

# Innovative Dispute Resolution: The Application of Blockchain in Cross-Border E-Commerce Governance

Xiangbin Zuo<sup>1</sup>, Nur Khalidah Dahlan<sup>2</sup>, Haniff Ahamat<sup>3</sup>, Dan Wu<sup>4</sup>

## Abstract

*With the rapid development of cross-border e-commerce, issues such as product quality, logistics disputes, and after-sales service have become increasingly prominent. Traditional litigation and arbitration methods have many limitations in efficiency and cost, and there is an urgent need to find innovative solutions. As a cutting-edge technology, blockchain technology can potentially improve dispute resolution efficiency, reduce costs, and enhance trust, especially in cross-border e-commerce. First, the basic concepts of blockchain and smart contracts are introduced, and then the application advantages of blockchain in dispute resolution are analyzed. Combined with the practical cases of Alibaba and JD Global Shopping, the actual effects and challenges of technology implementation are discussed. The paper puts forward suggestions for promoting the widespread application of blockchain technology in cross-border e-commerce dispute resolution and looks forward to its future development prospects.*

**Keywords:** *Blockchain, Cross-Border E-Commerce, Dispute Resolution, Smart Contract.*

## Introduction

### *Rapid Development of Cross-Border E-Commerce and Frequent Disputes*

Cross-border e-commerce has developed rapidly in recent years and has become an important part of global trade that cannot be ignored. GlobalData, a leading data and analysis company, found that more and more Chinese consumers like to buy domestic and foreign goods from e-commerce platforms. The Chinese e-commerce market is expected to grow at a compound annual growth rate of 9.9% between 2024 and 2028, and the size of the Chinese e-commerce market will increase by 11.9% in 2023 to RMB 15.4 trillion, as shown in Figure 1. However, as this market expands, cross-border e-commerce disputes are also growing, involving various types of disputes, including product quality, payment security, logistics efficiency, and after-sales service (Deng, 2024). Since cross-border e-commerce transactions usually involve legal systems, cultural differences, and market rules in different countries and regions, dispute resolution becomes more complicated. At present, although traditional dispute resolution mechanisms such as litigation and arbitration can handle these disputes to a certain extent, due to their high costs, long processing cycles, and difficulty in cross-border execution, these mechanisms often cannot meet the needs of the rapid development of cross-border e-commerce (Rabinovich & Katsh, 2019).

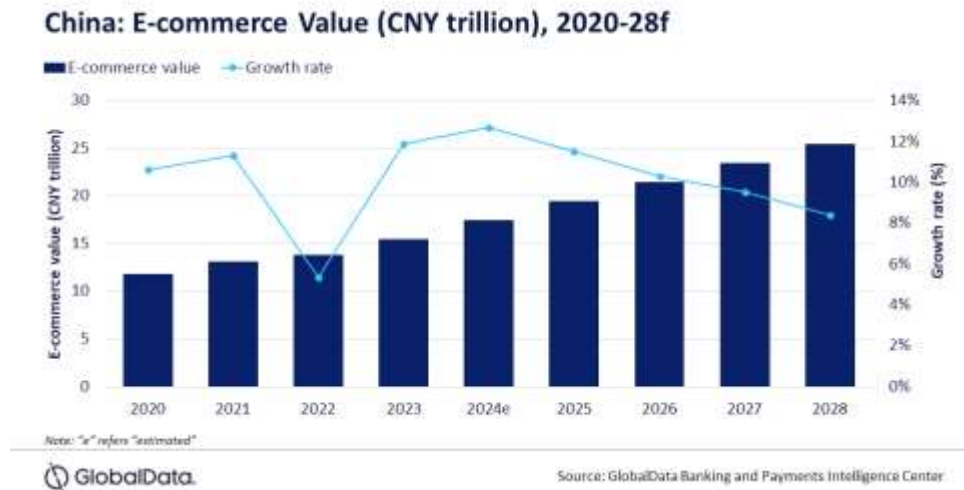
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<sup>1</sup> Faculty of Law, Universiti Kebangsaan Malaysia (UKM), Bangi Selangor 43600, Malaysia

<sup>2</sup> Faculty of Law, Universiti Kebangsaan Malaysia (UKM), Bangi Selangor 43600, Malaysia.

<sup>3</sup> Faculty of Law, Universiti Kebangsaan Malaysia (UKM), Bangi Selangor 43600, Malaysia.

