

Research on Innovation and Development of Blockchain Technology in Financial Field

Chenxi Zhao

*School of Economics and Management
Inner Mongolia University of Science and Technology
Baotou, China*

Xianyong Meng

*School of Logistics Management and Engineering
Zhuhai College of Jilin University
Zhuhai, China*

Abstract—The blockchain technology studied in this paper is a distributed data security and service technology that integrates information security, artificial intelligence, distributed cloud storage and big data analysis. Blockchain technology can be applied in many fields such as international settlement, equity trading, insurance services, digital rights, financial technology, and electronic payment etc. Through the research and analysis of the basic model and composition technology of blockchain, this paper proposes that the future innovation and development direction of blockchain technology in the financial field is distributed security authentication technology, artificial intelligence technology, security cloud storage technology and big data processing technology are effectively combined with the blockchain technology to design a financial service and management platform.

Keywords—*blockchain, financial innovation, application model, security certification*

I. INTRODUCTION

Blockchain technology has the characteristics of decentralization, distributed, and certifiable. It is a low-level service platform technology that provides a secure and reliable data security storage and access control for network applications in a distributed network environment. Blockchain technology is a distributed data security and service technology that integrates information security, artificial intelligence, distributed cloud storage, and big data analysis. Due to its security, efficiency, convenience and many other advantages, it has attracted extensive attention from financial industry experts. At present, blockchain technology can be applied to electronic money, international settlement, equity transactions, insurance services, digital copyright, financial technology, electronic payment, etc., and will provide a good innovation development path for financial service innovation and its derivatives innovation [1-3].

Blockchain technology was first proposed in 2008 by a scholar who calls himself “Satoshi Nakamoto” in his paper:

Corresponding Author: Xianyong Meng, School of Logistics Management and Engineering, Zhuhai College of Jilin University, Zhuhai, China.

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“Bitcoin: A Peer-to-Peer E-Cash System”, used cryptography and the consensus mechanism to implement electronic payment in a distributed network environment, effectively solving the problem of openness of electronic payment, such as the repeated payment of electronic payment and the bottleneck of the payment center [4,5].

In recent years, more and more scholars in academia have begun to pay attention to blockchain technology and explore the application of blockchain technology in finance and other fields. At the same time, the United Nations, the International Monetary Fund and many national governments have also issued a series of reports on blockchain technology, with the aim of actively promoting the application of blockchain technology in industries such as finance [6,7].

From an international perspective, international financial giants, such as Citibank and Bank of America, have begun to adopt blockchain technology in their financial operations. In 2015, National Association of Securities Dealers Automated Quotations (NASDAQ) began to adopt a block trading technology based trading platform for realizing traceability of private equity or shares. The Global Banking Financial Telecommunications Association has also begun to use blockchain technology to provide cross-border payment services for international trade to improve cross-border payment efficiency [8,9].

In September 2016, Barclays Bank of the United Kingdom took the lead in using the blockchain technology to complete the first international trade settlement. With the accounting and transaction processing system based on blockchain technology, the processing efficiency of trade settlement can be greatly improved. The processing time of traditional international settlement business is reduced to 4 hours from 5 to 10 working days.

In May 2018, Hong Kong and Shanghai Banking Corporation (HSBC) and Internationale Nederlanden Groep (ING) cooperated in the application of blockchain technology to produce digital credit certificates for Cargill, which is engaged in commodity trading, processing, transportation and risk management, and successfully completed the world's first trade finance transaction. HSBC and ING used R3's Corda platform to complete a cross-border transaction for the Cargill Group to export soybeans from Argentina to Malaysia. The Corda platform used this time is a distributed ledger platform based on

blockchain technology introduced by American R3 Company, which can reduce the processing time of international settlement business based on letter of credit for 5 to 10 working days to 24 hours [10,11].

From the domestic perspective, the People's Bank of China, the China Securities Regulatory Commission, the China Insurance Regulatory Commission, the China Banking Regulatory Commission, the National Standards Commission and other five ministries jointly issued the "Financial Industry Standardization System Construction and Development Plan (2016-2020)" during "13th Five-Year Plan", which sets the digital currency as focus on construction areas to reduce the cost of money circulation, improve the central bank's ability to control money, reduce money laundering, tax evasion and other criminal activities. At the same time, blockchain as the underlying supporting technology of electronic money, has carried out

multi-agents, multi-level, all-round application in the financial industry, the application of blockchain has extended from financial to Internet of Things, intelligent manufacturing, supply chain management and other fields [12-16].

