

A Study on Enhancing Transparency of Corporate Sustainable Procurement Based on Blockchain Technology

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Abstract. Against the backdrop of increasing integration of the global economy, supply chain finance faces challenges such as information silos, high cost of paper document transmission, and difficulty in risk control. This study focuses on the application of blockchain technology in enhancing the transparency of sustainable procurement for enterprises. Through an in-depth analysis of successful cases such as the FILO platform and Walmart, the study reveals how blockchain technology can effectively solve the problem of information asymmetry in the traditional procurement process and improve the transparency and efficiency of procurement through its decentralization, data inerrancy, and traceability throughout the process. The study explores the potential value of blockchain technology in the field of supply chain finance using case study and model construction. The results show that blockchain technology can significantly optimize the procurement management process, reduce the risk of human intervention, promote collaborative supply chain operations, and enhance consumer trust. In addition, the study also looks forward to the future trend of the integration and application of blockchain with artificial intelligence, big data and other technologies, and puts forward relevant policy recommendations and practical insights, which provides a reference path for enterprises to implement blockchain technology to enhance procurement transparency.

1 Introduction

In today's increasingly integrated global economic system, supply chain finance is facing unprecedented challenges. The phenomenon of information silos prevails, and the transmission method of paper documents not only increases the cost of information acquisition, but also greatly improves the difficulty of risk control, resulting in the credit of core enterprises being difficult to be effectively transmitted to all levels of the supply chain, which in turn restricts the scope of coverage of supply chain finance and its operational efficiency [1]. In the face of this dilemma, the introduction of blockchain technology brings new solution ideas for supply chain finance. Its decentralized and untamperable characteristics provide a possibility to build a transparent and efficient supply chain financial system. Through blockchain technology, real-time sharing and tracing of information can be

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realized, reducing the cost of risk control and improving the overall efficiency of supply chain finance [2]. In this context, this study aims to deeply explore the application of blockchain technology in enhancing the transparency of sustainable procurement of enterprises, reveal its potential in enhancing procurement transparency, optimizing supply chain finance, and promoting the sustainable development of enterprises, and contribute new thinking and exploration to the development of this field.

2 Current situation and problems of enterprise procurement transparency

2.1 Definition and importance of corporate procurement transparency

Enterprise procurement transparency is a multi-dimensional concept, which covers the aspects of openness, timeliness and accuracy of procurement information. Specifically, it requires enterprises to ensure that all relevant information remains open and transparent to internal and external stakeholders during the procurement process, so that all parties can fully understand the real situation of procurement activities.

The importance of enterprise procurement transparency in the modern business environment is becoming more and more prominent, which is mainly reflected in the following aspects:

First, procurement transparency plays a key role in shaping and maintaining an enterprise's brand image. A highly transparent procurement system can enhance consumers' trust in the enterprise, thus improving the enterprise's market reputation and competitiveness. For example, Wal-Mart has effectively enhanced consumer confidence in product quality by publicizing its purchasing sources and supplier information, which is an important part of its brand image building.

Second, procurement transparency also plays an important role in cost control. A transparent procurement process helps companies identify potential cost-saving opportunities and avoid unnecessary waste and corrupt behavior. Through the open bidding and competitive bidding process, enterprises can ensure the fairness and reasonableness of the procurement price, thus achieving cost optimization. This cost control mechanism is important for the long-term development of the enterprise.

Thirdly, procurement transparency is also crucial to enterprise risk management. A transparent procurement system can reduce the risks associated with information asymmetry and help enterprises better identify and manage potential risks in the supply chain. In the area of food safety, a transparent procurement process helps enterprises identify and deal with raw material quality issues in a timely manner, thus avoiding food safety incidents. This risk management capability is essential to safeguard the sound operation of enterprises.

Transparency in corporate procurement plays an important role in brand image building, cost control and risk management, and is a key element that modern enterprises cannot ignore.

