

## Opportunities and risks faced by the combination of blockchain and supply chain finance

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**Abstract:** After more than ten years of rapid development, blockchain technology has now entered the era of hyperledger 3.0. More and more industries have integrated blockchain technology and are constantly experimenting and exploring, especially the supply chain finance industry. Give full play to the role of blockchain technology in promoting supply chain finance, and study the challenges and challenges faced by the application of blockchain technology in the supply chain finance industry. This paper analyzes the content analysis of foreign internal scholars on the supply chain through qualitative research. The analysis of financial cases and research summarizes the challenges and challenges faced by the application of current blockchain technology in the supply chain finance industry. Through analysis, blockchain technology can be cut and supply chain financial services have good adaptability. Blockchain technology can play an important role in promoting smooth information flow, coordination of entities, risk control, and process simplification for supply chain financial services, but at the same time the application of blockchain technology still faces multiple challenges including laws and regulations, technical aspects, regulatory measures, risk prevention, and application efficiency. It is necessary for the country to advance legislative work and introduce technical standards as soon as possible to promote public chains, alliance chains and proprietary chains. The development and application of the chain in technology.

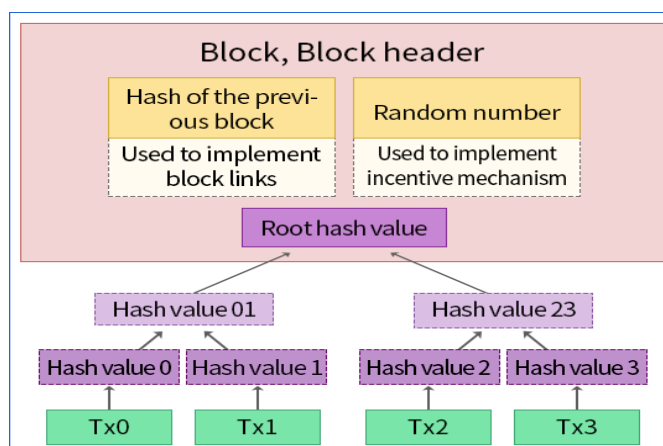
**Keywords:** Blockchain; Supply Chain Finance; Smart Contract; Supply Chain; Fintech; Qualitative Research; Content Analysis Method; Literature Research; Case study;

### 1. Introduction

#### 1.1. The theory and development of blockchain technology

Blockchain is a new application mode of computer technology such as distributed data storage, point-to-point transmission, consensus mechanism, and encryption algorithm(Yan & Kim & Yang, 2020). The consensus mechanism is a mathematical algorithm in the blockchain system to establish trust and obtain rights and interests between different nodes. Blockchain can be simply divided into three levels, protocol layer, extension layer and application layer. Among them, the protocol layer can be divided into the storage layer and the network layer, which are independent but inseparable from each other. Blockchain technology uses a distributed collective operation method under a distributed peer-to-peer network without a central control point to construct a P2P self-organizing network(Han & Lee & Lee & Park, 2020). Through a complex verification mechanism, the blockchain database can maintain integrity, continuity and consistency (shown Figure 1).

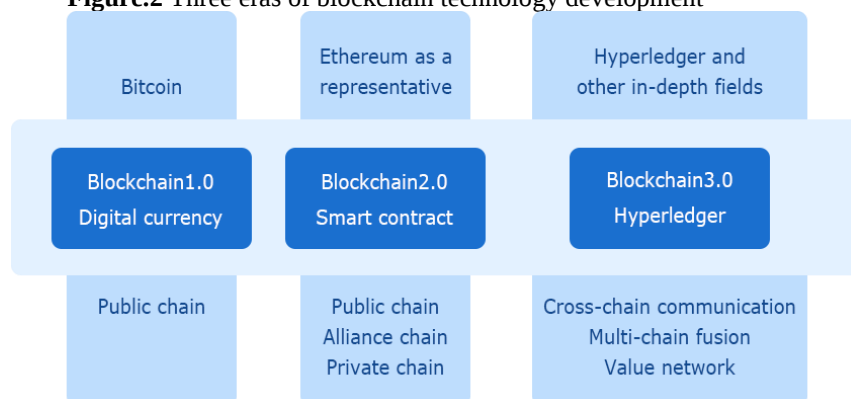
**Figure.1** Block Theory



As a decentralized, distributed, credible, non-tamperable and traceable public account book, blockchain

