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Full Research Paper

Blockchain Empowers Financial Innovation

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Abstract: Blockchain builds the foundation of trust services in a trustless environment, and is considered to be the future technology that is most likely to cross the barriers to financial innovation. This article summarizes the enabling role of blockchain technology in financial innovation, including payment, credit reporting, exchanges and digital currency. Combined with the limitations of financial innovation and the technical characteristics of decentralization, de-trust, non-tampering, and security of blockchain, we discuss how to break through the bottleneck of financial innovation with the help of blockchain technology. Based on the analysis of the technical characteristics of the blockchain, it further discusses how the blockchain technology can be practically applied in the financial industry. Finally, it discusses the challenges that blockchain technology will face to the development of financial innovation, focuses on the three-stage maturity model of blockchain, and looks forward to its future development trend.

Keywords: Blockchain, Fintech, Financial Innovation, Blockchain Maturity Model

1. INTRODUCTION

In recent years, blockchain technology has become the focus of global attention in the wave of financial innovation. With the continuous emergence of technologies such as big data, cloud computing, Internet of Things and artificial intelligence, its huge strategic significance and commercial value have attracted global financial institutions. The industry is competing and the attention of governments and institutions around the world. The essence of the blockchain is a decentralized distributed ledger database, the purpose is to solve the problem of transaction trust. The origin of the blockchain can be traced back to November 1, 2008. Someone in the name of Satoshi Nakamoto published a groundbreaking paper on Bitcoin on the cryptography mailing list of the "metzdowd.com" website^[1], proposing the concept of Bitcoin and mode, which describes a new currency system, Satoshi Nakamoto established an open source project for this mode, officially announcing the birth of blockchain in 2009.

Since October 2016, the Ministry of Industry and Information Technology released the "China Blockchain Technology and Application Development White Paper (2016)"^[2], and blockchain was first included as a strategic cutting-edge technology in the "State Council on Printing and Distributing" issued by the State Council in December 2016^[3]. Since the 13th Five-Year "Notice of National Informatization Planning", local governments have issued policy guidance and notification documents related to blockchain, and the domestic public has gradually begun to understand the technical logic and underlying value of blockchain. In April 2017, Tencent released the "Tencent Blockchain Solution White Paper: Building the Foundation of Trust in the Digital Economy Era", indicating that blockchain technology has huge application scenarios in the optimization of public services and social mechanisms^[4]. Since 2020, the General Office of the State Council has issued the "Guiding Opinions on Supporting National-level New Areas to Deepen Reform and Innovation and Accelerate the Promotion of High-quality Development", pointing out that it is necessary to accelerate the development of blockchain technology and industrial innovation, and explore the "blockchain+" model^[5].

This paper briefly introduces the application of blockchain technology, summarizes the application and empowerment research of blockchain technology in financial innovation, including payment, credit reporting,

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exchanges and digital currency. Then, aiming at the difficulties in the blockchain-enabled financial innovation, a framework driven by blockchain technology is proposed. The technical features mainly include: decentralization, de-trust, non-tampering traceability and security. The practical application of blockchain technology in the financial industry is discussed. This paper further discusses the challenges that blockchain technology will face in enabling financial innovation and development, and discusses future development trends and several key issues that should be paid attention to.

2. RESEARCH STATUS AT HOME AND ABROAD

2.1 Blockchain technology application

Blockchain technology has the characteristics of decentralization, non-tampering and traceability of data, low cost and high data security, so that blockchain technology is not only limited to the field of digital currency, but also in economic, financial and social systems. There are a wide range of application scenarios. Based on blockchain technology, point-to-point value transfer can be realized. By reconstructing financial infrastructure facilities, the efficiency of post-financial transaction clearing and settlement processes can be greatly improved and the costs can be reduced, and existing payment problems can be solved to the greatest extent^[6]. Digital currency is the most widely used and most recognized application of blockchain technology^[7]. The model mechanism based on blockchain technology applied to credit reporting and ownership management can be used for the management and traceability of ownership such as property rights and copyrights^[8]. In supply chain management, it includes collaboration and information exchange among a large number of entities such as capital flow, information flow, and material flow. The authority control, anti-counterfeiting, traceability and corresponding smart contracts based on blockchain technology can be standardized through good process modeling^[9].