2.2 Current problems with transparency in corporate procurement

In the field of enterprise procurement, transparency problems are significant, posing a major challenge to procurement efficiency and supply chain management. The problem of information asymmetry is highlighted, and the opacity of cost information leads to higher procurement costs, making it difficult for enterprises to obtain the best price; at the same time, incomplete information about suppliers increases supply chain risks, and it becomes difficult to assess the reliability and stability of suppliers. The phenomenon of data silos is also widespread, interdepartmental data segregation leads to inefficiency in the procurement

process, and the difficulty of information sharing further causes duplication of efforts and delays [3]; the lack of uniformity in data standards increases the risk of decision-making errors, and enterprises may make procurement decisions based on one-sided or inaccurate data. In addition, traceability challenges should not be overlooked. Difficulties in supply chain traceability led to a decrease in consumer trust, while the lack of compliance traceability increases compliance risk, and companies may face fines and reputational damage as a result. Together, these issues constrain the transparency and efficiency of corporate procurement. As shown in table 1 :

Table 1. Current issues in corporate procurement transparency [3]

Serial number	Concern	Problem description	Problematic impact
1	Information asymmetry	Non-transparent cost information	Rising procurement costs and difficulties in obtaining optimal prices
		Incomplete vendor information	Increased supply chain risk and difficulty in assessing supplier reliability and stability
2	Data silo	Inter-office data segregation	Inefficient procurement processes and difficulties in sharing information leading to duplication of efforts and delays
		Lack of harmonization of data standards	Increased risk of poor decision-making, with procurement decisions based on partial or inaccurate data
3	The retroactive conundrum	Difficulty in supply chain traceability	Reduced consumer trust and inability to provide transparent information on product origin and ingredients
		Compliance Traceability Missing	Increased compliance risk, inability to demonstrate compliance with environmental, labor rights and other regulatory requirements, exposure to fines and reputational damage

2.3 The necessity of the introduction of blockchain technology

In the field of enterprise procurement, the transparency problem has long been an important factor restricting the improvement of procurement efficiency and supply chain management effectiveness. Information asymmetry makes it difficult to accurately assess the cost structure and reputation of suppliers in the procurement decision-making process, which increases procurement costs and affects procurement quality. The phenomenon of data silos makes it difficult to realize effective information sharing between different departments within the enterprise, resulting in a long and inefficient procurement process. Traditional sourcing models present significant challenges in supply chain traceability, making it difficult to ensure product quality and compliance, further eroding consumer trust and corporate reputation.

In response to these problems, the introduction of blockchain technology is particularly important. Based on its five-layer structure-data layer, network layer, consensus layer, contract layer, and application layer (see Fig. 1), the blockchain system brings a brand-new solution to procurement management through the core features of distributed ledger, encryption technology, and consensus mechanism. Blockchain technology can record and publicize suppliers' cost information and transaction history in real time, enhancing information transparency and enabling enterprises to more accurately assess supplier

performance and reduce procurement costs. At the same time, the distributed ledger feature of blockchain promotes data sharing within the enterprise and between upstream and downstream of the supply chain, breaks down data silos, ensures the seamless connection of information in each link of the procurement process, and improves the efficiency and quality of decision-making.

What's more, blockchain technology also realizes the full traceability of each link in the supply chain, which not only enhances consumers' trust in the enterprise's products, but also effectively safeguards the enterprise's compliance and reduces the fines and reputational losses that it may face due to compliance issues. Through its non-tamperability and high security, blockchain technology provides more solid security for enterprise procurement management, helping enterprises to stand out in the fierce market competition and realize sustainable development.

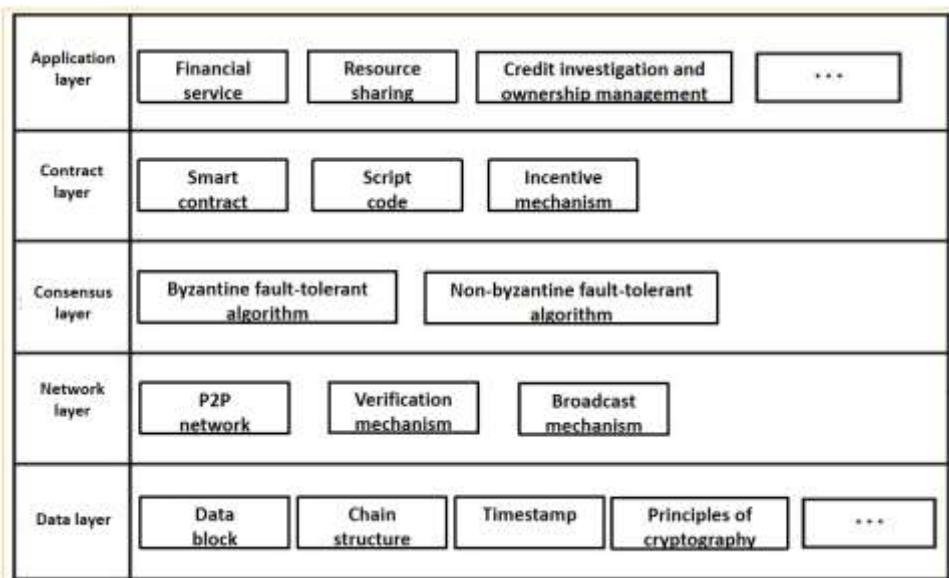


Fig. 1. Blockchain infrastructure model [2]

