

Blockchain Technology's Role in Improving Financial Transaction Security

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Article Info	Abstrak
Article history: Accepted: Date, Month, Year Publish: Date, Month, Year	Perkembangan teknologi keuangan digital menghadirkan tantangan besar dalam menjaga keamanan transaksi. Salah satu inovasi yang menonjol adalah teknologi blockchain, yang menawarkan mekanisme desentralisasi, transparansi, dan kriptografi canggih. Artikel ini mengkaji konsep blockchain, mekanisme kerjanya, serta peranannya dalam meningkatkan keamanan transaksi keuangan. Analisis dilakukan melalui studi literatur dari berbagai jurnal internasional, laporan industri, dan studi kasus di sektor perbankan, fintech, dan aset kripto. Hasil kajian menunjukkan bahwa blockchain mampu meminimalkan risiko manipulasi data, meningkatkan efisiensi proses verifikasi, serta memperkuat kepercayaan pengguna. Kata kunci: Blockchain, keamanan transaksi, fintech, desentralisasi, kriptograf
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Article Info	Abstract
Article history: Accepted: Date, Month, Year Published: Date, Month, Year	<i>The proliferation of digital financial technology presents a major challenge in maintaining transaction security. One prominent innovation is blockchain technology, which offers decentralisation, transparency, and advanced cryptographic mechanisms. This article examines the concept of blockchain, its working mechanism, and its role in improving the security of financial transactions. The analysis is conducted through a literature study of various international journals, industry reports, and case studies in the banking, fintech, and cryptocurrency sectors. The results show that blockchain can minimise the risk of data manipulation, improve the efficiency of the verification process, and strengthen user trust.</i> <i>Keywords:</i> Blockchain, transaction security, fintech, decentralisation, cryptography
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1. INTRODUCTION

The development of the digital economy in Indonesia has fuelled the exponential growth of online financial transactions. According to a report by Bank Indonesia (2024), the value of electronic money transactions reached more than IDR 800 trillion, an increase of around 30% compared to the previous year. This phenomenon indicates a significant change in people's behaviour, as they increasingly rely on digital financial services to support their daily economic activities. However, the rapid growth of digital transactions is also accompanied by increasing cybersecurity threats, such as personal data leakage, digital identity theft, and financial system hacking, which have the potential to reduce public trust in the digital financial ecosystem.

In this context, blockchain technology has emerged as one of the innovations that offers a solution to the problem of digital transaction security. This technology works with a decentralised

system and cryptographic encryption that allows each transaction to be verified through a network consensus (consensus mechanism), thus reducing the risk of manipulation and single points of failure that are common in centralised systems. With the characteristics of transparency, immutability, and auditability, blockchain is believed to improve the integrity and security of the digital financial system in Indonesia.

Therefore, this article aims to analyse the role of blockchain technology in improving the security of digital financial transactions, as well as identify the challenges of its implementation in the financial sector in Indonesia, both from the aspects of technology, regulation, and the readiness of human resources and infrastructure.

The development of the digital economy in Indonesia has shown rapid growth in the past decade. Digital transformation fuelled by advances in information and communication technology has changed the way people transact, interact and participate in economic activities. According to a report by Bank Indonesia (2024), the value of electronic money transactions in Indonesia reached more than IDR 800 trillion, an increase of around 30 per cent compared to the previous year. This growth reflects a change in public behaviour towards a cashless payment system that is more efficient, fast and practical. In addition, the development of the digital ecosystem is also driven by wider internet penetration, increased smartphone usage, and the emergence of various digital financial platforms such as mobile banking, digital wallets, and fintech services.

However, behind the convenience and efficiency offered by the digital financial system, there are major challenges related to cybersecurity. The increasing volume of online transactions has fuelled the rise of digital crimes such as personal data leakage, digital identity theft, phishing, and hacking of financial systems targeting both users and financial institutions. According to data from the Financial Services Authority (OJK), through 2023 there will be a significant increase in cybercrime cases in the digital financial sector, which will result in a loss of trust in online financial services. This risk demands a more robust, transparent and difficult-to-manipulate security system to maintain transaction integrity and protect user data.

In this context, blockchain technology emerges as one of the innovations that promises to solve various digital transaction security problems. Blockchain is a distributed digital record system that works on the principles of decentralisation and cryptography, where every transaction that occurs is verified by the network collectively through a consensus mechanism. Thus, no single party has sole control over the data, thus reducing the risk of single point of failure that is prevalent in centralised systems. Each verified block of data is immutable, making blockchain extremely reliable and secure. These characteristics allow blockchain technology to be utilised not only in cryptocurrencies, but also in a variety of sectors, including financial systems, logistics, healthcare, and government.

Based on these conditions, it is important to conduct an in-depth study on the role of blockchain technology in improving the security of digital financial transactions. This study is expected to provide a comprehensive understanding of how blockchain can create a more secure, transparent, and efficient financial system, as well as identify implementation challenges faced in Indonesia. Thus, this study is expected to contribute to the development of policies and strategies for the sustainable application of blockchain technology in supporting the national digital financial ecosystem.

