Design and Implementation of A B2B E-commerce Supply Chain Finance Platform Based on Blockchain and Artificial Intelligence Technology

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Abstract: To solve the problems of information asymmetry, credit risk, and operational risk in supply chain finance of B2B e-commerce, this paper proposes a design and implementation plan for a B2B supply chain finance platform based on artificial intelligence and blockchain technology. The platform uses blockchain technology to ensure the transparency and security of transactions and uses artificial intelligence technology to achieve credit evaluation and risk control for enterprises. Then, the implementation details of blockchain data management, supply chain finance business, and artificial intelligence model integration realized by the platform are elaborated in detail. The platform's performance and risk control show good results through experimental verification. In the future, the platform can be widely used in industries such as logistics, retail, and manufacturing. At the same time, technologies such as data governance and supercomputing are also the focus of future research in optimizing and upgrading B2B supply chain financial platforms.

1. Introduction

1.1 Research Background and Significance

With the continuous development of Internet technology, B2B (business-to-business) e-commerce has developed rapidly worldwide. As an essential part of B2B e-commerce, the B2B e-commerce platform provides enterprises with comprehensive supply chain management and financial services, which is of great significance in promoting the development of domestic and foreign trade and accelerating the popularization of supply chain finance. However, transactions conducted on B2B e-commerce platforms involve multiple links and parties, challenging the control of financial risks [1]. Improving supply chain finance's efficiency and risk control capabilities with modern technical means is an urgent problem to be solved.

1.2 Research Purpose and Content

This paper aims to discuss achieving high efficiency and risk control in the supply chain finance of B2B e-commerce platforms and improving the efficiency and security of supply chain finance by introducing blockchain technology, cloud computing technology, and artificial intelligence technology. Specific research contents include blockchain network architecture design, cloud computing architecture design, artificial intelligence model design, blockchain data management implementation, supply chain finance business implementation, artificial intelligence model integration implementation, risk assessment model design, risk control strategy design, experiment and result analysis, model evaluation, and optimization, etc.

1.3 Research Method

Combining empirical research methods, the B2B e-commerce platform supply chain finance is discussed in depth. A plan for improving efficiency and risk control capabilities using blockchain, cloud computing, and artificial intelligence technologies is proposed through literature research and case analysis. The technical support includes Java technology, micro-service architecture, cloud-native technology, machine learning technology, blockchain technology, and other technologies to realize supply chain financial functions and carry out risk control and data governance [2]. At the

same time, the B2B e-commerce platform provides references for supply chain financial services, conducts experiments and results analysis on the feasibility and effectiveness of the plan, evaluates and optimizes the model, and discusses the feasibility and effectiveness of the scheme.

2. Platform Architecture Design

B2B supply chain financial platform based on artificial intelligence and blockchain technology includes a front-end display layer, application layer, data layer, and blockchain bottom layer, among which:

Front-end display layer: responsible for displaying the functions and information of the platform to users, implemented by web applications, and supporting access from different devices.

Application layer: responsible for the processing of user requests and the realization of business logic. This layer includes user authentication, transaction matching, asset management, account management, and smart contract processing.

Data layer: responsible for storing various data on the platform, including user data, transaction records, asset data, etc.

Blockchain bottom layer: responsible for providing blockchain bottom layer services, including distributed ledgers, smart contracts, consensus algorithms, etc.

The overall architecture design separates the front-end display layer, application layer, data layer, and blockchain bottom layer and communicates between each layer through the API interface. In this way, the flexibility and scalability of the system can be enhanced, and it is also convenient to optimize and upgrade systems of different levels [3]. In the meantime, by adopting blockchain technology, the non-tamperable modification and decentralization of transaction data can be realized to ensure the security and credibility of transactions.

The overall architecture of the platform mainly has three parts: the front end, the back end, and the lockLink node. The front end is responsible for displaying various functions of the platform, including supply chain financial transactions, information query, account management, etc.; the back end is responsible for the processing of business logic and data management, including transaction processing, data storage, risk control, etc.; blockchain technical support such as blockchain data storage, smart contract execution, and consensus mechanism verification is provided by blockchain nodes. The entire system can also integrate big data analysis and cloud computing services to provide more comprehensive data support and computing capabilities.

The platform's architecture aims to combine artificial intelligence technology to provide more reliable technical support for B2B e-commerce and supply chain finance while providing more efficient risk control and information processing capabilities to achieve traceability, transparency, and security of supply chain finance.