3 Mechanism analysis of blockchain technology to enhance transparency of corporate sustainable procurement

3.1 Information tampering and traceability

Blockchain technology, with its unique data immutability and full traceability, shows significant advantages in enhancing the transparency of enterprise sustainable procurement. Through distributed ledger technology, blockchain ensures that every procurement data is securely recorded on the chain, and any modification will be detected and recorded by the nodes in the network, thus guaranteeing the authenticity and integrity of the data. This feature enables every link in the procurement process, from supplier selection and raw material procurement to product production, transportation and sales, to be traced in a clear and transparent manner. According to the application data in the field of supply chain finance, blockchain technology can significantly reduce operating costs, such as the cost of customer acquisition and data acquisition costs, to 2023, blockchain allows the supply chain finance market to reduce the overall operating costs by 0.48%, in the case of cost reduction,

corresponding to the realization of about 29.7 billion yuan of incremental profit scale of these results (see Fig. 2 for details). This not only reflects the potential of blockchain technology in enhancing economic efficiency, but also validates its important role in enhancing supply chain transparency and credibility. Therefore, blockchain technology is gradually becoming a key tool for enterprises to realize sustainable procurement and enhance competitiveness (As shown in Fig. 2.)

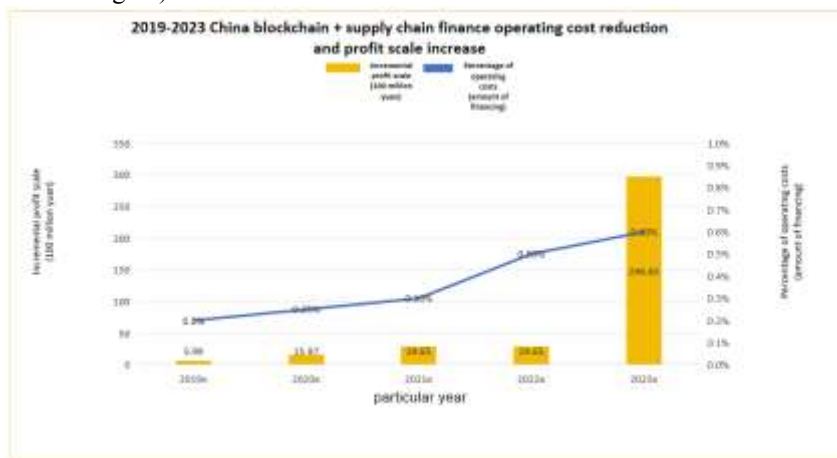


Fig. 2. Reduction in operating costs and incremental profit size chart [3]

3.2 Smart contracts and automated execution

As one of the core applications of blockchain technology, smart contracts bring unprecedented changes to procurement management. Its automated execution feature not only simplifies the traditional procurement process, but also improves transparency and fairness by reducing human intervention. In the case of FILO's supply chain financial service platform, the smart contract automatically verifies contract execution and triggers the payment process based on preset conditions, ensuring the accuracy and timeliness of contract fulfillment. This mechanism effectively reduces the risk of fraud and accelerates the flow of funds, enhancing the responsiveness and stability of the supply chain.

More importantly, the introduction of smart contracts makes the entire procurement contract execution process transparent, and the production progress and product quality of suppliers are monitored in real time, providing a reliable guarantee for purchasers. The combination of smart contracts and blockchain platform also breaks the information silo phenomenon in the traditional supply chain, promotes information sharing and collaboration between upstream and downstream enterprises in the supply chain, and further improves the overall efficiency.

The application of smart contracts in procurement management is not only a revolution of the traditional mode, but also a preview of the future trend of supply chain management intelligence. With the continuous maturity of technology and the expansion of application scenarios, smart contracts will show their unique value in more fields and lead the trend of business change.