<sup>4</sup> Faculty of Law, Universiti Kebangsaan Malaysia (UKM), Bangi Selangor 43600, Malaysia, Email: P127390@siswa.ukm.edu.my, (Corresponding Author)



**Figure 1 Development of China's E-Commerce Market Size**

( Data source: <https://www.globaldata.com/media/banking/china-e-commerce-payments-to-reach-3-6-trillion-in-2028-forecasts-globaldata/>)

### *Limitations of Traditional Dispute Resolution Mechanisms*

Traditional dispute resolution mechanisms have obvious limitations in dealing with cross-border e-commerce disputes, mainly reflected in litigation, arbitration, and traditional dispute resolution (Dahlan, 2023). Litigation is a traditional legal means, but its process is cumbersome, time-consuming, and expensive. Especially in cross-border transactions, the legal systems and jurisdiction issues of different countries often add additional complexity. In addition, the weak enforcement of judgments across jurisdictions has greatly reduced the efficiency of litigation in resolving disputes and cannot meet the needs of the rapidly growing cross-border e-commerce market. Although arbitration is regarded as a more flexible alternative, its efficiency and cost are also unable to meet the needs of cross-border e-commerce. The arbitration process takes a long time and is expensive. Especially in complex cases involving multiple parties, the high cost and uncertainty of the arbitration mechanism often discourage merchants and consumers. In addition, the fairness and transparency of arbitration are also limited by the rules and procedures of different arbitration institutions. The lack of unified standards has greatly reduced the effectiveness of resolving cross-border e-commerce disputes (Zhu, 2024).

### *Literature Review on Blockchain Technology as An Innovative Solution*

Driven by the wave of informatization, ODR decentralized platforms are gradually becoming the new favorite in the field of dispute resolution. This new platform not only breaks the limitations of traditional dispute resolution methods, but blockchain technology, with its unique decentralized characteristics, has opened up a new path for fair, transparent, and efficient e-commerce dispute resolution methods (Koulu, R. 2016).

Blockchain technology has become a transformative force in cross-border e-commerce governance, not only improving international trade transparency, security, and operational efficiency, but also innovating dispute resolution mechanisms. Zhou and Liu (2022) highlight the role of blockchain in optimizing supply chains through data governance and visibility, while Lian (2022) demonstrates its ability to simplify big data management and reduce encryption costs. These advances are critical to building trust and reliability in e-commerce, especially in cross-border environments.

A key area of focus is the integration of blockchain with dispute resolution systems. Rabinovich-Einy and Katsh (2019) highlight the inevitability of disputes in blockchain transactions and advocate tailored online

dispute resolution (ODR) systems. Similarly, Schmitz and Rule (2019) propose blockchain-based ODR tools to effectively resolve smart contract disputes. Zhong et al. (2021) extend this research by proposing a blockchain-based mediation mechanism to address judicial challenges in cross-border e-commerce. Together, these studies highlight the transformative potential of blockchain in creating a decentralized, transparent, and efficient dispute resolution framework.

In addition, blockchain significantly enhances payment security and governance mechanisms. Chen et al. (2021) and Liao and Shao (2021) explored blockchain-based payment systems, showing how encryption and decentralized platforms can reduce fraud and build trust between transacting parties. In terms of governance, Zhang (2022) and Na (2023) discussed regulatory challenges and proposed ways to sustainably integrate blockchain into the e-commerce ecosystem. These insights reveal the multifaceted impact of blockchain in addressing existing inefficiencies and building resilient governance structures.

In summary, although the prospects of blockchain in cross-border e-commerce are undeniable, challenges such as regulatory uncertainty and scalability issues still exist. This requires emphasizing the necessity of interdisciplinary cooperation to seamlessly integrate blockchain into cross-border e-commerce and dispute resolution. Therefore, studying the application of blockchain in cross-border e-commerce dispute resolution will not only help improve dispute resolution efficiency and reduce costs, but also promote the innovation of global e-commerce transaction rules and the transformation of the global governance system, and has important theoretical and practical significance.

### *Research Questions*

With the rapid development of cross-border e-commerce, traditional dispute resolution mechanisms are unable to meet the needs due to problems such as inefficiency, high cost, and jurisdictional conflicts. Blockchain technology, with its characteristics of decentralization, transparency, and immutability, has shown the potential to innovate dispute resolution mechanisms. Therefore, this study aims to answer the following core questions:

How does blockchain technology demonstrate its advantages in cross-border e-commerce dispute resolution?

Do existing blockchain dispute resolution practices effectively address the limitations of traditional mechanisms?

How to achieve blockchain-driven optimization of cross-border e-commerce dispute governance through collaborative innovation of technology and legal framework?

### **Research Objectives**

This study aims to explore the application potential and practical effects of blockchain technology in cross-border e-commerce dispute resolution, and propose policy and practical recommendations for its widespread promotion. Specifically, the research objectives include:

Analyze how blockchain technology and its core features can meet the needs of cross-border e-commerce dispute resolution.

Evaluate the performance of blockchain dispute resolution mechanisms in terms of efficiency, cost and transparency.

Explore the legal adaptability and practical path of blockchain technology in international e-commerce governance, and build a credible and fair global cross-border e-commerce dispute governance framework.