II. BASIC MODEL AND COMPOSITION TECHNOLOGY OF BLOCKCHAIN SYSTEM

The distributed storage of the blockchain can realize the tamper-proof modification and traceability of the uplink data, and the trusted network constructed by the blockchain intelligent contract technology can realize the automation and intelligent circulation of digital assets in multiple scenarios [17-20]. The basic model of the blockchain is mainly composed of a data layer, a network layer, a consensus layer, an incentive layer, a contract layer, and an application layer, as shown in Figure 1.

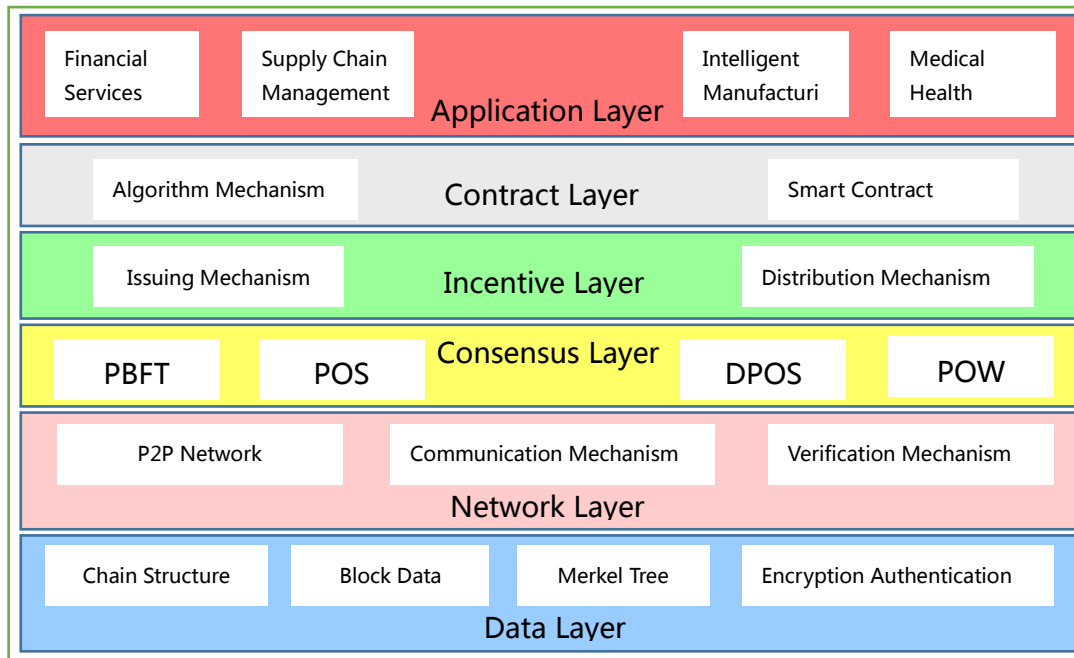


Fig. 1. Blockchain system base model

The first layer is the data layer, which mainly includes the underlying data block, data structure, and encryption and authentication algorithms. The second layer is the network layer, which mainly includes distributed networking technology, data transmission and the verification mechanism and other technologies among nodes in the blockchain system. The third layer is the consensus layer, which mainly includes various kinds of consensus mechanisms among network nodes such as the workload proof mechanism and the equity proof mechanism. The fourth layer is the incentive layer, which mainly includes various economic rewards and distribution systems and other economic incentive mechanism. The fifth layer is the contract layer, which is the concrete business logic on the blockchain system, mainly including the contract

mechanism such as smart contracts and algorithms. The sixth layer is the application layer, which mainly includes application scenarios of blockchain such as financial services, supply chain management and smart manufacturing.

III. THE APPLICATION OF BLOCKCHAIN TECHNOLOGY IN FINANCIAL FIELD

The advantages of blockchain technology are to optimize business processes, reduce operating costs and improve synergy efficiency. Blockchain technology is mainly used in financial services, supply chain management, culture and entertainment, intellectual property, intelligent manufacturing, social welfare and cultural education. In the

field of financial services, blockchain technology is used in financial scenarios such as supply chain finance, trade finance (letters of credit, letters of guarantee, forfeiting, factoring, bills), credit reporting, transaction clearing, insurance, securities, etc.

At present, blockchain technology is widely used in the financial field, such as digital currency, cross-border payment and settlement, supply chain finance, securities issuance and trading, customer credit and other fields. At the same time, blockchain technology can also be applied to the automatic processing and secure storage of transaction data of various digital financial assets. For example, transaction data such as stocks, options, bonds, notes, funds, etc. are stored in a distributed cloud book based on blockchain. The trading and transfer of financial assets are automatically completed on the blockchain.

