supervision of the platform

The logistics transfer in the system can be simplified as follows: logistics companies transport raw materials to manufacturers. And then, raw materials are processed into products before logistics companies are delivered to logistics warehouses for storage[5]. If retailers manage to get the pick-up application, goods will be transported by logistics companies to retailers. During the process, every article delivery will be recorded on the blockchain after smart contracts identify the identity of information. It is always supervised by each party. Financial institutions indirectly control raw materials and products with the economic value by controlling logistics companies[6]. If delivery information is not identical, full-node announcement transaction will be paused and considered in the credit. If delivers want to recover delivery, the related party should negotiate and submit the application.

3.4 The credit management of the platform

The finance platform can record transaction records on the blockchain on the basis of smart contracts' credit evaluate to assess and calculate the credit evaluate scores. If scores are less than 90, traders will pause transactions. If transactions should be recovered, it is necessary to apply for the finance platform. The platform will determine whether authority should be recovered in accordance with the latest credit information [7]. If scores are more than 90, the agreement-based smart contracts will be signed for transactions. If there are transaction disputes and financing disputes, the banks also will collect the latest credit information to do credit evaluate again, update the latest credit evaluation scores, and conduct full-node announcement[8]. Transactions' breach of contract information also will be recorded in the blockchain.

4. Conclusions

With the further development of social economy, applying the blockchain technology in the supply chain finance service platform has very important significance. This platform effectively combines the blockchain technology with the big data analysis technology. Compared with the traditional financing model based on the guarantee assets, it gradually turns into the comprehensive

financing model and constructs the trust mechanism corresponding to nodes, so that each enterprise in supply chains will attend it equally. The enterprise credit data can effectively integrate with supply chain finance services, further promote supply chain finance development, and ultimately achieve the goal of sustainable development.

Acknowledgements

The study was supported by the Key Industrial Technology Development Project of Chongqing Development and Reform Commission, China(Grant No.2018148208), Key Technological Innovation and Application Development Project of Chongqing, China(Grant No.cstc2019jscx-fxydX0094), Innovation and Entrepreneurship Demonstration Team of Yingcai Program of Chongqing, China(Grant No.CQYC201903167)，Social undertakings and people's Livelihood Guarantee Project of Yongchuan District(Ycstc,2020cc1201).

References

[1] Jiang Yu, Yao Xin, and Li Bing, the Applications of Using the Internet of Things and the Blockchain Technology to Enhance the Supply Chain Finance Risk Management[J], Trade Fair Economy, 2020(06): 51-54.

[2] Yang Ling, Xu Qing, and Li Jiaqian, the Applications of the Blockchain Technology’s Supply Chain Finance in Power Grid Enterprises[J], Technological Economic Herald, 2020, 28(24): 33-34.

[3] Xu Jiayang and Guo Fuchun, the Innovative Research on the Supply Chain Finance Based on the Blockchain Technology[J], Zhejiang Finance, 2020(08): 61-69+50.

[4] Zhang Zhengping and Ma Yangui, the Development of China’s Blockchain+ Supply Chain Finance: Model, Challenge, and Countermeasure [J], Financial Developmental Research, 2020(08): 48-54.

[5] Lin Ronglai and Wang Shijie, the Application Exploration of Label Analysis and the Blockchain Technology in the “Supply Chain” Finance Field [J], Network Safety Technology and Application, 2020(08): 120-123.

[6] Chen Jiyuan, Lu Heng, Lei Yuqian, Zhao Ning, Qi Qiantuo, Zhou Xinyu. Problems and improvement measures of blockchain in the application of supply chain finance[J].Tax Pay,2020,14(07):155-156.

[7] Shen Shu.Research on the Construction of Internet + Supply Chain Financial Data Platform[J].Tsinghua Financial Review,2020(03):89-92.

[8] Cao Yuan,Chen Youbin.Practice and thinking on the construction of blockchain supply chain financial platform[J].Fintech Times,2020(02):42-48.