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BLOCKCHAIN AND THE HARMONIZATION OF INTERNATIONAL TRADE LAW

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A B S T R A C T

The development of digital technology, particularly blockchain, has brought about significant transformations in the international trade system. Blockchain offers advantages in transparency, security, and efficiency through a decentralized recording system and the use of smart contracts, enabling the automation of cross-border transactions without intermediaries. However, the implementation of this technology has also given rise to various legal issues, such as unclear jurisdiction, differences in regulations between countries, and the lack of universal recognition of digital contracts. This situation indicates a gap between technological development and legal readiness to regulate it. This study aims to analyze the role of blockchain in international trade and examine the urgency of legal harmonization to support its implementation. The research method used is normative legal research with a library research approach, through a review of laws and regulations, scientific literature, and relevant international documents. The results show that blockchain has significant potential to increase efficiency, transparency, and trust in international trade. However, its implementation still faces obstacles in the form of regulatory disharmony and the lack of uniform global legal standards. Therefore, harmonization of international trade law is crucial to create legal certainty and support the optimal adoption of blockchain technology.

KEYWORDS

Blockchain, International Trade, Legal Harmonization, Smart Contract, Digital Regulation.

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INTRODUCTION

The development of digital technology has brought significant transformations to various sectors, including international trade. One of the most prominent innovations of the last decade is blockchain technology, which offers a decentralized, transparent, and secure recording system for cross-border transactions. Blockchain is considered capable of increasing the efficiency of global trade by reducing reliance on intermediaries, accelerating the verification process, and minimizing the risk of fraud in international transactions. (Gupta, Goyal, & Singh, 2025)

In international trade, blockchain has begun to be used in various aspects, such as trade finance, supply chain management, and smart contracts. This technology enables the automation of contract execution without third-party intervention, potentially reducing transaction costs and increasing trust between business actors across borders. (Hua & Zhang, 2024) However, despite its numerous advantages, blockchain implementation also presents complex legal challenges, particularly related to jurisdiction, the legal validity of digital documents, and data protection. (Thokal, 2024)

One of the main issues that has emerged is the lack of uniform regulations across countries governing the use of blockchain in international trade. Each country has a different legal approach, creating legal uncertainty for global businesses. This situation demonstrates the urgent need to harmonize international trade laws to accommodate the development of blockchain technology effectively and sustainably. (Abdul, 2024)

Furthermore, the borderless and decentralized nature of blockchain challenges traditional concepts in international trade law, such as choice of law and dispute resolution forums. This inconsistency between national legal systems and global technological dynamics has the potential to hinder the widespread adoption of blockchain in international trade. (Dewi et al., 2026)

On the other hand, several studies indicate that blockchain can be a solution to increase transparency and security in global supply chains, as well as address efficiency issues in traditional trade systems. However, without a harmonized and internationally integrated legal framework, this potential cannot be optimally utilized.

(Zhao, 2024) Therefore, collaborative efforts between countries and international institutions are needed to develop regulations that are adaptive, inclusive, and responsive to the development of blockchain technology.

Based on this description, this research is crucial in examining the role of blockchain in international trade and the urgency of legal harmonization to support its implementation. Thus, it is hoped that a regulatory model can be found that can bridge technological developments with the need for legal certainty in global trade.

RESEARCH METHODS

This research uses a normative legal research method with a library research approach. This method was chosen because the research focuses on analyzing legal norms, concepts, and regulations related to the use of blockchain technology in international trade and efforts to harmonize its laws.

2.1 Statutory Approach:

The approaches used in this research include several approaches, namely the statutory approach, the conceptual approach, and the comparative approach. The statutory approach is carried out by examining various national and international legal regulations related to international trade and digital technology, such as regulations regarding electronic transactions and data protection. The conceptual approach is used to understand the concepts of blockchain, smart contracts, and the principles of international trade law. Meanwhile, the comparative approach is carried out by comparing blockchain regulations in several countries to examine the possibility of legal harmonization.