In addition, many scholars have made relevant research reports on the application of blockchain technology to the financial industry. Taking advantage of the characteristics of blockchain technology, regulatory authorities need accurate, timely and multi-dimensional supervision^[10]. In addition to the above research directions, there are also many discussions in digital currency wallet research, Internet of Things, intelligent manufacturing, P2P, cybercrime, side chains, etc.

In conclusion, blockchain technology has been used in all aspects of economy, market, finance, etc., and has also been used to improve social infrastructure, especially in the fields of payment, health, science, culture and art. They also believe that this is a gradual process. Not only related technologies of blockchain are not mature enough, but also relevant laws, regulations and social policies will take a certain amount of time to be regulated. The blockchain maturity model (BCMM) and its adoption process have also been discussed and presented^[25]. As far as adoption is concerned, businesses should recognize that blockchain systems have not yet reached the optimal maturity level and should conduct extensive feasibility studies before implementing them.

2.2 Blockchain Technology and Financial Innovation Research

Blockchain-driven financial innovation has a significant impact on financial infrastructure and even the entire financial system, not only reshaping credit mechanisms and reducing transaction costs, but also preventing moral hazard^[11]. Huo Xuewen believes that blockchain has become the underlying technology of financial technology, and various countries are strengthening the research and application of blockchain technology. Payment, credit reporting, exchanges and digital currency will become the most important financial application scenarios of blockchain technology^[24].

Blockchain technology has a very good enabling effect in solving the information asymmetry and security problems in the banking industry. Banks can use blockchain technology to upgrade and transform bank payment clearing and credit information systems to promote the formation of a "multi-center, weak intermediary" scenario,

thereby improving the efficiency of the banking industry^[12]. The original application is the Ripple system, which was established in 2012 based on blockchain technology and mainly provides cross-border payment services.

In the field of credit reporting, blockchain technology focuses on solving the trust problem in financial activities, and it creates a way to solve the problem of credibility. Research shows that blockchain can automate the processing of contract execution, payment, and legal obligations through smart contracts^[13]. At the same time, it can overcome obstacles such as information barriers between organizations, optimize the financial operating environment, and improve transaction efficiency^[14].

In the field of exchanges, blockchain technology has played a very important role in optimizing securities transactions and improving the structure of the capital market. Compared with the traditional securities trading mode, blockchain technology can control the risks of transactions well, making transactions more transparent and efficient^[15]. Therefore, blockchain technology can optimize its risk control system in securities trading, reduce risks, and promote its healthy development.

Digital currency has the characteristics of decentralization, fast circulation and difficult to supervise^[16]. The digital currency of blockchain technology has brought a research upsurge of digital currency by virtue of the point-to-point transaction and decentralization design concept. Encryption technology opens up another new platform for financial development, and digital currency may become the development direction of future currency issuance and payment models.

In various industries, the government, technology companies, and investment institutions can achieve effective links through blockchain, and establish a good ecological environment for the "three-in-one" technology and financial development model^[17]. The Internet insurance industry can strengthen the protection of customer information, reduce the risk of information asymmetry, and reduce the cost of Internet insurance by virtue of the decentralization of the blockchain, the non-tampering of information, and the transparency and openness of the blockchain^[18]. Blockchain technology removes the excessive reliance on intermediary institutions on both sides of the transaction, which can reduce transaction costs and speed up the completion of financial transactions, realizing Internet finance in the true sense^[19]. In addition, blockchain also has important application value and development prospects in traditional financial industries such as auditing^[20] and accounting^[21].

3. THE ROLE OF BLOCKCHAIN TECHNOLOGY IN FINANCIAL INNOVATION

3.1 The breakthrough of blockchain technology to the limitations of financial innovation

Decentralization, trustlessness, immutability, and security are the four core features of blockchain technology^[22] (Table 1).