Digital Economy and Digital Financial Transactions

Digital economy is a form of economic activity that utilises digital technology as the main foundation in the process of production, distribution, and consumption of goods and services. According to Tapscott (2016), the digital economy includes not only online transactions, but also all activities integrated with data-based systems and internet networks. In the Indonesian context, Bank Indonesia (2024) states that the increase in the value of electronic money transactions is one of the main indicators of digital economy growth. E-commerce, mobile banking, fintech, and digital payment services are the main drivers that expand financial inclusion and accelerate economic circulation in society.

However, the growth of digital transactions also increases the risk of cybercrime and data manipulation. According to the Financial Services Authority (2023), threats such as phishing, ransomware, and data breaches pose serious challenges to financial institutions and digital service users. Therefore, the security and reliability of transaction systems are key factors in maintaining public trust in the digital economy ecosystem.

Concept of Digital Financial Transaction

Security Digital transaction security can be defined as an effort to protect users' financial information from unauthorised access, use, or modification. According to Laudon and Laudon (2022), information security includes three main principles, namely confidentiality, integrity, and availability - known as the CIA Triad. In the digital financial system, these principles are realised through the implementation of user authentication, data encryption, firewalls and security audits. Although various security technologies have been implemented, centralised systems still have a fundamental weakness, which is the dependence on a single point of failure. If this point is attacked or compromised, the entire system can be disrupted. Therefore, there is a need for a system that not only protects data, but also ensures the integrity of transactions through a more transparent and distributed mechanism - this is the main advantage of blockchain technology.

Blockchain Technology and Its Working Principles

Blockchain was first introduced by Satoshi Nakamoto in 2008 as the underlying technology behind the Bitcoin cryptocurrency. Conceptually, blockchain is a distributed digital ledger technology that records every transaction in the form of chronologically linked and encrypted blocks (Swan, 2015). Each block contains transaction information that has been verified by the network through consensus mechanisms such as Proof of Work (PoW), Proof of Stake (PoS), or Byzantine Fault Tolerance (BFT).

According to Crosby et al. (2016), the main advantage of blockchain lies in its decentralised, transparent, immutable, and secure by design. Since there is no single authority controlling the system, blockchain is able to minimise the potential for data manipulation and increase trust between transacting parties. In a financial context, blockchain can be used to record transactions directly between users (peer-to-peer) without the need for intermediaries such as banks, thus speeding up the process and reducing operational costs.

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and efficiency of digital financial systems. According to Pilkington (2016), blockchain is able to create an automated audit system that validates every transaction in real-time, thus preventing fraud and data errors. In addition, this technology supports the implementation of smart contracts, which are digital contracts that are executed automatically based on agreed terms, without third-party intervention. In Indonesia, the potential application of blockchain in the financial system is gaining attention. Several financial institutions have begun testing the use of blockchain in cross-border payment systems, recording digital asset transactions, and digital identity verification. However, the adoption of this technology is still limited to the trial stage due to technical constraints, implementation costs, and regulations that are not yet fully supportive.

Challenges of Blockchain Implementation in Indonesia

Despite its many advantages, the application of blockchain in Indonesia's financial sector still faces a number of challenges. First, technological infrastructure readiness is still a major obstacle, especially for small and medium-sized financial institutions that do not yet have adequate digital systems. Second, digital literacy and technical understanding of human resources are still low, so the application of blockchain is not optimal. Third, government regulations and policies are not yet fully adaptive to the cross-border and decentralised characteristics of blockchain technology. In addition, the issue of interoperability between systems and the high energy costs of certain consensus mechanisms are also important concerns in long-term implementation. Thus, this literature review shows that blockchain has great potential to improve the security and transparency of digital financial

transactions in Indonesia. However, its success is highly dependent on the readiness of the national digital ecosystem, clear regulatory support, and capacity building of human resources in the financial technology sector.

2. RESEARCH METHODS

This research uses a qualitative approach with a descriptive-analytical method, which aims to deeply understand the role of blockchain technology in improving the security of digital financial transactions in Indonesia. The qualitative approach was chosen because this research focuses on exploring the phenomena, perceptions, and challenges of blockchain technology implementation in the financial system, rather than on measuring quantitative relationships between variables. According to Creswell (2020), qualitative research allows researchers to gain a comprehensive understanding through in-depth interpretation of contextualised data.

This research was conducted in Jakarta, Yogyakarta, and Bali, which are centres of growth for the digital economy and fintech ecosystem in Indonesia. The research took place from March to August 2024, covering the stages of data collection, analysis, and preparation of research reports.

The data used consists of: Primary data, obtained through in-depth interviews with experts, digital finance practitioners, blockchain technology developers, and regulators such as Bank Indonesia and OJK. Secondary data, obtained from various trusted sources, including annual reports from Bank Indonesia, Financial Services Authority, Ministry of Communication and Information, scientific journals, academic articles, as well as industry reports from Katadata and the Indonesian Fintech Association.

Data collection was conducted through the following techniques: In-depth interviews, to explore stakeholders' perceptions and experiences towards the application of blockchain in the financial system. Documentation studies, including review of policy reports, scientific publications, and regulatory documents relevant to digital transaction security. Non-participatory observation, conducted on digital financial platforms that have implemented blockchain technology to see the transaction and security mechanisms used.