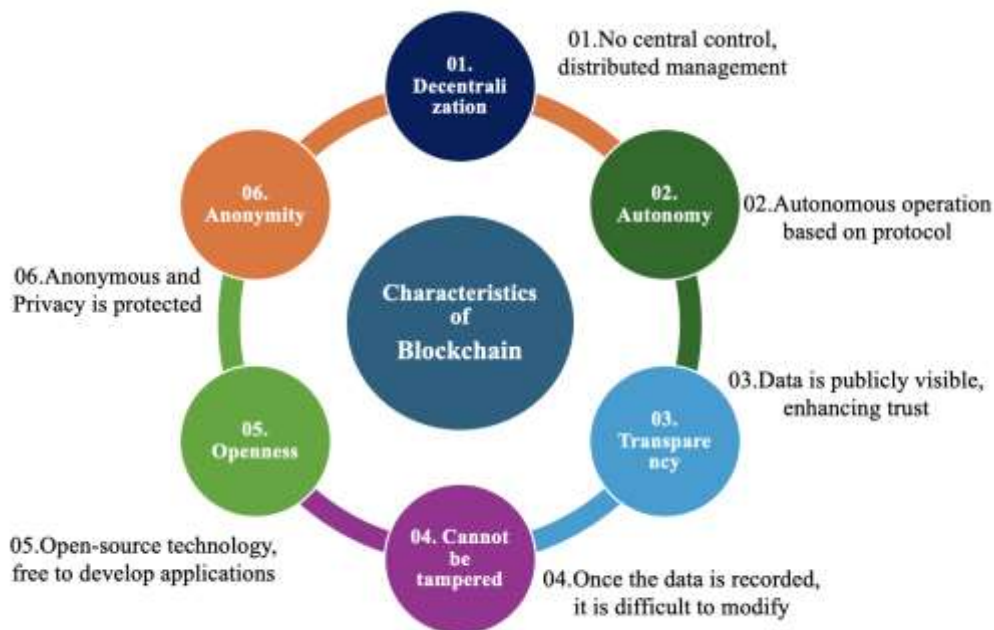
### **Research Methods**

This study adopts a method that combines theoretical analysis with case study. On the one hand, through literature analysis, the theoretical basis and application status of blockchain technology and cross-border e-commerce dispute resolution mechanism are sorted out; on the other hand, representative cases (such as the Kleros platform or pilot projects of cross-border e-commerce companies) are selected to deeply analyze their operation mode, application effect and existing problems. The comprehensive use of technology, law and governance perspectives ensures the multidimensionality and practical guidance of the research.

### *Overview of Blockchain Technology*

#### *Core Features of Blockchain*

Blockchain technology is a decentralized distributed ledger technology that ensures data transparency and security by recording transaction information (Javaid et al., 2022). As shown in Figure 2, blockchain has the advantages of decentralization, transparency, openness, autonomy, information immutability, and anonymity. These advantages provide innovative technical support for cross-border e-commerce dispute resolution. Since blockchain adopts a decentralized approach, there is no single control node. This structure can avoid the common problems of single point or centralized control. All participants can access data equally, which improves the fairness and credibility of the system. Transparency is another major feature of blockchain. All transaction records on the chain are publicly available, and anyone can trace and verify the process and results of the transaction. This brings more credibility to cross-border e-commerce transactions and avoids information asymmetry in transactions as much as possible. Once a transaction is recorded on the blockchain, it cannot be modified or deleted, ensuring the integrity and fairness of the evidence. This gives blockchain a strong advantage in dispute resolution and effectively protects the legitimate rights and interests of all parties (Bhushan, 2023).



**Figure 2. Characteristics of Blockchain**

#### *Basic Concepts of Smart Contracts and Their Execution Logic*

As shown in Table 1, unlike the process of traditional contracts, smart contracts are an automated execution protocol based on blockchain technology. It pre-sets contract terms through programming codes to ensure that when specific conditions are met, the contract is automatically executed without human intervention. Unlike traditional contracts, smart contracts do not rely on intermediaries for execution. All operations are

automatically completed by computer programs according to set rules, thereby improving efficiency and reducing costs. The execution logic of smart contracts is based on pre-written codes. When the triggering conditions are met, the contract will automatically execute the preset operations. Smart contracts will compare the current status and judge the conditions based on the data on the chain. If the corresponding predetermined conditions are met, the system will automatically execute according to the content of the contract according to the provisions of the contract (Pradhan & Singh, 2021). Due to the immutability of blockchain, contracts cannot be changed once deployed, thus ensuring the transparency and credibility of the execution process. The application of smart contracts in cross-border e-commerce can help improve the automation and efficiency of dispute resolution and reduce human intervention and the occurrence of disputes.

| Aspect             | Traditional Contracts                                 | Smart Contracts   |
|--------------------|---|---|
| Execution          | Manually Enforced Through Legal Systems               | Automated Execution Via Pre-Set Code                        |
| Intermediaries     | Requires Intermediaries (E.G., Lawyers, Arbitrators)  | No Intermediaries; Relies On Blockchain                     |
| Transparency       | Limited; Depends On Trust Or External Verification    | Transparent, Stored On A Blockchain                         |
| Efficiency         | Slower Due To Paperwork And Processing Delays         | Fast, Once Conditions Are Met                               |
| Costs              | Higher, Due To Legal And Administrative Fees          | Lower, Due To Automation And Fewer Intermediaries           |
| Flexibility        | Highly Flexible; Terms Can Be Negotiated And Modified | Limited Flexibility: Changes Require New Coding             |
| Security           | Vulnerable To Fraud Or Tampering                      | Immutable And Secure Via Blockchain Technology              |
| Dispute Resolution | Handled By Courts Or ADR Mechanisms                   | Minimized Disputes; External Resolution May Still Be Needed |
| Accessibility      | Less Accessible Due To Legal And Financial Barriers   | More Accessible Through Decentralized Platforms             |