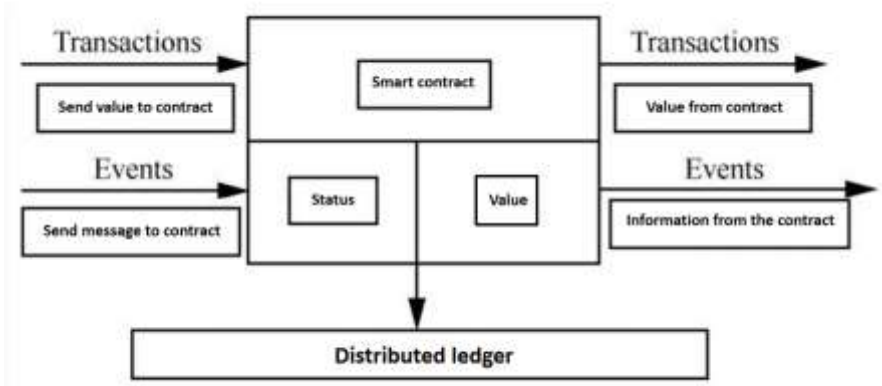


Fig. 3. Operation mechanism of smart contract [2]

3.3 Multi-party participation and information sharing

Blockchain technology, with its decentralization, transparency and non-tamperability, builds a solid cornerstone for multi-party collaboration in the supply chain. Taking Jingdong as an example, in its huge ecommerce ecosystem, blockchain technology is deeply integrated into supply chain management, realizing seamless connection and information sharing among suppliers, manufacturers, warehousing and logistics, and end consumers [4]. This innovative model breaks down the information barriers in the traditional supply chain, enabling each link to have real-time access to key data on product sources, quality monitoring, inventory changes, and other key data, thus significantly improving the transparency of procurement activities.

The deepening of information sharing not only optimizes resource allocation, but also enhances the flexibility and responsiveness of the supply chain. In the case of Jingdong, the blockchain network ensures the transparency and traceability of every purchase order, every inventory change, and even the logistics track of every product, greatly reducing the risks and costs associated with information asymmetry. In addition, the introduction of blockchain technology also promotes the establishment of trust among supply chain participants, as all information is recorded in a tamper-proof distributed ledger, and any participant can verify the authenticity and integrity of the data, which lays a solid foundation for the fairness and efficiency of procurement activities. The deep integration of multi-party participation and information sharing is leading the modern supply chain to develop in the direction of greater efficiency, transparency and credibility.

4 Case study: application of blockchain technology in sustainable procurement

FILO platform utilizes blockchain's non-tamperability and smart contract characteristics to deeply reconstruct the traditional procurement process, ensuring the authenticity and transparency of transaction data and efficient simplification of the process. Walmart, on the other hand, utilizes blockchain to realize the accurate traceability of the whole life cycle of products, which not only enhances the transparency of procurement, but also greatly strengthens the trust of consumers. Both of them break information barriers through blockchain technology, promote information sharing and collaboration among multiple parties in the supply chain, optimize resource allocation, and reduce costs, jointly

demonstrating the huge potential of blockchain in enhancing the transparency of enterprise procurement. With the continuous evolution of blockchain technology, its application in supply chain management will be more extensive and in-depth, leading the transformation of enterprise procurement mode to a more transparent, efficient and sustainable direction.

4.1 Fiero platform: blockchain reinvents procurement transparency and efficiency

By deeply integrating blockchain technology, the FILO platform has completely revolutionized the procurement process and significantly improved the transparency and efficiency of procurement activities. The platform utilizes the non-tamperable characteristics of blockchain to securely record all procurement-related data, including supplier qualifications, transaction records, contract information, etc., on the chain, forming an open, transparent and tamper-proof data chain. This initiative not only ensures the authenticity and integrity of the data, but also provides real-time access to key procurement information for all parties in the supply chain, which greatly facilitates information sharing and collaboration.

With the application of smart contracts, FILO platform realizes the automated execution and monitoring of procurement contracts. The smart contract automatically triggers the execution of the contract according to the preset conditions, including payment and delivery confirmation, which significantly shortens the approval cycle, realizes second-level approval and real-time arrival, and greatly improves the speed of fund flow. At the same time, the smart contract also has the ability of self-verification and execution, which effectively reduces human error and fraud risk, and enhances the stability and security of the supply chain.