technology has quickly become the underlying core technology in the fields of finance, anti-counterfeiting, traceability, and privacy protection since its launch in 2009(Yoon & Lee, 2020). In the past ten years, with the digital currency 1.0 era led by Bitcoin, the smart contract 2.0 era led by Ethereum, and the current 3.0 era led by Hyperledger (see Figure 2 for details), blockchain technology has been fast Iterative development and integration into various industries in society. As General Secretary Xi Jinping emphasized in his important speech on October 24, 2019: "It is necessary to strengthen basic research, enhance original innovation capabilities, and strive to make China walk the forefront of theory in the emerging field of blockchain, occupy the commanding heights of innovation, and obtain industry After "New Advantage"(Ma & Lin, 2020), the application and development of blockchain technology rose to a national strategic height for the first time. At the same time, the development and application of blockchain technology in major countries around the world has also entered a peak period. The Chinese government released the RMB digital currency to start trial operation, the US Facebook released the digital currency project Libra white paper, and the German government released the "German Blockchain Strategy" The South Korean government is also formulating an institutionalized tariff collection plan for cryptocurrency(Yan & Chung, 2020). The Japanese Virtual Currency Business Association (JCBA) issued a "recommendation on new supervision of ICOs". In the same year, the government passed the "Fund Settlement Algorithm" and "Financial Business Law" amendments. Strengthened measures for virtual currency exchange and trading rules. In general, the development and application of blockchain technology has entered a whole new level.