**Table 1. Comparison Between Traditional Contracts and Smart Contracts**

### *Advantages And Applicability of Blockchain Technology in Dispute Resolution*

Blockchain technology has significant advantages in dispute resolution. It can significantly improve efficiency and reduce time and costs in the dispute resolution process. Through the automated execution of smart contracts, blockchain eliminates the need for manual intervention and intermediaries, reducing tedious steps in the transaction and arbitration process. The decentralized nature of the blockchain ensures the efficient operation of the system and avoids lengthy procedures that may occur in traditional dispute resolution mechanisms. All transaction records and contract execution processes are open and traceable, which provides verifiable data support to all parties and greatly enhances the trust foundation in the dispute resolution process. Since the data cannot be tampered with once it is on the chain, this also ensures the authenticity of the evidence and reduces disputes caused by data forgery or tampering.

### *Application of Blockchain in Cross-Border E-Commerce Dispute Resolution*

#### *Smart Contract Arbitration*

Automated dispute resolution through code preset rules

Smart contracts can achieve automated dispute resolution through code preset rules. When a dispute arises between two parties in a cross-border e-commerce transaction, the smart contract automatically determines and executes relevant measures based on the pre-set rules. The deadline for providing evidence, dispute resolution methods, and the calculation method of the amount of compensation are all preset rules for just resolution. These rules are already clear when the contract is deployed, ensuring that disputes between the two parties can be resolved quickly and efficiently when they occur.

For instance, on a cross-border e-commerce platform, when a buyer raises a complaint about not receiving goods, the smart contract first checks the buyer's logistics tracking data. If the system confirms that the goods have not been delivered or that the logistics status is abnormal, the smart contract automatically triggers a refund procedure based on preset rules. Conversely, if the logistics records show that the goods were signed for but the buyer still raises a dispute, the smart contract will require the buyer to provide additional evidence and freeze the relevant funds until the issue is resolved through arbitration. This process allows the smart contract to quickly handle disputes and reduce human intervention.

#### *Implementation of Fund Custody and Allocation Mechanism*

The fund custody and allocation mechanism of smart contracts in cross-border e-commerce dispute resolution can effectively ensure the security of funds and avoid human manipulation and fraud. If the two parties reach an agreement, the funds related to the transaction will be managed through the smart contract system. This means that before the dispute is resolved, the funds are in a safe and neutral state, and neither party can unilaterally control them. When a dispute occurs, the smart contract automatically executes the allocation of funds according to the pre-set dispute resolution rules and ruling results (Li, 2024). The smart contract system can accurately execute the transfer of funds according to the specific circumstances, ensuring that it can be reasonably allocated according to fair ruling results. This automated processing method avoids delays, bias or fraud that may occur in traditional dispute resolution.

#### *Decentralized Arbitration Mechanism*

##### *Arbitration Node Selection and Voting Mechanism*

In the blockchain-based dispute resolution mechanism, the selection and voting mechanism of arbitration nodes ensures fairness and equity through decentralization. The selection process is open and transparent, and all relevant parties can participate in the evaluation and selection of arbitrators, eliminating the problems of favoritism and information asymmetry. Smart contracts automatically execute elections, and all voting processes are recorded on the chain to ensure the transparency and fairness of the results. The decentralized voting mechanism ensures that the opinions of each participant are heard fairly, reduces conflicts of interest, and enhances the credibility of the arbitration process (Ast & Deffains, 2020).

The selection of arbitration nodes typically considers candidates' professional background and past records. All parties involved participate through the blockchain network to make nominations and votes publicly. Voting data is recorded on the blockchain, ensuring transparency. For example, in the event of a dispute, the smart contract automatically invites candidate arbitrators, who must accept the role to begin the arbitration process. Each node makes independent decisions based on the evidence submitted, and the decision is determined by a decentralized voting mechanism, with the majority vote automatically enforced by the smart contract (Daraghmi, et al., 2024).

##### *Establishing Trust Consensus with Multi-Party Participation*

Blockchain promotes multi-party participation and builds trust consensus through its decentralized nature, which is particularly suitable for cross-border e-commerce dispute resolution. Unlike traditional mechanisms that rely on third parties, blockchain uses distributed ledgers and smart contracts to directly build trust between trading parties. All transaction and adjudication information is open and transparent, and participants can monitor and verify in real time to ensure that the process is traceable. This transparency reduces the cost of trust, reduces dependence on intermediaries, and enables participants to verify

information independently.