The implementation effect of FILO platform is particularly remarkable. Take FOSUN FINANCIAL and Fosun Financial as an example, after joining the platform, both of them have realized the rapid expansion of business scale and the significant growth of cumulative billing amount and financing amount (see Table 2). These specific data not only validate the excellent effectiveness of FILO platform in enhancing procurement transparency and efficiency, but also highlight the important role of blockchain technology in promoting supply chain management innovation and optimization.

Table 2. Current issues in corporate procurement transparency [3]

Company name	Entry time	Number of core enterprises	Number of supply chain enterprises	Cumulative amount billed (in millions of dollars)	Financing amount (million dollars)
FOSUN FINANCIAL	March 2019	3	51	4246	1762
Fosun Gold (investment bank)	May 2018	1	120	50000	47000

4.2 Walmart: application and effectiveness of blockchain technology in sustainable procurement

As a leading global retail giant, Walmart, faced with the challenges of transparency and efficiency in supply chain management, has actively introduced blockchain technology to reshape its procurement process. Through the decentralized, untamperable and traceable features of blockchain, Walmart has realized the whole process of visualization from raw material procurement to final sales of various commodities (such as electronic products, daily necessities, etc.), including pork. Taking the pork supply chain as an example, blockchain

technology makes the source, breeding process, quarantine information and logistics track of each piece of pork traceable, which significantly enhances consumers' confidence in the transparency and safety of commodities.

The application of smart contracts further automates the procurement process, reducing human error and intervention and improving overall efficiency. For suppliers of pork and other commodities, the blockchain platform provides a channel for real-time information sharing, ensures transparency and accuracy in order fulfillment, and facilitates collaborative work across the supply chain. Questionnaire data show that after the introduction of blockchain technology, more than 85% of consumers are satisfied with the transparency of Walmart's merchandise, reflecting the technology's remarkable effectiveness in enhancing consumer trust. As shown in Fig. 4.

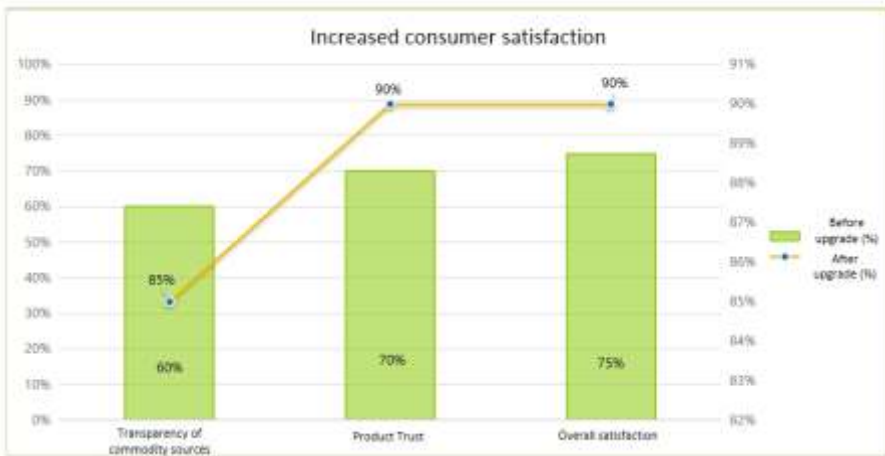


Fig. 4. Increase in consumer satisfaction[6]

Walmart effectively integrates blockchain technology in its sustainable sourcing practices to achieve transparent management of the supply chain for a wide range of commodities, including pork. This not only improves the transparency and operational efficiency of the supply chain, but also significantly enhances consumers' trust in the source and quality of goods. Through the information sharing and traceability mechanism of the blockchain platform, Walmart has successfully built a supply chain ecosystem with a high degree of synergy and trust, which provides a valuable practical example and academic inspiration for the sustainable development of the retail industry.