**Figure.2** Three eras of blockchain technology development

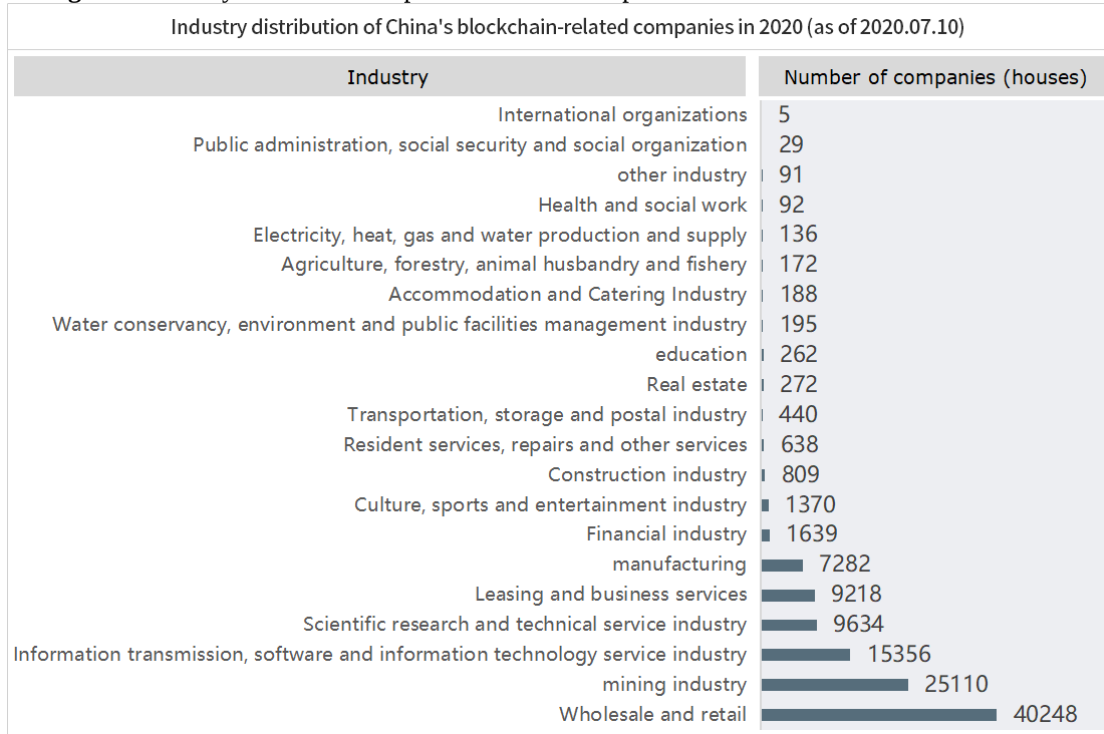


## 1.2. Summary of Supply Chain Finance Development

Supply chain finance is a professional area of commercial bank credit business (bank level), and it is also a financing channel (enterprise level) for enterprises, especially small and medium-sized enterprises. It means that banks provide customers with financing and other settlement financial services, and at the same time provide these customers' suppliers with the convenience of timely receipt of loans, or provide their distributors with prepayment and inventory financing services. Simply put, it is a financing model in which banks link core companies with upstream and downstream companies to provide flexible financial products and services.

Supply chain finance aims to solve the imbalance in capital allocation for enterprises (especially small and medium-sized enterprises), open up upstream and downstream logistics chains, capital chains, business flows, and information flows, and provide them with a supporting enterprise as a whole, relying on the industrial chain to improve Group competitiveness of the entire supply chain. Supply chain finance helps to enhance the viability of the supply chain, improve the efficiency of supply chain capital operation, and reduce the overall management cost of the supply chain(Wang & Xia, 2018). As the fierce market competition gradually shifts from competition among single enterprises to competition among overall supply chains, supply chain finance plays an increasingly important role in the economy and society. The country regards the development of supply chain finance as an important measure to promote the development of the supply chain. In 2017, my country's first supply chain policy, the "Guiding Opinions on Actively Promoting Supply Chain Innovation and Application", issued by the General Office of the State Council, stated that it is necessary to "actively and steadily develop supply Chain finance, to promote supply chain finance to serve the real economy". In 2018, 8 ministries and commissions including the Ministry of Commerce issued the "Notice on Launching Pilot Supply Chain Innovation and Application", further pointing out the need to standardize the development of supply chain finance and continue to promote the practice of supply chain finance. With the continuous development of supply chain finance and continuous integration with new technologies, the current supply chain finance has become one of the hotspots in the application of blockchain technology. At present, the industry distribution of my country's blockchain startups is relatively concentrated, accounting for more than 80% in the financial and corporate services fields (see Figure 3). The financial field mainly includes digital currency-related transaction services, cross-border payments, supply chain finance and other sub-fields(Xu, 2019).

**Figure.3** Industry distribution map of blockchain companies

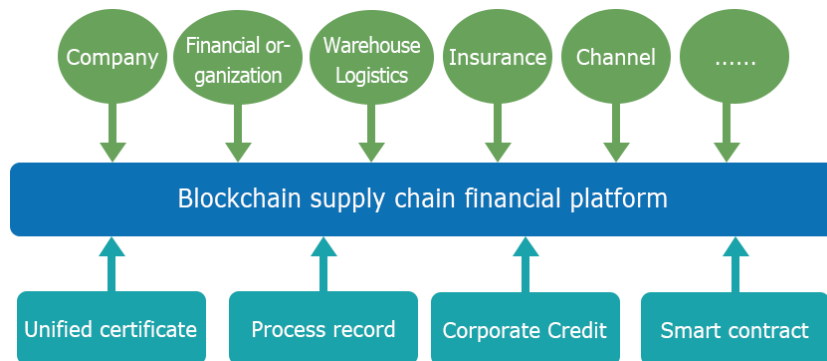


### 1.3. Blockchain Reshapes Supply Chain Finance

According to the scope of use and authority, the current blockchain can be divided into: public chain, alliance chain and proprietary chain (private chain). The common points of the three chains include openness and transparency, non-tampering, traceability, time series, P2P, and encryption. The degree of decentralization is different. The biggest difference lies in the consensus mechanism and the establishment of trust(**Chen, 2017**). In the financial industry, the information asymmetry between the two parties makes the industry one of the most centralized industries, and the characteristics of blockchain technology such as decentralized credit and non-tamperable security make it hopeful to solve the current part of the financial industry. Pain point, it has wide application possibilities in many subdivisions(**Jiang, 2018**).