### *Storage and Verification of Evidence*

#### *Generation and Preservation of Tamper-Proof Evidence Chain*

Blockchain technology, through its tamper-proof characteristics, provides a reliable evidence-preservation solution for cross-border e-commerce dispute resolution. After the evidence is uploaded, it is converted into an immutable digital record and generates a unique hash value, and any modification will be immediately visible. This ensures the authenticity and reliability of the evidence. At the same time, the evidence chain on the blockchain is open and transparent, and the participants can view and verify it in real time. This mechanism enhances trust, ensures the integrity of the evidence chain, and provides strong support for the dispute resolution process.

Specifically, after uploading the evidence, the blockchain uses the SHA-256 hash algorithm to generate a unique hash for each piece of evidence, serving as its ‘digital fingerprint’ and is stored permanently (Malik, A. & Sharma, A. K., 2023). The evidence record also includes a timestamp and a hash of the evidence holder’s identity information. These key pieces of data together form a complete evidence chain. If any party attempts to tamper with the evidence, the corresponding hash value will change, triggering an alert on the blockchain to ensure the integrity of the evidence. Additionally, the distributed storage nature of the blockchain ensures that evidence data is backed up across multiple nodes, effectively preventing data loss or single-point failures.

#### *Transparent Review of Transaction Data*

Blockchain technology ensures the authenticity and reliability of transaction data through its transparency. All transaction records cannot be changed or deleted once they are on the chain. Both parties to the transaction and related parties can check the transaction data at any time to ensure the fairness of evidence. When disputes occur, blockchain provides real and traceable evidence, simplifies evidence review, and improves credibility and efficiency. The transparent review mechanism reduces the risk of information asymmetry, enhances the trust between the two parties to the transaction, and helps promote the healthy development of cross-border e-commerce platforms.

#### *Real-World Applications of BDR*

Blockchain Dispute Resolution (BDR) has shown significant potential in cross-border e-commerce with various applications. For example, the Sagewise system offers a unique solution for handling small-value cross-border transaction disputes. Users submit a deposit to participate in arbitration, where the platform randomly selects arbitrators to evaluate evidence and vote on the resolution. The transparent and fair process is automated by the smart contract, minimizing subjectivity and high costs associated with human arbitrators (Kadioglu Kumtepe, C. C., 2020).

Additionally, large e-commerce platforms like Alibaba are exploring blockchain’s dispute resolution applications by storing transaction records and logistics information on the blockchain. When a dispute occurs, the system can quickly call relevant data to verify the claims of both parties and provide a preliminary resolution. This data-driven approach significantly improves resolution efficiency, especially in high-frequency cross-border transactions.

Other notable platforms include Aragon, which utilizes blockchain for decentralized governance and dispute resolution, and Mattereum, which provides a digital rights protocol for real-world assets. OpenBazaar introduces a decentralized marketplace with integrated dispute resolution, leveraging blockchain for transparent and autonomous decision-making. Lastly, the concept of a ‘digital jury’ in the form of decentralized applications (dApps) offers innovative solutions for dispute resolution, creating a trusted, fair, and efficient mechanism for handling complex cross-border e-commerce disputes.

## *International E-Commerce Governance Reform Driven by Blockchain*

### *Improve Dispute Resolution Efficiency and Reduce Costs*

Blockchain technology significantly improves the efficiency of dispute handling and reduces related costs through automated dispute resolution mechanisms. Smart contracts in the blockchain are different from traditional dispute resolution methods. Resolution rules can be preset. Once a dispute occurs, the system will automatically execute the resolution process according to the set conditions without manual intervention, greatly shortening the resolution time. This automated mechanism not only improves processing efficiency but also effectively reduces various costs of dispute resolution. Intermediary costs and administrative fees can be lower than traditional arbitration and litigation procedures (Ruan, 2024). Decentralized solutions allow parties to dispute to interact directly, reducing overhead costs and wasted time during litigation. Ultimately, blockchain technology can provide all parties with a more efficient and economical way to resolve disputes in cross-border e-commerce.

### *Promote Transaction Transparency and Trust*

Blockchain technology significantly improves transaction transparency and trust by providing transparent data records and a decentralized system structure. The problem of information asymmetry between transaction parties is a common situation in cross-border e-commerce. Blockchain technology can make transactions more transparent through the openness and traceability of transaction records. This open and transparent feature not only reduces the risk of fraud, but also allows all parties to clearly understand the entire transaction process, increasing mutual trust. In traditional dispute resolution mechanisms, both parties often rely on third-party institutions for arbitration, and these arbitration institutions may be affected by various factors, leading to lack of trust (Cao, 2023). In contrast, blockchain technology can ensure that each party can conduct real-time supervision and verification in a fairly and transparently manner, strengthening the trust of both parties to the agreement. This mechanism promotes the transaction flow of cross-border e-commerce and promotes a more open and fair business environment.

### *Breaking the Jurisdictional Restrictions Under the Traditional Legal Framework*

Blockchain technology, through its decentralized and globally interoperable characteristics, has effectively broken through the jurisdictional restrictions in the traditional legal framework. In cross-border e-commerce, when transactions involve multiple countries and regions, the traditional legal framework is often limited by geographical jurisdiction and legal differences between different countries, resulting in complex and time-consuming dispute resolution. The distributed ledger of the blockchain can cross national borders and record all transaction data openly and transparently on the chain, allowing any party to access and verify transaction information globally, thereby realizing a global unified dispute resolution mechanism.