5 Construction of a model for enhancing transparency of enterprise sustainable procurement based on blockchain technology

5.1 Model design principles and objectives

To build a sustainable procurement transparency model based on blockchain technology, it is necessary to establish clear design principles and goals, which are in line with the successful practice cases of the FILO supply chain financial service platform and Walmart and other enterprises. The design principle should focus on maximizing transparency, utilizing the decentralization, data tampering and full traceability features of blockchain to completely break down information silos and ensure real-time sharing and verification of procurement information along the whole chain. Objectively, it aims to realize the automation

and intelligence of the procurement process through the deployment of smart contracts, reduce human intervention, and improve the efficiency and fairness of contract execution [5]. At the same time, the model should cover multi-dimensional assessment indicators such as supplier selection, order execution, payment and settlement, and sustainability performance, forming a comprehensive, systematic and quantifiable transparency assessment system to provide solid support for the continuous optimization of enterprise procurement management. In the end, the model will help enterprises win market trust in the fierce market competition by virtue of a highly transparent procurement system and promote the healthy and stable development of supply chain finance. Together, these indicators constitute the core framework for assessing the transparency of procurement activities, providing a solid quantitative foundation for enterprise procurement management.

5.2 Model structure and functions

The core of the enterprise sustainable procurement transparency enhancement model based on blockchain technology lies in its solid architecture and advanced technology. The model adopts Ethereum as the underlying blockchain platform, which, thanks to its strong scalability and mature developer community support, ensures the technical feasibility and future expansion potential of the model. In terms of smart contract writing and deployment, programming languages such as Solidity are used to accurately realize the automation and transparency of the procurement process, reduce human intervention, and improve contract execution efficiency and transparency.

The model architecture consists of a data layer, a network layer, a consensus layer, a contract layer and an application layer, each of which assumes a specific function. The data layer is responsible for securely storing all transaction data in the procurement process; the network layer ensures information transmission and synchronization among nodes; the consensus layer maintains the consistency and security of the blockchain through specific consensus mechanisms, such as proof of workload or proof of interest; the contract layer deploys smart contracts to automate the execution of procurement rules; and the application layer provides users with an intuitive interface and data analysis functions.

Through the division of authority and data sharing mechanism among multiple participants (e.g., suppliers, purchasers, logistics service providers and regulators), the model realizes seamless connection and real-time updating of supply chain information, and provides an efficient, transparent and credible procurement management solution for enterprises. This structure not only meets the urgent needs of current procurement management, but also lays a solid foundation for future technological upgrades and functionality expansion.

5.3 Model implementation process

When deploying the enterprise sustainable procurement transparency enhancement model based on blockchain technology, high-performance federation chains such as Hyperledger Fabric are selected as the core to ensure the security and efficiency of collaboration among multiple nodes. Through a strict identity verification process, suppliers and purchasers are given legitimate identities and permissions to enhance the trust foundation of transactions. The automated execution of smart contracts runs through the whole procurement process, promoting transparency and efficiency. Data is uploaded to the chain in real time, forming a tamper-proof data chain that supports efficient auditing and tracing. At the same time, the combination of the Internet of Things and big data analysis, real-time monitoring of the production status of suppliers and product quality, accurate docking procurement demand, and promote the optimization of supply chain efficiency. This series of implementation steps

not only demonstrates the unique value of blockchain in procurement management, but also provides a solid technical support and innovative path for enterprises to implement sustainable procurement strategies [6].

6 Conclusion

This study provides insights into the remarkable effectiveness of blockchain technology in enhancing the transparency of sustainable procurement in enterprises. The successful case of FILO Platform and Walmart demonstrates that blockchain effectively improves procurement transparency and efficiency through decentralization, data tampering and full traceability. FILO platform utilizes blockchain to realize real-time sharing of procurement data and automated execution of smart contracts, which reduces the risk of human intervention and promotes supply chain collaboration. Walmart, on the other hand, has realized the accurate traceability of the entire product life cycle through blockchain technology, significantly enhancing consumer trust. These cases provide valuable reference for other enterprises, demonstrating the universal applicability of blockchain technology in enhancing procurement transparency.

Looking ahead, the integration and application of blockchain with artificial intelligence, big data and other technologies will lead a new trend in supply chain management, bringing more efficient and accurate procurement decision support to enterprises. However, along with the in-depth application of technology, enterprises need to face challenges such as the unification of technical standards, data privacy security protection and the establishment of cross-enterprise cooperation mechanisms. In this regard, it is recommended that enterprises increase R&D investment and talent training in blockchain technology, promote its wide application in the field of supply chain finance, strengthen policy guidance and support, and encourage inter-enterprise cooperation in order to address the challenges together and realize the transformation and upgrading of procurement management and sustainable development.

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