2.2 Conceptual Approach:

The approaches used in this research include several approaches, namely the regulatory approach (statutory approach), the contextual approach (conceptual approach), and the comparative approach (comparative approach). The regulatory approach is carried out by examining various national and international legal regulations related to international trade and digital technology, such as regulations regarding electronic transactions and data protection. The contextual approach is used to understand the concepts of blockchain, smart contracts, and the principles of international trade law. Meanwhile, the comparative approach is carried out by comparing blockchain regulations in several countries to examine the possibility of

legal harmonization.

2.3 Practical Evaluation (Evaluative Approach):

Data collection was conducted through documentation studies, namely by reviewing and examining various literature relevant to the research topic. Data sources were obtained from scientific journal databases, international agency reports, and credible academic publications and exchanges. The data analysis technique used was qualitative analysis with a descriptive-analytical method. The collected data was then analyzed by identifying, classifying, and interpreting various concepts and legal norms related to blockchain in international trade. Furthermore, deductive conclusions were drawn, namely by drawing conclusions from general to specific matters to answer the research problem.

RESULTS AND DISCUSSION

RESULTS

1. Blockchain Concept in International Trade

Blockchain is a distributed ledger technology that enables decentralized and immutable data recording. In the context of international trade, this technology serves as a transparent and secure system for recording cross-border transactions without the need for a third party as an intermediary. (De Filippi & Wright, 2022).

Blockchain's key characteristics—transparency, cryptographic security, and decentralization—make it highly relevant in international trade involving multiple parties and jurisdictions. With this system, every transaction can be verified in real time by all parties involved, thereby increasing trust among global business actors. (World Economic Forum, 2023)

The application of blockchain in international trade can be seen in the trade finance sector, where this technology is used to digitally process documents such as letters of credit. This can reduce processing times that previously took days to mere hours. (International Chamber of Commerce [ICC], 2022)

Furthermore, blockchain is also used in supply chain management. This technology enables transparent tracking of goods from producers to end consumers, thereby increasing accountability and reducing the risk of counterfeiting. One important innovation in blockchain is smart contracts, digital contracts that can be automatically executed when certain conditions are met. In international trade, smart contracts can replace conventional contracts and

expedite transaction execution.

However, blockchain adoption still faces various challenges, such as limited scalability, energy consumption, and the complexity of integration with existing systems. This poses a barrier to widespread implementation in global trade. From a legal perspective, blockchain also raises questions regarding the validity of digital documents, the recognition of smart contracts, and legal liability in decentralized systems. This ambiguity indicates that the technology has not been fully matched by adequate legal development.

Therefore, while blockchain offers efficiency and transparency in international trade, a comprehensive understanding of both the technology and the law is necessary for optimal implementation and legal certainty for all parties.

2. Legal Issues in Blockchain Use

One of the main challenges in using blockchain in international trade is the lack of clarity regarding legal jurisdiction. Because blockchain is cross-border and decentralized, it is difficult to determine which country's laws apply to a transaction. Another issue concerns the legal validity of smart contracts. Not all countries recognize digital contracts as valid evidence, creating legal uncertainty in blockchain-based transactions.

Furthermore, the issue of personal data protection is a major challenge. The transparency of blockchain can conflict with data protection principles, especially in legal systems that strictly regulate privacy rights. (Raskin, 2022) Another issue that arises concerns legal liability. In blockchain systems, which lack a central authority, it is difficult to determine who is responsible in the event of errors or violations of the law.

In terms of regulation, there are differences in approaches between countries in regulating blockchain. Some countries are progressive, while others remain very restrictive, creating disharmony in global law. This lack of synchronization impacts businesses, who must adapt to various regulations in each country, increasing compliance costs.

Furthermore, the lack of international standards governing the use of blockchain in trade exacerbates legal uncertainty. This hinders the technology's widespread adoption globally. Thus, these various legal issues demonstrate that

the use of blockchain in international trade still requires clearer and more globally coordinated regulations.

DISCUSSION

1. Harmonization of International Trade Law on Blockchain

Legal harmonization is an effort to align different legal systems to create legal certainty in international relations. In the blockchain context, legal harmonization is crucial given the cross-border nature of the technology. One step toward harmonization can be achieved through the development of an international convention governing the use of blockchain in trade. International institutions such as UNCITRAL play a crucial role in formulating global legal standards.

