

# Explore the Application of Blockchain Technology in Logistics Supply Chain System

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## Abstract

After the concept of blockchain was put forward, it has developed rapidly in just a few years, and has been highly valued by global financial institutions, commercial institutions and regulators. Applying blockchain technology to the field of logistics supply chain can effectively solve the limitations of current Internet of things technology, which is of great significance to the development of logistics industry. This paper first introduces the relevant research on blockchain technology at home and abroad, then expounds the concept and characteristics of blockchain, and analyzes the impact of blockchain technology on the logistics industry. Finally, the article summarizes the specific application scenarios of blockchain technology in logistics supply chain system.

## Keywords

**Blockchain Technology; Logistics; Supply Chain System.**

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## 1. Introduction

With the rapid development of the global Internet economy in recent years, the extensive and diverse social and economic demand for logistics makes the development of the logistics industry more and more valued by the state and major enterprises. The current logistics supply chain system is a centralized system. Its data handover and processing process is complex, low efficiency, high cost, low trust, which makes information asymmetry. Therefore, trust is the biggest bottleneck for the sustainable development of logistics at present. Using the characteristics of blockchain decentralization, information transparency, security, reliability and tamper resistance, applying blockchain technology to logistics supply chain system provides ideas for breaking through the bottleneck of logistics development. In December 2016, China incorporated blockchain technology into its strategic technology layout. On the afternoon of October 24, 2018, the Political Bureau of the CPC Central Committee stressed that the integrated application of blockchain technology plays an important role in new technological innovation and industrial change.

## 2. Research Status at Home and Abroad

As for the application of blockchain technology, domestic and foreign experts conducted systematic research. As early as 1991, S. Haber and W.S. stornetta explained in detail how to store digital documents as complete and verifiable data, and how to use time to express the uniqueness of data to retain the concept of timestamp. Satoshi Nakamoto (2009) first proposed the concept of blockchain, which describes a system that can complete tasks autonomously and intelligently according to preset instructions and use it as the basis of bitcoin. MalanieS. (2015) proposed that blockchain, as the most accurate data collection mode of the current algorithm, can well support the data storage and calculation of new economies or enterprises.

Domestic scholars such as Wang Yuandi (2017) analyzed the advantages of blockchain technology to make it applied in various fields, and envisaged the application of blockchain technology in logistics express business. Xu Chunbo and Yan Long (2019) analyzed cost factors from multiple perspectives and built a blockchain based supply chain logistics information model to improve the ecological information of the logistics supply chain system through data. Zhu Haiyang and Chen Liang (2019) elaborated the great changes that blockchain may bring to the financial field from a technical perspective, and mentioned the development direction of the combination of blockchain and finance in the future and how financial personnel should deal with the changes in financial management under the conditions of new technology.

### 3. Concept and Characteristics of Blockchain Technology

#### 3.1 Concept of Blockchain Technology

Blockchain technology is a new type of technology with point-to-point transmission, consensus mechanism, data storage and other computer technologies. Blockchain technology was first proposed in 2021, and bitcoin, an encrypted mathematical currency, was born. Since then, bitcoin and blockchain technology have attracted people's attention. Blockchain technology is a data structure that connects blocks in the form of a chain to form a whole. It is composed of two main parts: the block head and the block body. The block head is mainly responsible for connecting with the next block through the main chain, while the block body is responsible for storing data information. When the block and chain form a completed system, the system will automatically form a timestamp and mark the corresponding time tag on the data information. The evolution of blockchain is shown in Table 1.

**Table 1.** Evolution process of blockchain

Stage	Features
Blockchain 1.0	Represented by bitcoin, it is the application, payment, circulation and other monetary functions of digital money, that is, the programmability of money.
Blockchain 2.0	Digital currency and smart contracts are mainly influenced by the financial industry, that is, financial programmability.
Blockchain 3.0	In all sectors of society, such as medical treatment, Internet of things and other applications related to human information, that is, social programmability.

#### 3.2 Basic Characteristics of Blockchain Technology

Blockchain technology is the integration and innovation of existing technologies. It does not rely on a single technology, but a collection of multiple technologies. It includes the consensus mechanism, the distributed data area of mutual authentication, and the use of single communication and encrypted computing to ensure its security. It has the following three characteristics:

##### 3.2.1 There is No Centralization.

Blockchain technology does not rely on the central node in the process of data transmission, but on the consensus open source protocol, which can realize parallel data transmission.

##### 3.2.2 Transparent and Open.

In the major blocks of blockchain technology, in addition to the encrypted private information, the data information stored in the block is in the form of the whole network disclosure, that is, anyone can query the data information stored in the block through the corresponding interface.