Supply chain finance has a broad market in the financing of enterprises (especially small and medium-sized enterprises). With its unique technical advantages, such as decentralization, transparency, non-tampering, and traceability, blockchain has introduced smart contracts and BaaS(Blockchain As a Service) and other middle-tier technology applications, it can effectively solve the many pain points faced by the current supply chain finance, and rebuild the supply chain finance ecosystem. In view of the long-term financing difficulties of small and medium-sized enterprises, supply chain finance is undoubtedly a success Exploration also shows the potential to solve the problems faced by existing supply chain finance (see Figure 4)

**Figure.4** Blockchain supply chain finance flowchart



Blockchain is a basic underlying technology(**Moon, 2020**). It has the potential to create a new technical foundation for the economic and transaction system of the supply chain finance industry. Using the dynamic distributed ledger of the blockchain can significantly reduce the background operation and maintenance of financial

institutions Cost(Sun, 2017). Blockchain technology will profoundly change the commercial operation of the supply chain finance industry, and this change is far greater than that of the supply chain industry. Blockchain application is not only a challenge for traditional business models, but also an important opportunity to create new businesses and simplify internal processes. In the era of economic and financial globalization, strengthening the research on the application of blockchain technology in the financial field has important theoretical and practical significance for exploring the innovation and development of global financial services(Xie, 2017).

## 2. Previous research

### 2.1. Characteristics of financial innovation in the context of blockchain technology

Compared with traditional financial innovation, the technical characteristics of blockchain provide a new perspective for solving financial problems in the real economy, thus forming new characteristics of financial innovation in the context of blockchain technology, which are mainly reflected in: With the rapid development of technology, the role of blockchain in finance has been continuously strengthened(Wen, 2017). In terms of digital currency, at present, there are more than thousands of digital currencies led by Bitcoin. The Token incentive mechanism has overturned the traditional legal currency issuance mechanism, and has derived new financial forms with unique characteristics such as ICO and virtual currency investment. In terms of financial services, decentralized features such as distributed storage of data on the chain, joint maintenance of nodes on the chain, and point-to-point transmission have changed the traditional data storage model and improved the security of financial services; anonymity features can fully protect the privacy of financial service participants. Avoid unnecessary privacy leaks; smart contracts establish machine trust, reduce financial service costs, and improve financial service efficiency(Zhang, 2016). Therefore, in recent years, governments of various countries have increasingly inclined to develop blockchain technology in the direction of the financial service industry. Once the blockchain technology is deeply integrated with the financial industry, it will reconstruct financial entities, financial architecture, financial models, financial products, financial behaviors, and financial infrastructure, creating a new financial system and financial format(Zhou & Li, 2016).

### 2.2. Financial innovation in the context of blockchain technology

Blockchain technology has already had many innovative applications in the financial field, that is, using secure, flexible, highly transparent, and decentralized blockchain technology(Chen & Peng, 2018) to reduce system costs and improve service efficiency in financial business innovation. Empower the financial industry(Jiang, 2015). On October 18, 2016, under the guidance of the Ministry of Industry and Information Technology Information and Software Service Industry Department and the National Standardization Management Committee, the China Blockchain Technology and Industry Development Forum prepared the "China Blockchain Technology and Application Development White Paper (2016) )" proposed "financial services as the first application field of the blockchain" and pointed out that the blockchain has the potential to reconstruct the financial industry infrastructure, and that the blockchain is an innovative financial infrastructure built on The financial services and business models based on the blockchain will also undergo tremendous changes(Xu, 2018). In the traditional financial industry, due to the lack of credit, various risks restrict the development of the financial industry. Financial institutions face two main risks in providing credit services, one is the credit risk of SMEs themselves, and the other is the subjective fraud risk(Wei & Dai, 2020). Blockchain technology mainly establishes point-to-point mutual trust through asymmetric encryption, information sharing, smart contracts, etc., and solves the pain points of the financial industry. Blockchain technology can subvert the traditional intermediary mode of the financial industry and greatly improve the efficiency of the financial system. , Blockchain technology can be applied to various fields of the financial industry, bringing great potential to the development of the financial industry.