Furthermore, harmonization can also be achieved through the adoption of uniform legal principles, such as the recognition of electronic documents and smart contracts as valid evidence in international transactions. Another approach is through soft law, such as international guidelines and recommendations that can be voluntarily adopted by countries. This approach is considered more flexible in keeping up with rapid technological developments. (United Nations Commission on International Trade Law [UNCITRAL], 2022)

Legal harmonization also needs to consider the balance between technological innovation and legal protection, including personal data protection and cybersecurity. Several countries have begun developing regulations that support the use of blockchain, such as the recognition of digital contracts and blockchain-based identity systems. This can serve as a model for other countries in the harmonization process.

However, the harmonization process is challenging due to differences in national interests, legal systems, and levels of technological development in each country. Therefore, strong international cooperation and a shared commitment are needed to create a harmonious and adaptive legal framework for blockchain developments in international trade.

Many academics and legal practitioners have conducted extensive research on the use of blockchain in international trade. However, most research focuses on technical aspects and technology implementation, while studies on international legal harmonization are relatively limited.

Research conducted by Arun Gupta, Vivek Goyal, and Bhavana Singh in the article "Blockchain in International Trade Finance: Legal Risks, Compliance

Challenges, and Regulatory Gaps" (2025) discusses various legal risks, compliance challenges, and regulatory gaps in the application of blockchain to international trade finance. The results show that although blockchain can improve the efficiency of trade transactions, obstacles remain in the form of regulatory inconsistencies between countries, potentially creating legal uncertainty.

Furthermore, Milind Thokal's research, "Blockchain Technology and Trade Finance: Implications for International Trade Law" (2024), examines the impact of blockchain use on international trade law. The study found that blockchain technology can transform global trade mechanisms through document digitization and contract automation, but this has not been matched by adequate legal system readiness, particularly regarding the legal recognition of smart contracts.

Another study was conducted by Runhan Zhao in the article "Legal Frameworks and Challenges for Blockchain-Based Bills of Lading in International Trade" (2024). This study focused on the use of blockchain in electronic bills of lading. The results showed that blockchain use can improve the security and authenticity of international trade documents, but still faces obstacles in the form of differing legal regulations across countries.

Furthermore, research by Oktafiani Permata Dewi et al. in "Harmonization of International Commercial Law and Personal Data Protection in the Blockchain Era" (2026) discusses the relationship between personal data protection and the harmonization of international trade law in the blockchain era. This study emphasizes the importance of harmonizing international regulations to address legal conflicts arising from the cross-border and decentralized nature of blockchain.

Based on these previous studies, it can be seen that studies on blockchain in international trade generally focus on aspects of technological implementation, legal risks, and data protection. Meanwhile, this study focuses more on analyzing the urgency of harmonizing international trade law as an effort to create legal certainty in the use of blockchain. Thus, this research has a novelty in its focus of discussion, which examines the relationship between the development of blockchain technology and the need for more comprehensive harmonization of international law.

Figure 1.1: Comparison of Document Processing Time between Conventional Contracts and Blockchain Smart Contracts