Table 1. Blockchain technical characteristics and financial innovation

Blockchain technical features	Instruction	Breakthroughs in the Limits of Financial Innovation
Decentralized	A peer-to-peer network is formed between nodes, there is no centralized hardware or management organization, and the rights and obligations of any node are equal.	The payment system has been optimized in terms of building a financial credit system, streamlining processes, and improving transaction security.
Building trust based on formulas	Use a set of consensus-based mathematical algorithms to achieve a network of trust between machines instead of borrowing a third-party institution to establish credit.	As the underlying technology of financial technology, it further reduces information asymmetry, builds a value information network, and establishes a unified credit system.
The information cannot be tampered with	An irreversible database is formed based on timestamps, but if 51% or more of the nodes in the operating system are at the same time, a security problem will be formed.	Realize the digital management of securities registration, issuance, trading and equity.
Security	Based on cryptography, the public key and private key encryption algorithms are used to meet the security needs and authority verification needs of the system. The public key can be made public, while the private key must be kept secret.	Scenarios such as information encryption, login authentication, and digital signatures.

Traditional settlement requires intermediate procedures such as account opening banks, central banks, correspondent banks, and clearing banks. Each institution has its own financial system, resulting in slow transaction speed and low efficiency. Through the decentralized features of blockchain technology, the payment system is further optimized, the transaction process is simplified, and security is improved.

Credit is the foundation of the financial innovation industry, and a large number of intermediaries appear in the process of maintaining trust in financial institutions. The trust established by the blockchain through the consensus mechanism makes it possible to break through the boundaries between people and expand the tradable boundary, thereby further reducing information asymmetry and building a unified trust value system.

The information of the blockchain cannot be tampered with and the traceability makes the transaction transparent. All connected nodes can verify the compliance of the operation of the financial institution by tracing the transaction history, which is conducive to maintaining financial stability and preventing financial risks.

Security is the foundation and premise of blockchain development. The current basic idea of blockchain development is to seek a balance between decentralization and high data throughput on the premise of ensuring security. At the underlying data level, the support of cryptographic components such as digital signatures and hash functions is often required. Application scenarios such as information encryption and digital signatures can be realized in the field of financial innovation.

3.2 Analysis of the application of blockchain technology in financial innovation

Blockchain can solve the problems of high labor cost and time cost, low business processing efficiency, various operational risks and credit risks brought about by the traditional financial industry. It has laid the foundation for the intelligence, autonomy and systematization of the financial industry. The application of blockchain technology in financial innovation covers securities and banking business, asset management, trade finance, insurance business, anti-money laundering business, bill trading and other categories (Table 2).

Table 2. Industry pain points and blockchain technology applications

Application classification	Industry pain points	Application of blockchain technology
Securities and Banking Business	Business processing needs to go through multiple institutions, and each institution has its own accounting system, resulting in slow transaction speed and low efficiency.	The programmable nature of the blockchain can improve the efficiency of securities transactions and financial services.
Asset Management	The whole process is complex and involves data systems of multiple stakeholders.	Timestamp technology and immutable features facilitate anti-counterfeiting and anti-counterfeiting, intellectual property protection, asset authorization and control.
Trade financing	There are high costs and potential risks of manual data collection, reconciliation, and trade contacts.	With digital encryption, peer-to-peer technology, distributed consensus and smart contracts, the rapid and transparent exchange of information is realized.
Insurance business	It is difficult to integrate and share massive information, information asymmetry and data leakage.	The traceability, security and consensus mechanism of blockchain helps the insurance industry to achieve information sharing and connection among a large number of decentralized nodes within the industry, between industries and among users.
Anti-money laundering business	The efficiency of customer identification is low, the informatization of anti-money laundering work is low, the cost of anti-money laundering supervision is high, and the data related to financial institutions is not synchronized and not shared.	Use digital currency to enable instant sharing and real-time monitoring of cross-country and cross-sectoral data on demand.
Bill trading	Due to the large number of human interventions, there are problems such as authenticity, timeliness, and illegal operations in the bill market.	Use digital bills to replace existing electronic bills to achieve point-to-point transfer of value.