## 3. Research method

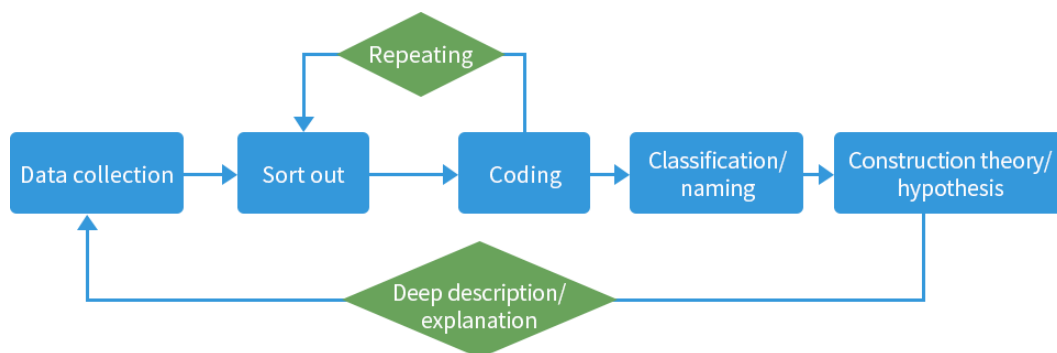
Qualitative research is also called qualitative research or qualitative research. It is produced in the context of postmodernism. It proposes a phenomenological and hermeneutic analysis and understanding of research issues from the perspectives of post-positivism, critical theory and constructivism(Cai & Zhang, 2014). Qualitative research mainly uses methods such as participatory observation, in-depth interviews, phenomenology, and hermeneutics, emphasizing the interaction between the researcher and the researchee, and constructing a grounded theory through in-depth description. At the same time, qualitative research is also a process of discovering common problems from actual observations. It belongs to exploratory and narrative research. It is based on the professional paradigm of hermeneutics or the professional paradigm of criticalism. This type of paradigm considers understanding one the best way to process is to go through and experience this process. Figure 5 shows the main models and theories of qualitative research.

**Figure.5** Modes and theories of qualitative research



Qualitative research can also be regarded as a general term for a class of research methods such as case research, follow-up research, grounded theory, and participatory observation, which is different from a series of methods of quantitative research. Unlike the latter, which acquires "cross-sectional data" more at a certain point in time, qualitative research pays more attention to the process and context of the research, pays more attention to the time of the research, and tends to adopt the paradigm of longitudinal research, which is suitable for being close to the research object. Characteristics such as the multi-dimensionality of research perspectives, the promotion of researchers' reflection, and the diversity of available research methods. Therefore, qualitative research has achieved considerable development and fruitful results in social science research such as sociology, anthropology, pedagogy, and management. Figure 6 shows the basic steps of qualitative research methods.

**Figure.6** Basic steps of qualitative research methods



The role of qualitative research is determined to a certain extent by its own unique functions, which are precisely lacking in quantitative research, so the two are complementary and referential. On the whole, social research generally includes two elements: the subject of research, the researcher, and the object of research, the object of research. The inevitable requirement for scientific research and research methods is to control research errors reasonably.

Case studies are an important component of qualitative research, which essentially belongs to the category of phenomenology. Simply put, it is to use real examples to explain a research phenomenon, or to discover and construct a research proposition. It is exploratory, descriptive and explanatory. It can help people fully understand complex social phenomena and is suitable for research that occurs in the contemporary era. However, events that cannot be controlled by related factors are also conducive to showing a certain phenomenon and its complex interaction with the situation at the time. From a logical point of view, in order to extract the causal relationship of the research object from a special phenomenon, case studies must use inductive logic instead of the deductive logic commonly used in quantitative research. In the field of management, case studies are closely integrated with corporate practice, thus building a bridge between theory and application, communicating researchers and practitioners, and facilitating mutual understanding and discussion.