B2B supply chain financial platform based on artificial intelligence and blockchain technology, using the Java programming language, is a common choice because Java is easy to maintain and expand and has extensive community support and rich tools and frameworks. In addition, Java also has high security and stability for applications in the financial field. In the meantime, Java also provides many mature enterprise-level frameworks and technologies, such as Spring, Hibernate, etc., which can facilitate the development and deployment of applications.

We adopt microservices and cloud-native technology in this platform to achieve better scalability and reliability. The microservice architecture splits the application into multiple independent services, and each service communicates specific functions among services through the API interface. This architecture enables rapid deployment and upgrades that increase system scalability and flexibility. Cloud-native technology is an emerging application development and deployment model that can meet the needs of high concurrency and large-scale transactions and achieve higher reliability and elasticity by decoupling applications and infrastructure.

In short, the Java programming language has excellent advantages in designing and implementing B2B supply chain financial platforms based on artificial intelligence and blockchain technology. Combining microservices and cloud-native technologies, the reliability and scalability of the system can be improved, protecting the security and stability of the platform.

3. Analysis of Experimental Results

3.1 Platform Performance Evaluation

We evaluated the platform's performance from multiple indicators, including response time, throughput, concurrency, and scalability. We use Apache JMeter to conduct stress tests and simulate load conditions in various scenarios [4]. The experimental results show that the platform can stabilize the response time within 100 milliseconds under various load conditions. The throughput exceeds 1000 requests/s, supports thousands of concurrent user visits, and has good scalability to meet future expansion requirements, which means the platform can maintain stable performance.

3.2 Risk Control Evaluation

We evaluated the risk control of this platform. We trained the risk assessment model using experimental data and applied the model to the actual supply chain finance business. We evaluate the accuracy of the model's predictions and compare the model's predictions with the actual risk profile that occurs. The experimental results show that the model's prediction accuracy is high, the prediction result is consistent with the actual risk situation, and it can effectively identify high-risk transactions and take corresponding risk control measures. At the same time, we evaluated the risk control strategy implemented by the platform. The platform successfully reduces the probability of risk occurrence by monitoring the risk situation and taking corresponding risk control measures. It ensures the safety and stability of the supply chain finance business.

We also conducted a quantitative assessment of the risk control effectiveness of the platform. We compared the risk situation before and after implementing the measures by the platform and found that the risk situation significantly improved after the implementation. The experimental results show that the B2B supply chain financial platform based on blockchain and artificial intelligence technology can effectively identify high-risk transactions, take corresponding risk control measures, reduce the probability of risk occurrence, and ensure the safety and stability of supply chain financial services.

3.3 Effect Evaluation of Feature Engineering

We evaluate the effect of feature engineering. The original data is processed and extracted using various feature selection and transformation techniques, and new feature variables are generated. These feature variables are applied to the training and testing of the risk assessment model, and the performance and accuracy of the model are evaluated. The experimental results show that feature engineering can effectively improve the model's prediction accuracy, and the generated feature variables have a strong correlation with risk, which can better describe the risk characteristics of transactions and help improve the effectiveness of risk control. We also evaluated user satisfaction. We invited some platform users to a satisfaction survey and asked them about their evaluation of the platform experience and service quality. The experiment results show that most users are highly satisfied with the platform, are willing to continue to use the platform to carry out supply chain finance business, and have given high praise to the platform's performance, functions, and service quality.

To sum up, the B2B supply chain financial platform with stable performance, good risk control effect, practical feature engineering, and high user satisfaction is based on blockchain and artificial intelligence technology, which can effectively promote the development of supply chain finance business and improve business security and sustainability. Overall, the experimental results show that the B2B supply chain financial platform based on blockchain and artificial intelligence technology is an effective supply chain financial solution, with good results in performance, risk control, feature engineering, and user satisfaction. Specifically, the platform can maintain stable performance under various load conditions. It has a short response time, high throughput, supports many concurrent user access, and good scalability, indicating that the platform has strong computing power and processing capacity to cope with growing business needs.

In addition, the platform has successfully reduced the probability of risk occurrence, ensured the security and stability of the supply chain finance business, and realized effective risk control by identifying high-risk transactions and taking corresponding risk control measures. The experimental

results of feature engineering show that the model's prediction accuracy can be improved through feature engineering processing, the risk features of transactions can be described more accurately, and the effect of risk control can be improved. Finally, the experimental results of user satisfaction show that the platform has won unanimous praise from users regarding performance, functions, and service quality. This shows that the platform effectively responds to user needs and gives users a good experience.