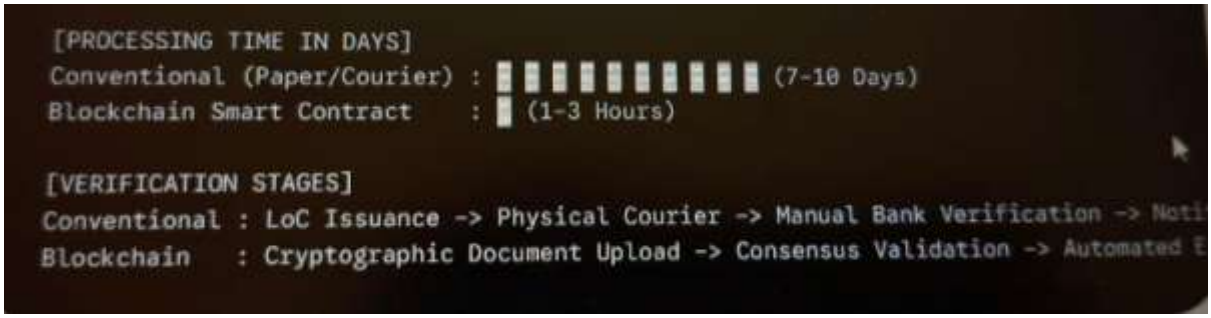
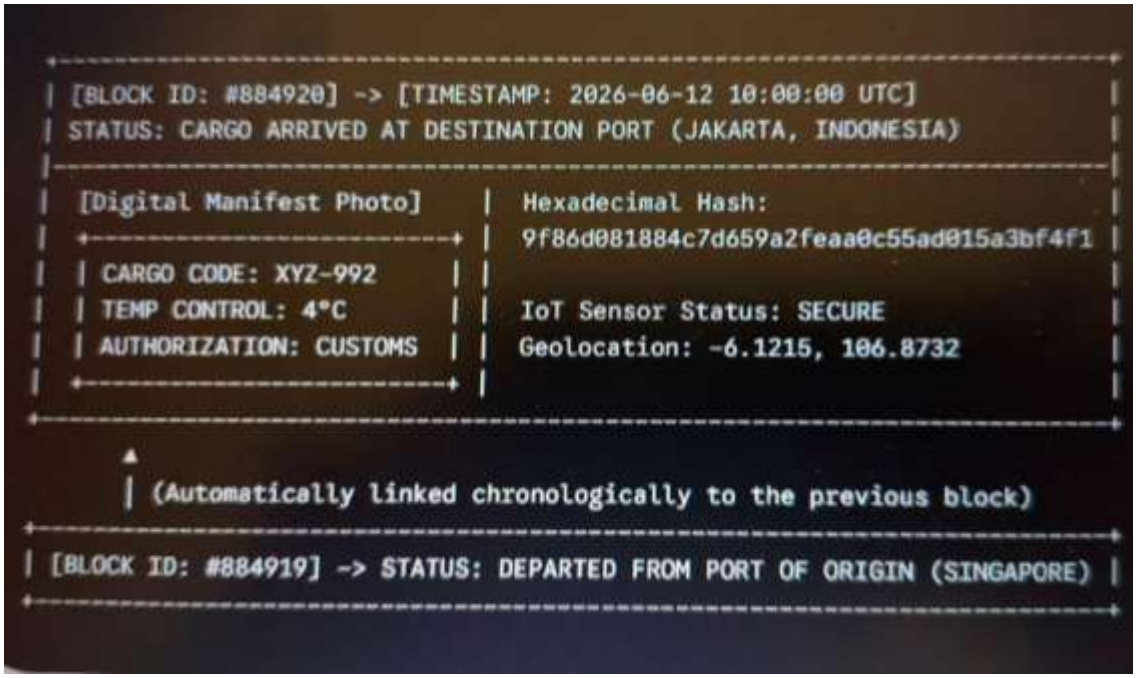


Figure 1.2: Visual Data of Container Tracking Coordinates



(Trevan/Provenance) on the Blockchain Ledger

CONCLUSION

The development of blockchain technology has brought significant changes to the international trade system, particularly in increasing the efficiency, transparency, and security of transactions across countries. This technology enables decentralized data recording and the use of smart contracts that can automate the execution of agreements without the need for a third party. This demonstrates that blockchain has significant potential to transform global trade mechanisms, which have historically relied on conventional systems.

However, the application of blockchain in international trade still faces various challenges, particularly in legal aspects. Issues such as unclear recognition, the lack of universal recognition of smart contracts, and differences in regulations between countries are major obstacles to the widespread adoption of this technology.

Furthermore, issues of personal data protection and legal liability in decentralized systems are also important concerns that need to be addressed immediately.

Legal disharmony between countries indicates a gap between technological developments and the readiness of existing legal systems. This situation has the potential to pose legal threats to international businesses and hinder the optimal use of blockchain in global trade.

Therefore, harmonization of international trade law is an urgent need. This harmonization effort aims to create regulatory uniformity, increase legal certainty, and support sustainable technological innovation. With a harmonious legal framework, it is hoped that blockchain implementation in international trade can run effectively and provide maximum benefits for all parties involved.

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