#### 4. Empirical analysis

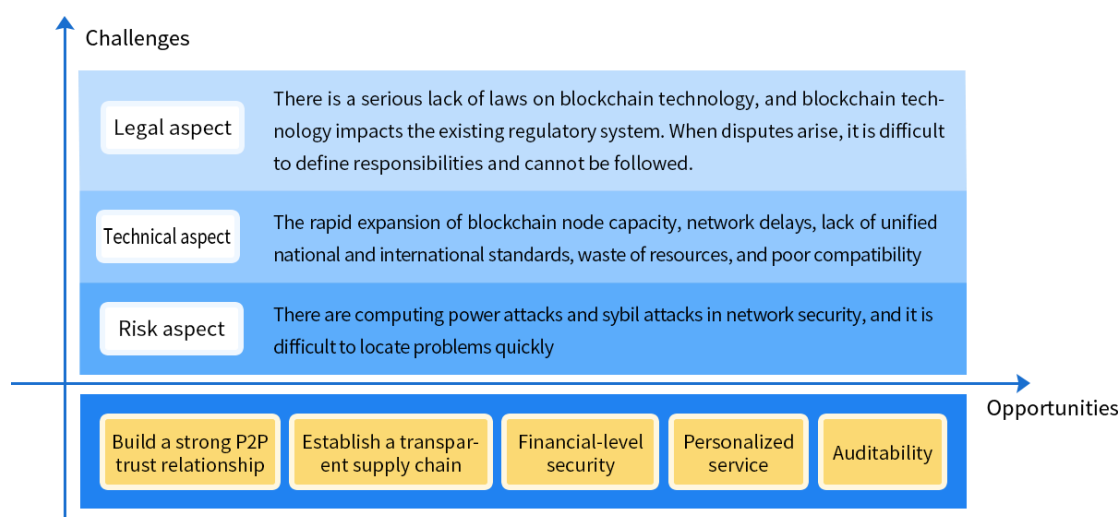
The analysis of this thesis uses the research and case analysis of blockchain technology in supply chain finance by domestic and foreign scholars in the past four years. The representative viewpoints are summarized in ten aspects. In response to the above-mentioned definitions of experts and scholars, we adopted the "content analysis method" in qualitative research, and carried out open coding and centralized coding of various representative definitions, of which 62 open codes were obtained, and 37 centralized codes were finally formed. Through coding, it helps to refine the main points of experts and scholars based on rigorous research methods.

In summary, after analyzing and researching the above-mentioned experts and scholars' research cases through the content analysis method of qualitative research, we summarized the opportunities and challenges faced by the application of blockchain technology in supply chain finance. At the overall level of supply chain finance, block chain technology and supply chain finance business have good adaptability. Block chain technology can play a role in the smooth flow of information, main body coordination, risk control, and simplification of operation

procedures for supply chain finance business. Important promotion. But at the same time, blockchain technology still faces challenges including legal, technical, regulatory, risk prevention, and efficiency(shown in Figure 7):