This decentralized solution eliminates geographical barriers, avoids the uncertainty caused by different jurisdictions in traditional legal procedures, and ensures that disputes can be handled quickly and efficiently. The global nature of blockchain has promoted the development of cross-border e-commerce, promoted coordination and cooperation between different jurisdictions, and made the global e-commerce environment more open and fairer (Dan et al., 2024). This breakthrough development not only reduces transaction costs but also enhances the trust between the two parties to the transaction, promoting the rapid growth of cross-border e-commerce.

### *Redefining Platform Responsibility*

Blockchain technology, through its transparent and tamper-proof characteristics, has promoted the improvement and implementation of the platform responsibility system. In traditional cross-border e-commerce platforms, platforms usually play an intermediary role, but due to information asymmetry and



poor supervision, platforms often find it difficult to effectively fulfill their responsibilities to all parties to the transaction. Blockchain technology provides a traceable and transparent transaction record system for the platform, so that every operation and decision of the platform can be viewed and verified in real time by all users and regulators. This mechanism not only enhances the platform's control over the entire transaction process, but also prompts the platform to assume more responsibility when handling disputes. In the blockchain environment, the platform must ensure the accuracy of all transaction data, handle consumer complaints and disputes promptly in a timely manner, and be responsible for transactions on its platform. This transparency and traceability promote the implementation of platform responsibilities, protect the rights and interests of consumers, and reduce the risk of platform abuse of power. Blockchain technology can help build a fairer and more equitable cross-border e-commerce environment, enhance consumer trust, and promote the healthy development of the industry (Pan, 2023).

### *Challenges and Limitations*

#### *Technical Challenges*

##### *Complexity of Smart Contract Code Design*

Smart contract code design requires professional technical knowledge and development skills. Since smart contracts cannot be modified once deployed, any code errors or loopholes may lead to serious consequences, such as contract execution failure or unfair dispute resolution results. Developers must accurately design contract logic and conduct rigorous testing and auditing to ensure code security and execution accuracy. Otherwise, incorrect design may affect the effective application of smart contracts in cross-border e-commerce, and even bring financial losses and legal risks.

##### *Energy Consumption and Scalability Issues of Blockchain Technology*

Blockchain technology, especially the public blockchain based on proof of work, has high energy consumption, resulting in increased environmental burden and costs. As the transaction volume increases, the energy demand of the blockchain network also rises, affecting its sustainable development. Therefore, how to optimize the energy efficiency of blockchain and reduce its carbon footprint has become an important issue in the development of technology. Existing blockchain systems may experience network congestion when processing a large number of transactions, resulting in longer transaction confirmation time and higher handling fees. In order to meet this challenge, it is necessary to develop more efficient consensus mechanisms, such as proof of stake or sharding technology, to improve the system's processing capacity and ensure that its application in high-frequency transaction environments such as cross-border e-commerce is not restricted.

##### *Challenges of Legal Applicability*

##### *Legal Recognition of Blockchain Arbitration*

As an emerging dispute resolution method, the legal effect of blockchain arbitration has not yet been uniformly recognized worldwide. The legal systems of different countries and regions have different degrees of acceptance of blockchain arbitration. Some countries may not have stipulated the application of blockchain technology in legal procedures, leading to its legitimacy issues in international dispute resolution (Ortolani, 2019). Therefore, the legal recognition of blockchain arbitration urgently needs to be further clarified in order to provide more stable legal protection for dispute resolution in the cross-border e-commerce field. The different definitions and acceptance of blockchain technology in the laws of different countries may affect the enforceability of their arbitration results. In some jurisdictions, it may be necessary to amend or supplement existing laws to formally recognize the effectiveness of blockchain arbitration and ensure its effective implementation and widespread application worldwide (Chevalier, 2021).

##### *Conflict between Data Privacy Protection and Regulation*

Blockchain technology effectively protects data privacy through its decentralized and encrypted features, ensuring the security and anonymity of user transaction data. However, this privacy protection mechanism may conflict with traditional regulatory requirements. The laws of many countries require traceability and transparent review of transaction data to prevent illegal activities such as money laundering and fraud, while the immutability and anonymity of blockchain make it difficult for regulators to obtain sufficient transparent data for effective monitoring. While promoting the application of blockchain technology, it is necessary to find a balance between data privacy protection and regulatory compliance. On the one hand, user privacy should be ensured and not to be violated; on the other hand, regulators also need to ensure that technology is not abused and can effectively prevent financial crimes and other illegal activities. This requires countries to fully consider the characteristics and practical applications of technology when formulating relevant laws and regulations, and promote the integration of blockchain with the legal framework (Mohanta et al., 2019).