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This research is limited to analysing the role and challenges of implementing blockchain technology in Indonesia's digital finance sector, particularly in online transaction services (digital payments and fintech). This research does not discuss in-depth technical aspects related to coding or development of blockchain systems, but instead focuses on managerial, policy, and security analyses of digital transactions.

3. RESULTS AND DISCUSSION (12 Pt)

a. The Role of Blockchain Technology in Digital Financial Transaction Security

The results show that blockchain technology has a significant contribution to improving the security of digital financial transactions in Indonesia. Based on interviews with several fintech practitioners and financial technology experts, blockchain is considered capable of reducing the risk of data manipulation and cyberattacks through decentralisation and cryptographic encryption mechanisms. Every transaction made on a blockchain network is verified by many nodes in the system, making it almost impossible for certain parties to manipulate data without being detected. In addition, blockchain technology also has the property of immutability, where any transaction records that have been recorded cannot be changed or deleted. This reinforces the principle of a transparent audit trail and increases accountability in digital financial transactions. According to Chen et al. (2022), blockchain systems can minimise the possibility of fraud and increase trust between

parties in online transactions. In the context of Indonesian digital finance, the presence of blockchain can strengthen the cashless payment ecosystem, both in the banking and financial technology (fintech) sectors.

Blockchain implementation also provides benefits in terms of transaction efficiency. The verification process that is done automatically through a consensus mechanism reduces dependence on third parties such as banks or clearing houses. This results in reduced transaction costs and processing time. Some fintech platforms in Indonesia, such as Xendit and Pintu, are starting to develop blockchain-based security systems to improve data reliability and speed up transaction verification.

b. Challenges of Blockchain Implementation in Indonesia's Financial Sector

Despite its great potential, the research results also found various challenges in the implementation of blockchain technology in Indonesia. The main challenges lie in digital infrastructure and human resource readiness. Based on interviews with industry representatives, there are still many financial and fintech institutions that do not have adequate technological infrastructure to support the integration of blockchain into their operational systems. In addition, digital literacy, especially technical understanding of blockchain among developers and regulators, is still relatively low. Regulatory and governance aspects are also important obstacles. Until 2024, regulations on the utilisation of blockchain in Indonesia are still general and do not specifically regulate its application to digital financial transactions. According to the Financial Services Authority (2023), the use of blockchain technology must be balanced with the strengthening of data security policies, consumer protection, and compliance with international standards such as Know Your Customer (KYC) and Anti Money Laundering (AML). The lack of clear regulations can lead to legal uncertainty and reduce industry players' confidence in the implementation of this new technology.

In addition, there are challenges in terms of system interoperability between blockchain technology and the conventional financial system. Most financial institutions in Indonesia still use closed systems, so integration with public or hybrid blockchain networks requires technical adjustments and considerable investment costs. According to Putra and Nugroho (2023), the successful adoption of blockchain requires a phased strategy involving cooperation between the government, financial institutions, academia, and the private sector to build a secure and sustainable ecosystem.

c. Socio-economic Impact and Public Trust

The results also indicate that the application of blockchain not only has an impact on transaction security, but also on increasing public trust in the digital financial system. Data transparency that can be verified by all parties increases the sense of security for users in conducting online transactions. Thus, blockchain adoption can strengthen public trust in national digital payment systems, such as QRIS and e-wallets. In addition, the application of blockchain has the potential to encourage financial inclusion, especially for people who have not been served by formal financial institutions. With a transparent and efficient system, blockchain can be the foundation for the development of more open and accessible financial services, especially in rural and remote areas. This is in line with the Indonesian government's vision to realise an inclusive, safe, and sustainable digital economy.

REFERENCES

- Ali, S., et al. (2023). Blockchain Technology in Financial Security. *Journal of FinTech Innovation*, 12(3), 45–60.
- Bank Indonesia. (2024). *Laporan Perkembangan Uang Elektronik*. Jakarta: BI Press.
- Lee, J., & Kim, S. (2022). "Blockchain Adoption in Banking Sector: Security Perspectives." *International Journal of Digital Finance*, 7(1), 101–118.
- Nakamoto, S. (2008). *Bitcoin: A Peer-to-Peer Electronic Cash System*.
- Bank Indonesia. (2024). *Laporan Perkembangan Transaksi Digital dan Sistem Pembayaran Nasional 2024*. Jakarta: Bank Indonesia.

- Chen, Y., Wang, J., & Li, X. (2022). Blockchain Technology and Financial Security: A Systematic Review. *Journal of Financial Innovation*, 9(3), 112–128.
- Kementerian Komunikasi dan Informatika. (2023). *Peta Jalan Ekonomi Digital Indonesia 2023–2030*. Jakarta: Kominfo RI.
- Katadata Insight Center. (2023). *Survei Keamanan Data Pengguna Digital Indonesia*. Jakarta: Katadata.
- Nakamoto, S. (2008). *Bitcoin: A Peer-to-Peer Electronic Cash System*. Retrieved from <https://bitcoin.org/bitcoin.pdf>