- **Legal aspect:** As the decentralization mechanism of blockchain technology has severely impacted the country's current legal supervision system, the current blockchain-related laws and systems are seriously lagging behind. Once the technology has legal disputes at the application level, it is difficult to define the relevant legal responsibilities. Because the country does not have relevant legislation and a relatively complete regulatory system for blockchain, various cities, institutions, and regions face inconsistent handling of legal disputes caused by blockchain technology or applications.
- **Technical aspect:** The distributed accounting and storage of the blockchain requires multiple points to verify the replication information, which will cause the storage capacity of each node to expand rapidly, and the block size and block generation time are restricted by factors such as network delays , Resulting in a series of problems such as low business throughput, resource redundancy, network delay, and low consensus efficiency, making it difficult to handle high-throughput real-time financial services. In terms of standards, there are currently no unified international and national standards for blockchain, and there are problems such as poor compatibility, low interoperability, and blurred legal boundaries. At the same time, the market lacks relatively mature products, and there is no data sharing mechanism between various industries and institutions. There are also large technical barriers for industries and enterprises. And because of its non-tamperable characteristics, some application levels lack corresponding flexibility.
- **Risk aspect:** From the perspective of network security. The security of the blockchain network is inseparable from the maintenance of a large number of trusted computing nodes. How to ensure that trusted nodes are not attacked before financial business innovation is a huge challenge to prevent financial risks. In addition, the rapid increase in computer computing power and breakthroughs in quantum computing may put the blockchain encryption algorithm at risk of being cracked, which will greatly impact the security of the blockchain encryption system; at the same time, the blockchain may be affected by the network layer. The "witch attack" may be "computational power attack" at the consensus layer, and "hacking" at the smart contract layer due to code vulnerabilities, which may cause huge losses. In addition, from the perspective of cooperation and trust, on the one hand, from the perspective of client security. With the rapid development of computing technology, the possibility of asymmetric encryption algorithm cracking will continue to increase in the future, which is also one of the potential security threats facing blockchain technology. On the other hand, each node in the blockchain system is not completely anonymous. With the continuous progress of various anti-anonymity identification technologies, the key target positioning and identification privacy protection technology of the blockchain will be greatly challenged.

**Figure.7** Opportunities and challenges faced by blockchain technology in supply chain finance



While there are many challenges in the application of blockchain technology, the opportunities of blockchain technology in supply chain finance are also very obvious, because it solves the problem that traditional supply chain finance is relatively difficult to break through. The comprehensive expression is as follows(shown in Figure 7):

- **Build a strong P2P trust relationship:** As a distributed ledger technology, blockchain uses distributed deployment and storage. Data is not maintained by a single centralized organization, and it is impossible to manipulate data in accordance with its own interests. Strong trust relationship. Blockchain technology can record, store, transmit, verify, and analyze information through programmatic recording, storage,

transmission, verification, and analysis of information without compromising the confidentiality of data, thereby forming credit and transmitting credit, and its application in financial services not only brings considerable cost savings , Which can greatly simplify the transaction process and automate the execution of contracts, thereby improving transaction efficiency, reducing the cost of idle funds, reducing transaction and settlement risks, and optimizing customer experience.

- Establish a transparent supply chain: The blockchain saves complete data, allowing different participants to use consistent data sources instead of scattered data, ensuring the traceability of supply chain information and achieving supply chain transparency. The distributed storage of information and data ensures the integrity of the data. Transaction accounting is done by multiple nodes distributed in different places, and each node records a complete account, so they can participate in the supervision of the legality of the transaction. At the same time, they can testify together, and they can be completely transparent, open and fair.
- Financial-level security: As transactions are encrypted and immutable, the ledger is almost impossible to be damaged. Blockchain technology can make the main participants become a node in the blockchain network, so that each link of the entire business process can form an encrypted data record, because the record cannot be tampered with and is completely traceable, which is convenient for supervision Unlike auditing the flow of funds and information, all parties involved in the business do not have to worry about the loss of profits caused by one party's tampering with contracts, databases or other information asymmetry issues. The characteristics of the non-tamperable data and the existence proof of the timestamp of the blockchain can be well used to solve the disputes between the participating entities in the supply chain system and the problem of the capital chain. The combination of data immutability and transaction traceability can solve the problem of counterfeit and shoddy products in the circulation of products in the supply chain.
- Personalized service. The programmability of the blockchain itself can essentially meet the individual needs of various consumers. Through smart contract coding, special requirements can be formulated for each participant in the entire link of the supply chain to meet the different use and application requirements of all parties.
- Auditability. Record the identity information of each data change, allowing reliable audit trails.