### *Multi-Party Cooperation and Standardization Issues*

Currently, blockchain technology lacks unified technical standards, which has led to compatibility and interoperability issues worldwide. Different blockchain platforms use different protocols and consensus mechanisms, which makes cross-platform data exchange and cooperation complicated and inefficient. Especially in the field of cross-border e-commerce, different blockchain application standards in different countries and regions may increase the difficulty of executing transactions and dispute resolution, affecting overall efficiency.

### *Case Study and Practice Analysis*

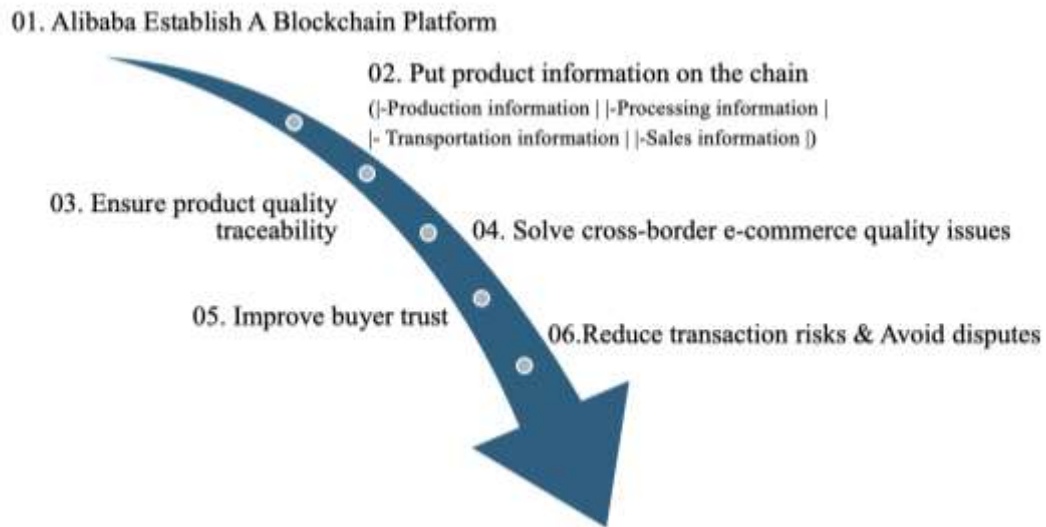
#### *Analysis of Existing Blockchain Dispute Resolution Platforms*

Kleros is a decentralized dispute resolution platform based on blockchain, which uses smart contracts and distributed consensus mechanisms for automated arbitration. The operation of the platform ensures the transparency, fairness and efficiency of the dispute resolution process through the execution of smart contracts. On the Kleros platform, users can agree on arbitration rules in advance when conducting transactions. If a dispute occurs, the smart contract will automatically trigger the arbitration procedure. The platform uses blockchain technology to ensure that all transaction data, arbitration records and judgment processes are tamper-proof and traceable, thereby improving the trust in dispute resolution.

The advantage of the Kleros platform is that it breaks the geographical limitations of traditional dispute resolution mechanisms and supports dispute resolution in cross-border e-commerce transactions. Users can quickly resolve transaction disputes according to preset arbitration rules, reducing the time and cost issues common in traditional arbitration procedures. However, the limitation of Kleros is that its arbitration process relies on the correct programming of smart contracts, and the platform's rulings still need to be recognized by law.

#### *Blockchain Pilot Projects for Cross-Border E-Commerce Companies*

Cross-border e-commerce platforms such as Alibaba Tmall International and JD Global Shopping have begun to actively explore the application of blockchain technology in their operations, improving transaction transparency and efficiency through different blockchain traceability and logistics management systems. Alibaba cooperated with IBM to establish a full-process commodity traceability system using the blockchain platform. By uploading product production, processing, transportation and sales information to the blockchain, the traceability of product quality is ensured and product quality problems common in cross-border e-commerce are solved. This approach significantly improves the trust of buyers and reduces transaction risks caused by information asymmetry, which avoids potential disputes, as shown in Figure 3.



**Figure 3. Alibaba Blockchain Product Management Platform**

(Sources: [https://cn.aliyun.com/solution/blockchain/mytc?from\\_alibabacloud=](https://cn.aliyun.com/solution/blockchain/mytc?from_alibabacloud=))

In addition, JD Global Shopping uses blockchain technology to establish a cross-border logistics information platform to put logistics information on the chain to achieve information sharing and transparency. Through this system, logistics companies, customs, e-commerce platforms and other parties can share information and coordinate management, which greatly improves logistics efficiency and reduces costs, and enhances users' trust in the platform.

#### *Exploration and Promotion of Blockchain Dispute Resolution Mechanisms By International Organizations*

Several international organizations have begun to pay attention to the potential of blockchain technology in dispute resolution and promote its global application. Institutions such as the International Chamber of Commerce and the United Nations Commission on International Trade Law are studying how to combine blockchain with the existing international arbitration system to improve the efficiency and fairness of dispute resolution in cross-border trade. In addition, the United Nations Conference on Trade and Development is also promoting the application of blockchain in global supply chain management, especially in terms of transparency and accountability tracking.