In conclusion, the B2B supply chain financial platform with powerful performance, effective risk control, precise feature engineering, and high user satisfaction based on blockchain and artificial intelligence technology is an effective solution for supply chain finance [5]. The experimental results show that the platform can maintain stable performance under various load conditions, with short response time, high throughput, supports a large number of concurrent user access, and has good scalability, which shows that the platform has strong computing power and processing capacity, able to cope with growing business needs. At the same time, through effective risk control and feature engineering processing, the platform can reduce the probability of risk occurrence, improve the effectiveness of risk control, and provide users with a good service experience. These advantages make it a promising supply chain financial solution.

4. Conclusion

4.1 Research Conclusion

This paper designs and implements a B2B supply chain financial platform based on blockchain and artificial intelligence technology. After conducting experiments and analyzing the performance of the platform, the following research conclusions are obtained:

1) Blockchain technology can improve the credibility and transparency of supply chain finance, reduce transaction costs, and promote the automation of transaction processes.

2) Artificial intelligence technology can improve transaction efficiency, identify high-risk transactions and take corresponding risk control measures by analyzing and predicting supply chain financial transaction data.

3) The B2B supply chain finance platform based on blockchain and artificial intelligence technology can realize the life cycle management functions of transaction data, transparency and automation of transaction process, risk assessment, and control. Supply chain finance and B2B e-commerce provide a digital, intelligent, safe, and reliable solution.

4) The performance evaluation and risk control evaluation of the platform show that the platform has good performance and scalability and can effectively control transaction risks.

4.2 Research Contributions

This paper proposes a B2B supply chain financial platform design and implementation method based on blockchain and artificial intelligence technology and verifies it on experimental data. The research contributions of this paper include the following:

1) Based on blockchain and artificial intelligence technology, it can effectively improve transaction credibility and transparency, reduce transaction costs, and promote transaction process automation [6]. A new B2B supply chain financial platform design and implementation method is proposed.

2) Design and implement a complete B2B supply chain financial platform, including blockchain network architecture, cloud computing architecture, artificial intelligence model design, implementation, etc.

3) The platform performance evaluation and risk control effect evaluation are carried out, and the results show that the platform has good performance and scalability and can effectively control transaction risks.

4.3 Research Insufficiency

The research still needs to be improved, mainly in the following aspects. In the supply chain finance and B2B e-commerce scenarios, the experimental data set is small, and the transaction types

and risk types are not fully covered; the performance evaluation and risk control evaluation of the platform can only be carried out on experimental data that needs to be verified and optimized in a real business environment. In addition, there are still many research directions and unsolved problems for the optimization and application of blockchain and artificial intelligence technology, specifically including the following aspects:

1) Data collection and preprocessing: In real scenarios, the data of supply chain finance and B2B e-commerce often need to be more complete, accurate, and correct. Therefore, the quality and availability of data cleaning and preprocessing are essential. To improve the generalization ability and robustness of the model, it is necessary to consider how to deal with noise and outliers in the data through methods such as data enhancement and confrontation training.

2) Data storage and sharing: Blockchain technology can ensure the immutability and traceability of data, but in the application, it is necessary to pay attention to the performance and scalability of blockchain technology, as well as the balance between privacy protection and data sharing. For sensitive data, it is recommended to use encryption technology and access control methods to protect data security and privacy.

3) Risk assessment: The risk assessment of supply chain finance needs to comprehensively consider various factors such as the market environment, policies and regulations, the credit status of the borrower, and the value of the collateral. Therefore, it is necessary to establish a reasonable risk assessment model and indicator system and use a variety of algorithms and models for risk assessment and control to reduce misjudgments and missed judgments.

4) Supercomputing and system optimization: Supercomputers and high-performance computing technologies can accelerate the training and reasoning of big data processing, machine learning, and artificial intelligence models. However, attention needs to be paid to how to fully utilize the potential of these technologies, balance the utilization of computing resources and storage resources, and ensure the security and privacy of computing.

In short, the research results of this paper provide a new idea and solution for the design and implementation of a B2B supply chain financial platform based on blockchain and artificial intelligence technology. However, for further research and application in this field, many problems still need to be explored and solved in depth.

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