4. CHALLENGES

Although blockchain technology has a broad and huge application in the field of financial innovation, the development and application of blockchain in the financial industry at this stage face challenges in many aspects, such as lagging laws and regulations, technical constraints, lack of standards, and potential safety hazards.

Due to the highly digitalized and virtualized characteristics of the financial innovation field, governments around the world have carried out strict management. The national-level three committees and the industry-level institutions have strict regulatory systems and clear legal norms. Due to the decentralization and other characteristics of blockchain technology, it will largely break away from the traditional regulatory system. However, the current laws and regulations directly related to blockchain in China are still basically in a blank state. In the application of blockchain, the contradiction of lack of laws and regulations is becoming more and more prominent.

The blockchain is still in its early stage and is not yet technically mature. Financial products that can generate benefits are still in the research and development stage, and there are no mature blockchain financial products that can be widely used. How to break through the technical constraints is a difficult practical problem. The essential role of blockchain technology is also similar to basic protocols such as TCP/IP, which are used to specify the basic format and corresponding rules for transmitting and managing information in the network. However, various application standards based on blockchain technology are still in the stage of development.

The basic security goal of blockchain system construction is to protect data security, consensus security, privacy protection, smart contract security and content security in the blockchain system through technical means such as cryptography and network security. In the application of blockchain in the field of financial innovation, security issues must be considered, and effective means should be used to improve security assurance capabilities and prevent possible risks.

Wang H , Chen K , and Xu D put forward a safe adoption procedure comprising three stages as following^[25]:

1. Feasibility study

Why blockchain? If four or more of the following conditions are met, then blockchain has strong potential to provide a solution. 1) Multiple parties share data: multiple participants need views of common information. 2) Multiple parties update data: multiple participants take actions that need to be recorded and change the data. 3) Requirement for verification: participants need to trust the validity of the actions that are recorded. 4) Intermediaries add cost and complexity: removal of ‘central authority’ record keeper intermediaries has the potential to reduce cost (e.g., fees) and complexity (e.g., multiple reconciliations). 5) Interactions are time-sensitive: reducing delays has business benefits (e.g., reduced settlement risk and enhanced liquidity). 6) Transaction interaction: transactions created by different participants depend on each other

2. Development

During this stage, the key focuses are as follows: 1) Requirement analysis and 2) Architectural design.

3. Operation

If the blockchain system is replacing an existing system, a progressive replacement procedure is proposed as follows: 1) Keep the existing system running and run the blockchain system as the backup system for a certain period. 2) If the blockchain system is running smoothly, let it run as the operational system and run the existing system as the backup system. 3) Finally, operate the blockchain system as the stand along system.

In our understanding, there are adoption challenges to apply the BCMM to blockchain plus fintech, including payment (international clearing), credit investigation, exchange and digital currency.

5. CONCLUSIONS AND PROSPECTS

The advantages of blockchain technology are highly compatible with the technical needs in the field of

financial innovation, which can effectively realize financial innovation and expand applications. Blockchain technology has a wide range of driving financial innovation, and has played an incomparable advantage in securities and banking business, asset management, bill trading, etc. From the perspective of the role of blockchain technology in financial innovation, the technical characteristics of blockchain and concepts such as smart contracts and consensus mechanisms are promoting the development of financial innovation in my country.

This paper proposes the following two research prospects: accelerating the research on the application of blockchain technology in the field of financial innovation, and promoting the deep integration of blockchain technology and financial innovation; expanding the application fields of blockchain technology, such as medical, logistics, notarization and other scenarios. In addition, how to fully exploit the technical characteristics of blockchain to promote digital transformation in more fields is also an important research direction for the application of blockchain technology in the context of the era of big data.