The explorations of these international organizations provide legal framework support for cross-border e-commerce, helping countries to follow unified legal standards when applying blockchain technology, thus laying the foundation for the widespread application of blockchain dispute resolution mechanisms.

## **Conclusions**

### *Blockchain technology has a revolutionary significance for cross-border e-commerce dispute resolution*

Blockchain technology has brought profound changes to cross-border e-commerce dispute resolution. Through decentralization, transparency and immutability, blockchain can ensure that information in transactions and dispute resolution processes cannot be tampered with and is traceable, thereby enhancing the credibility of evidence and the fairness of dispute resolution. The application of smart contracts enables dispute resolution to be automated, automatically handling disputes based on preset rules, reducing manual intervention and human errors, improving efficiency and reducing costs (OLIVEIRA, 2023).

### *Future Research Directions: Coordinated Development of Technology and Law*

Future research directions should focus on the coordinated development of blockchain technology and legal frameworks, especially in cross-border e-commerce dispute resolution. As blockchain technology continues to mature, it is crucial to conduct in-depth research on its specific application scenarios and models in e-commerce dispute resolution. For example, how to establish a more efficient and credible dispute resolution system globally through mechanisms such as smart contracts and decentralized arbitration will be an important research direction. The application of blockchain technology is not only technological innovation, but also requires legal support and protection (Werbach, 2018). How to reasonably embed blockchain technology under the existing legal framework, especially to ensure legal effectiveness and compliance in cross-border transactions, is an urgent problem to be solved. Studying the coordinated development path of blockchain technology and legal norms will help promote the integration of the two, achieve sustainable development in the field of cross-border e-commerce, and enhance the adaptability of the law and the practicality of blockchain technology.

### *The Broad Prospects of Blockchain Dispute Resolution Mechanism in Cross-Border E-Commerce Dispute Governance*

Blockchain dispute resolution mechanism has broad prospects in cross-border e-commerce governance. With the rapid development of cross-border e-commerce, traditional dispute resolution methods have been unable to meet the needs of globalization and digitalization (Zuo, 2024). Blockchain technology provides innovative solutions for international e-commerce with its decentralization, transparency and immutability. Through blockchain, automated and transparent dispute resolution can be achieved on a global scale, thereby improving the efficiency and credibility of the e-commerce governance system.

## **Recommendations**

### *Strengthen the Research on The Adaptability of The Legal Framework*

With the application of blockchain technology in cross-border e-commerce dispute resolution, the existing legal framework urgently needs to be adjusted. There are still many parts of the legal efficiency of blockchain technology that need to be confirmed. In particular, the recognition of blockchain arbitration in the legal systems of different countries varies greatly. Therefore, it is particularly important to formulate relevant laws and regulations to clarify the legal status of blockchain arbitration, which will not only help to enhance the legitimacy of arbitration results, but also promote cross-border dispute resolution worldwide. In addition, it is necessary to explore a legal system suitable for blockchain dispute resolution, covering key areas such as smart contracts, evidence storage, and data privacy. In this way, relevant legal issues can be studied to help cross-border e-commerce obtain more stable and predictable protection (Sweet & Grisel, 2017).

### *Promote the Standardization and International Cooperation of Blockchain Technology*

In order to better promote the application of blockchain technology in cross-border e-commerce, it is particularly important to formulate unified technical standards. At present, the standardization of blockchain technology is low, and there are compatibility issues between different platforms and technologies, which not only affects the popularization of technology, but also limits its global application. Therefore, it is necessary to formulate unified technical standards. This needs to cover core areas such as smart contracts and data storage. This can enable effective collaboration between different platforms and regions, and enhance operability and interoperability (Duque & Torres, 2020). By strengthening international cooperation and establishing a transnational blockchain technology alliance, we can promote technology sharing and innovation, and promote the popularization and application of blockchain technology worldwide. Strengthening international regulatory coordination and technical standard docking will help achieve mutual recognition and efficient operation of blockchain arbitration mechanisms in different jurisdictions, and provide a safer and more transparent dispute resolution platform for cross-border e-commerce.

*Using Blockchain to Build a Credible and Fair Global E-Commerce Governance Mechanism*

Blockchain technology provides unprecedented opportunities for global e-commerce governance and enhances the credibility of governance mechanisms through decentralization and transparency. Blockchain technology can help record transaction processes and dispute resolution processes. This can enhance the data reliability of e-commerce platforms and improve transparency and fairness. With the help of smart contracts and decentralized arbitration mechanisms, the efficiency of e-commerce governance can be greatly improved, human intervention and potential corruption risks can be reduced, and the interests of all parties can be treated fairly.

Building a global e-commerce governance mechanism requires the coordinated cooperation of transnational laws and technologies. With the globality and immutability of blockchain, we can break geographical restrictions and achieve seamless connection of e-commerce supervision and dispute resolution in different countries and regions. This will not only protect the rights and interests of global consumers and merchants, but also promote the healthy development of the e-commerce industry and enable it to operate stably under the legal and ethical framework.

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