##### 3.2.3 Rigor.

Asymmetric cryptography is used in blockchain technology, which makes the data information in the block can not be tampered with, nor can it be forged, which is more rigorous.

## **4. Influence of Blockchain Technology on Logistics Industry**

As a major innovation in the Internet era, blockchain technology integrates the decentralization, irreversibility, openness and transparency of blockchain with smart logistics, which can deal with many pain points in the current logistics supply chain network and help the development of the logistics industry.

### **4.1 Realize Multi Center Logistics System**

Due to its own distributed structure system and corresponding protocols, blockchain technology stores the overall data flow in the operation process in all participating enterprises in the supply chain, and the participating enterprises will also record and check the data, so as to build a shared data center with full network verification and visibility. Enterprises in the supply chain can view and retrieve data, carry out distributed accounting mode, and use the network for mutual verification to ensure the reliability of all information.

### **4.2 Breaking Boundaries to Realize Information Sharing**

Using the encryption and signature technology of blockchain, we can solve the difficulties of mutual access between systems, avoid the complex process of manual verification, transfer real-time needs and information quickly and effectively, and effectively solve the problems of insufficient information sharing in the supply chain, so as to improve the comprehensive utilization of information and reduce the circulation cost of information. Based on the use of blockchain, all data will be stored on the chain. At the same time, the data will not be changed. While strengthening data sharing, it can also ensure the reliability and security of data.

### **4.3 Help Logistics Carry Out Traceability**

Due to the combination of blockchain and Internet technology, the whole process of logistics management is visualized, which makes it easy to view data in real time and makes the direction of funds more transparent. The establishment of smart logistics improves the safety of logistics. In case of an emergency, relevant departments can investigate the whole process of transportation at the first time, so as to strengthen the supervision of the industry.

## **5. Application Scenario of Blockchain Technology in Logistics Supply Chain System**

With the rapid progress of science and technology in China, e-commerce and intelligent logistics are widely used. Many goods are traded through the trading platform in the process of trading. It should be ensured that goods trading is not restricted by region and time, so that logistics can be smooth. The logistics platform database combined with blockchain technology can more effectively solve the problems of logistics distribution, package settlement and package transmission. In addition, the use of blockchain technology in the logistics industry can effectively optimize resource utilization, reduce intermediate links, and promote the overall efficiency of the logistics industry.

### **5.1 Application in Supply Chain Finance System**

In recent years, China's logistics finance has been rapidly developed. The application of blockchain technology in logistics finance to build product transactions, storage, sales, financing and other links, and the digital management of assets can realize the whole process management and accurate matching of the operation information and asset information of relevant enterprises, ensure the authenticity and accuracy of asset information, and make it transparent and rigorous. Financing is the main problem in the development of small and medium-sized logistics industry. Due to the low credit rating of small and medium-sized logistics enterprises, it is difficult to obtain financing from banks or other large financial institutions, which hinders the development of enterprises. The application of blockchain technology in the logistics supply chain makes it easy for banks and other financial institutions to query the credit information of enterprises, and can effectively solve their financing problems. In the development of the logistics industry, with the support of national policies and the

assistance of blockchain technology, solving the financing problems existing in the process of enterprise development can comprehensively promote the rapid development of the logistics industry. The blockchain supply chain financial platform is shown in Figure 1.