Blockchain technology can provide identity authentication and business audit services for supply chain finance, verify the identity of each participating entity in the system, and blockchain technology can review the authenticity and validity of all bills in the entire supply chain financial services process, as well as proof the authenticity and effectiveness of the transfer of creditor's rights certificates, the prevention of forgery of creditor's rights, and the difficulty of financing credit financing in supply chain.

The application of blockchain technology can realize the digitization of letters of credit, guarantees, factoring and bills for international trade, realize inter-bank message exchange in the form of alliance chain, and realize domestic and foreign bank interconnection in the form of peer-to-peer. At the same time, banks and regulators use blockchain platforms to provide identity verification services to international trade entities and verify the authenticity and effectiveness of bill transfers.

The blockchain technology can realize the real-time international transaction clearing / settlement function and improve the clearing / settlement efficiency of the financial system. The international transaction clearing / settlement system can share a set of trusted and mutually-recognized ledgers through the blockchain platform. All records of the international transaction clearing / settlement system can be checked on the blockchain. Realize the security, anti-modification and traceability of clear / settlement data, and greatly improve the efficiency and accuracy of synergy. In addition, the blockchain platform automates the transaction clearing / settlement process by carrying smart contracts.

Based on the blockchain technology, the relevant data of the insurance products and the data of the insurance process, the circulation process, the marketing process, and the claims process can be written into the blockchain to realize the full trace of the insurance data, and then in the insurance company, the regulatory department, and the consumer. A trust mechanism and a sharing mechanism are established to form a secure, credible and complete insurance service

information flow on the insurance system platform.

The use of blockchain technology can improve the security, liquidation efficiency and regulatory efficiency of securities assets, realize the traceability of securities transactions, ensure the free flow and comprehensive supervision of securities assets among different transaction platforms, realize the visualization of asset transfer process, and improve the traceability of securities asset transactions and financing and securities lending records.

IV. THE FUTURE DEVELOPMENT OF BLOCKCHAIN IN FINANCIAL FIELD

At present, blockchain technology has been widely used in other financial fields such as Internet finance and supply chain finance, but it still faces many technical bottlenecks and potential security threats, including high storage cost, low efficiency, waste of resources and privacy security and other issues need to be resolved urgently.

At present, the consensus mechanism adopted by the blockchain is the POW (Proof of Work) mechanism. Its stability can be verified by the Bitcoin system that has been running stably for many years, but its design idea is to introduce competing for computing of distributed nodes to ensure data consistency and irreparable modification, apparently competing for computing is a huge waste. Therefore, designing a more environmentally friendly POS (Proof of Stake) mechanism and DPOS (Delegated Proof of Stake) mechanism and other mechanisms for the financial field is a future development trend.

At present, the security of the blockchain system is at the expense of its efficiency. The network nodes of the blockchain need to store all the blockchain information as an important technical bottleneck for their commercial application, resulting in a very limited number of concurrent processing transactions; as the size of the blockchain increases, so does the need for storage, bandwidth, and calculate ability of network node. Therefore, in the future, it is necessary to design a blockchain service solution for financial field that uses distributed security authentication technology to realize fragmented and partially store.

Therefore, through the effective combination of blockchain technology and distributed security authentication technology, artificial intelligence technology, secure cloud storage technology, and big data processing technology, the traditional financial market has the problems of fraud risk, credit risk, market risk and central institution risk will all be solved very well. Designing a blockchain-based digital ticket payment model, a cross-border payment model based on blockchain technology, and asset securitization business management, and so on, a financial service model based on blockchain technology is the mainstream of blockchain technology application and innovation of financial field in the future.

V. CONCLUSION

The blockchain technology studied in this paper is

characterized by security, high efficiency, convenience, decentralization, distribution, and intelligence. In the cloud environment, technologies such as information security, artificial intelligence, distributed cloud storage, and big data analysis can be integrated. Provide secure and trusted data storage services for financial services such as supply chain finance, trade finance, electronic payment, international settlement, equity trading, and online insurance. In addition, the blockchain consensus mechanism and intelligent contract mechanism can be used to automate and intelligentize financial business processing. At the same time, the application of blockchain technology will provide a good development path for financial service innovation and its derivatives innovation.

This paper proposes blockchain technology and distributed security authentication technology, artificial intelligence technology, secure cloud storage technology and big data processing technology to address the risk of fraud, credit risk, market risk and central institutions in traditional financial markets. Designing of blockchain-based digital ticket payment model, cross-border payment model based on blockchain technology, asset securitization business management based on blockchain technology, etc. is the mainstream direction of future blockchain innovation and development.

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