REFERENCES

- [1] Nakamoto S. (2018). Bitcoin: a peer-to-peer electronic cash system[Online]. available: <http://bitcoins.info/bitcoin.pdf>.
- [2] (2016). China Blockchain Technology and Industry Development Forum China Blockchain Technology and Application Development White Paper [EB/OL]. available: <http://www.cbdforum.cn/index/article/rsr-6.html>. (in Chinese)
- [3] Guofa No. 73. (2016). the State Council Notice on Issuing the “13th Five-Year” National Informatization Plan [Z]. (in Chinese)
- [4] Tencent Research Institute Tencent Blockchain Technology Solution White Paper: Bottom Technology Platform and Five Scenario Solutions [EB/OL]. (in Chinese)
- [5] Guiding Opinions of the General Office of the State Council on Supporting National-level New Areas to Deepen Reform and Innovation and Accelerate the Promotion of High-quality Development [J]. Urban Planning Newsletter,2020(3):2-4. (in Chinese)
- [6] Zhou Ping, Du Yu, Li Bin, et al. (2016). China Blockchain Technology and Application Development White Paper[R]. Beijing: Ministry of Industry and Information Technology. (in Chinese)
- [7] LI Wenhong, Jiang Zeshen.(2018). A Study of the Development and Supervision of Distributed Ledger Technology, Blockchain and Digital Currencies[J]. Financial Supervision Research, 2018(06):1-12. (in Chinese)
- [8] Dunphy P, Petitcolas F. (2018). A First Look at Identity Management Schemes on the Blockchain[C]. IEEE Security and Privacy Magazine special issue on Blockchain Security and Privacy.
- [9] Korpela K, Hallikas J, Dahlberg T. (2017). Digital supply chain transformation toward blockchain integration[C]. proceedings of the 50th Hawaii international conference on system sciences.
- [10] DLA P. (2016). Blockchain and the law: practical implications of a revolutionary technology for financial markets and beyond[R].
- [11] Qiao Haishu, XIE Shanshan. (2017). Theoretical and practical analysis of blockchain-driven financial innovation[J]. New Finance,2017(01):45-50. (in Chinese)
- [12] Ye Guo, Chen Liang. (2016). Blockchain application and outlook in the banking industry[J]. Financial Innovation, 2(1):24.
- [13] Gunnar P. (2019). Smart contracts for smart supply chains[J]. IFAC Papers On Line, 52(13):2501-2506.
- [14] Sars S, Mahtab K, Joseph S, et al. (2019). Blockchain technology and its relationships to sustainable supply chain management[J]. International Journal of Production Research, 2019(7):2117-2135.
- [15] DTCC. Embracing disruption: tapping the potential of distributed ledgers to improve the post-trade landscape[R]. White Paper, 2016.
- [16] Athey S, Catalini C, Tucker C. (2016). Escaping from Government and Corporate Surveillance. Evidence from the MIT Digital Currency Experiment[R]. Retrieved on October, 2016, 16.
- [17] Gong Shiguang, Guo Jitao. (2016). Research on the innovation of science and technology finance model based on

- blockchain[J]. *Scientific Management Research*, 34(04):110-113. (in Chinese)
- [18] Zhao Dawei. (2016). Study on the Application of Block Chain in Internet Insurance Industry[J]. *Financial Development Research*, 2016(12):35-38. (in Chinese)
- [19] Swan M. (2015). *Blockchain: Blueprint for a new economy*. O'Reilly Media, Inc., 2015:1-67.
- [20] Chen Xu, Ji Chenghao. (2017). Research on real-time audit based on blockchain technology[J]. *Chinese Certified Public Accountant*, 2017(04):67-71. (in Chinese)
- [21] Wu Limei, Ding Jie, Wang Shenlong, et al. (2019). Financial sharing model architecture based on blockchain technology[J]. *Friends of Accounting*, 2019(02):149-154. (in Chinese)
- [22] Wang Faming, Zhu Meijuan. (2017). Bibliometric Analysis on the Research Hotspots of Blockchain in China[J]. *Information Magazine*, 2017(12):69-74. (in Chinese)
- [23] Han Xuan, Yuan Yong, Wang Feiyue. (2019). Security problems on Blockchain: The State of the Art and Future Trends[J]. *Chinese Journal of Automation*, 45(01):206-225. (in Chinese)
- [24] Don Tapscott and Alex Tapscott. (2016). *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business and the World*[M]. China CITIC Press. (in Chinese)
- [25] Wang H , Chen K , Xu D. (2016). A maturity model for blockchain adoption [J]. *Financial Innovation*, 2(1):12.