## 5. Conclusions and Discussions

This paper analyzes and summarizes the opportunities and challenges faced by the application of blockchain technology in supply chain finance from multiple dimensions. The above analysis shows that blockchain technology at the legal level requires national departments to quickly follow the market the application and actual situation will introduce relevant laws and regulations and corresponding regulatory policies as soon as possible. Relevant industries and institutions need to introduce relevant standards for blockchain technology as soon as possible, so that blockchain technology can be followed by laws and standards. At the technical level and risk level, I believe that with the continuous development of blockchain technology, various industries and institutions will gradually form a data sharing mechanism, and cross-chain technology between public chains, alliance chains, and proprietary chains Will gradually improve and mature, and the underlying technology will develop towards modularity and componentization.

Blockchain technology is a decentralized value transmission system that reshapes the trust mechanism. It can be widely used in fields such as temporarily no trust center, very high cost of solving trust, and value transmission between centers. According to the good adaptability to the financial industry, for blockchain technology, all financial-related industries in the future will be quickly integrated into blockchain technology. This makes the blockchain be regarded as a key technology leading the fourth industrial revolution by various countries around the world. It can be seen that blockchain technology has an important influence and opportunity for the development of the financial field.

## 6. Acknowledgement

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## References

- A. C. Q. MA, Z. J. LIN(2020). Financial innovation and risk management under the background of blockchain technology. China Science Foundation.
- B. J. Q. WANG, S. Y. XIA(2018). Blockchain financial application risk and supervision research. NEW FINANCE.
- C. D. XU(2019). Research on the Application of Blockchain Technology in Supply Chain Finance. Fintech.
- D. S. B. CHEN(2017). Application research of blockchain technology in the financial field. Dongbei Finance and Economics University.
- E. H. F. JIANG(2018). Research on the Application Mode of Blockchain Technology in the Financial Industry. ZheJiang University.
- F. J. N. SUN(2017). Application prospects of blockchain technology in the financial field. Jiangsu Science and Technology Information.
- G. Q. H. XIE(2017). Research on Blockchain Technology and Financial Business Innovation. Financial observation.
- H. Y. Z. WEN(2017). Thoughts on the development of supply chain finance based on blockchain technology. Journal of Three Gorges University.
- I. Y. ZHANG(2016). Research on the Impact of Blockchain Technology on the Development of my country's Financial Industry. International finance.
- J. L. Q. ZHOU, Z. H. LI(2016). The application of blockchain in supply chain finance. Information System Engineering. DOI:10.3969/j.issn.1001-2362.2016.07.033
- K. Y. X. CHEN, J. FU, J. PENG(2018). Blockchain security risk analysis and countermeasure research. ICT and Policy
- L. C. F. JIANG(2015). Supply chain financial service innovation. China's circulation economy.
- M. X. F. XU(2018). Risk assessment and management of blockchain finance. Modern Management Science.
- N. S. WEI, K. M. DAI(2020). Application analysis of blockchain financial scene and discussion on enterprise-level architecture. Journal of Guangzhou University of Technology.
- O. W. CAI, L. H. ZHANG(2014). Discrimination and Application of Qualitative Research Methods. Journal of Lanzhou Commercial College.
- P. H. S. YAN, H. H. KIM, J. W. YANG(2020). Efficiency Analysis of Chinese Blockchain Concept Stock Listed Companies. International Journal of Advanced Smart Convergence Vol.9 No.3 17-27.
- Q. S. J. HAN, S. LEE, D. LEE, S. Y. PARK(2020). An Experimental Study For Access Control System In Public Blockchain. The Journal of The Institute of Internet, Broadcasting and Communication.
- R. L. YAN, Y. CHUNG(2020). Improved Ad Hoc On-demand Distance Vector Routing(AODV) Protocol Based on Blockchain Node Detection in Ad Hoc Networks. International Journal of Internet, Broadcasting and Communication Vol.12 No.3 46-55.
- S. C. YOON, B. G. LEE(2020). The Study of Criminal Lingo Analysis on Cyberspace and Management Used in Artificial Intelligence and Block-chain Technology. International Journal of Advanced Culture Technology Vol.8 No.3 54-60.
- T. H. MOON, The Role and Opportunity of Blockchain in the Fourth Industrial Revolution. The Journal of the Convergence on Culture Technology.