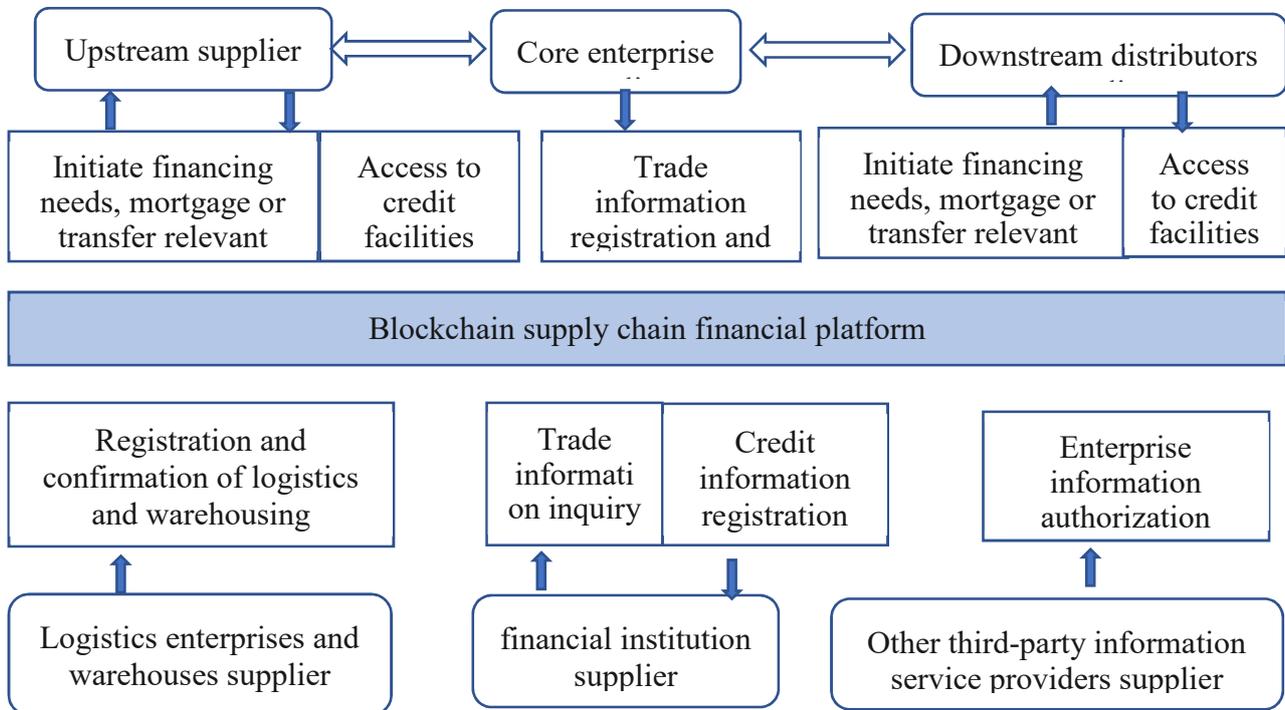


Figure 1. Blockchain + supply chain financial business model

### 5.2 Application in Logistics Traceability

The traditional logistics tracking system is faced with the low level of information sharing in traceability links, the lack of security of information, and it is difficult to clarify its responsibility subject even if there is an accident. Using blockchain technology, connect the main links of commodity circulation, such as production, sales, distribution, etc. Put relevant information on the blockchain, update its real situation in real time, realize full transparency of the process, and promote enterprises to strengthen product quality and quality in a fully transparent environment. Distributed ledger and immutability are the two major functions of the blockchain. The data on the chain has the characteristics of being tamper proof, which will further ensure the authenticity and reliability of the data at each node, establish and improve the multi-directional traceability and the traceability of quality inspection reports, Traceability of relevant video or image information (batch data), distribution and logistics links, final sales links, etc. For example, JD has launched traceability cooperation with Wyeth group. Under the blockchain technology framework of JD, consumers can scan the special QR code at the bottom of milk powder packaging to verify the authenticity and learn more about logistics data, so as to realize the full traceability of milk powder products and provide consumers with a new shopping experience.

### 5.3 Application in EDI Business

Applying blockchain technology to the international logistics supply chain will change the hierarchical structure between multiple participants, and all participants in the blockchain belong to equal nodes. If all entities can formulate unified data exchange standards with blockchain technology, it is hoped that the current complex data exchange format can be quickly improved, the efficiency of data exchange can be improved, the efficient exchange of data can be realized, and its reliability can be improved, eliminating the problems of data confidentiality and security. The application of blockchain technology in international logistics supply chain is of great significance to promote the development of logistics.

## 5.4 Application in Logistics Credit Investigation

In the industry's credit rating, even though most companies say that they provide some financial services based on big data risk control, the online trading volume is not large at this stage. It may be inaccurate to judge the company's credit rating only by its own business income and daily flow. The credit system of the logistics industry is very imperfect. Therefore, suppliers, logistics companies, warehouse management companies, relevant monitoring institutions, guarantee institutions, financial enterprises, government regulators and other parties can be connected to the platform through the blockchain. The credit rating of enterprises can be calculated through intelligent algorithms, and then the evaluation results can be recorded on the blockchain, so as to improve the credibility of small and medium-sized logistics and provide customers with high-quality logistics services.

## 6. Conclusion

As a disruptive technology in the new round of scientific and technological revolution and industrial reform, blockchain is expected to become a new driving force to boost the high-quality development of the logistics industry. The application of blockchain technology in the logistics field has become an inevitable trend. The development of China's blockchain industry is still in its infancy, and there are still limitations in the understanding of blockchain, both in theory and practice. Enterprise managers should continue to pay attention to the development of blockchain technology, carry out more in-depth research, improve the application efficiency of blockchain technology, give full play to the application value of blockchain technology, and deeply explore the value of blockchain technology in the field of logistics.

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