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ANALYSIS OF THE IMPLEMENTATION OF BLOCKCHAIN TECHNOLOGY IN SHARIA BANKING TRANSACTION TRANSPARENCY

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Abstract

This study aims to analyse the implementation of blockchain technology to improve the transparency of Islamic banking transactions. The research method uses a qualitative approach, namely a literature analysis study (library research), with content analysis techniques on various credible sources such as reference books, indexed scientific journals (Scopus, Sinta, Google Scholar), financial reports, and official documents related to policies and regulations in Islamic banking. The focus of this research is to explore the potential of blockchain in strengthening the principles of transparency, accountability, and operational efficiency, and to identify the challenges faced in its implementation in the Islamic banking sector. The results show that blockchain technology is able to minimise the risk of fraud, improve operational efficiency through a decentralised, secure, and immutable transaction recording system, and strengthen customer trust. Innovations such as smart contracts, Islamic DeFi, and digital sukuk open up opportunities for the development of Islamic financial products that are more adaptive and inclusive. However, there are several challenges including regulatory limitations, technological infrastructure readiness, low digital literacy, and the need to adjust blockchain to sharia principles, especially regarding the potential for usury, gharar, and maisir. This research recommends collaboration between regulators, Islamic financial institutions, and technology providers in designing a legal framework that is compliant with sharia principles and supports system transparency. The key to successful blockchain implementation is increased digital literacy among industry players and the public, strengthened regulation, and investment in technological infrastructure. This research also emphasises the importance of further exploring the impact of blockchain on Islamic financial inclusion and customer data protection to build a more transparent, fair and inclusive Islamic banking system.

Keywords: ***Blockchain, Islamic Banking, Transaction Transparency.***

1. INTRODUCTION

The rapid advancement and development of technology has become a topic of much discussion, marked by the birth of various innovations designed to facilitate human activities. Access to information that is available for 24 hours through the internet network encourages changes in behaviour and ways of communicating for the general public at this time. The internet is now a reliable source of information, especially for those who need fast and up-to-date information related to global developments (Sugiharto, 2020).

One of the significant innovations in the financial sector is Financial Technology (fintech), which offers more effective and efficient financial transaction solutions. One of the biggest breakthroughs in fintech is blockchain technology, which offers various advantages, especially in improving the security and efficiency of business operations. Blockchain is a decentralised technology that can store data in a secure and immutable peer-to-peer network. Blockchain is emerging as a potential solution to strengthen the principles of transparency, accountability, and fairness in transactions in the financial sector, including Islamic banking.

Blockchain technology makes it easier to record transactions in real-time with a transparent and secure system. Furthermore, blockchain can minimise the risk of fraud and improve operational efficiency by eliminating the need for third parties as intermediaries. Despite offering many benefits, the application of this technology also

faces various challenges, such as regulations that have not fully accommodated the use of blockchain in the Islamic financial system, the readiness of technological infrastructure, and the low level of digital literacy among industry players and customers.

Islamic finance is a financial system based on sharia principles, which prohibits the practice of usury, maisir, gharar, and investment in prohibited sectors (Hasan et al., 2023). Blockchain technology has a significant impact on this system, especially in terms of standardisation and transparency of financial reporting. Transparent recording of transactions allows for more accurate and efficient data analysis, and makes it easier for regulatory agencies to monitor.

As Islamic finance develops at a rapid pace, challenges related to transparency and security of transactions are becoming increasingly complex. One of the main obstacles is ensuring that every transaction is Shariah-compliant, while maintaining data accuracy and security. Blockchain, with its strong consensus mechanism and encryption, can be a strategic solution in addressing these challenges.

Previous research has examined the benefits of blockchain in the Islamic finance sector. Rista (2024) showed that the implementation of blockchain technology can improve the transparency, efficiency, and security of Islamic banking transactions in Indonesia. Blockchain enables transaction records that can be easily accessed by all relevant parties, minimises the potential for fraud, and increases customer trust. Efficiency is increased through process automation, reduction in the need for third parties, and acceleration of transactions, while data security can be strengthened through cryptography and consensus protocols. However, there are still challenges related to sharia regulations and digital literacy which are the main obstacles in blockchain implementation.

Akyuwen (2020) explains that blockchain can improve the efficiency and transparency of financial transactions by eliminating the need for trusted third parties. The use of distributed ledgers expands secure and transparent financial networks, while the application of artificial intelligence (AI) can optimise processes and strategic decision-making. On the other hand, research by Muhammad & Sari (2020) highlights that fintech, including blockchain, presents positive opportunities for banks to improve efficiency and strategic collaboration with the fintech sector. The application of this technology can not only improve transparency and data security, but can also help banks deal with digital disruption and reduce the risk of fraud.

Although the application of blockchain has shown positive impacts in the financial sector, research on blockchain technology in the context of Islamic banking is still very limited and requires further study, especially related to system integration and compliance with sharia principles. Its application in Islamic banking certainly requires a special approach that considers aspects of sharia law as well as infrastructure and regulatory readiness. Although the application of blockchain has shown positive impacts in the financial sector, research on blockchain technology in the context of Islamic banking is still very limited and requires further study, especially related to system integration and compliance with sharia principles. Its application in Islamic banking certainly still requires a special approach that considers aspects of sharia law as well as infrastructure and regulatory readiness.

This study aims to examine in more depth the implementation of blockchain technology in improving transparency of Islamic banking transactions, including the challenges faced, such as the need for strict supervision of transaction transparency, reducing the risk of errors and fraud, and compliance with sharia principles. This research also seeks to identify the potential for future blockchain development in supporting a more transparent, efficient, and secure Islamic banking system. The results of this study are expected to provide a more comprehensive understanding of the opportunities and challenges of blockchain implementation in Islamic banking, as well as provide strategic recommendations for regulators, Islamic financial institutions, and technology providers to create a more adaptive financial system in the digital era.

2. IMPLEMENTATION METHOD

The method used in this research is a qualitative approach with a literature analysis study method (library research) to understand the application of blockchain technology in improving the transparency of Islamic banking transactions. This approach allows researchers to explore various scientific views and relevant practices regarding the integration of blockchain in the Islamic banking system. The research data collection technique uses the content analysis method of literature that discusses the implementation of blockchain technology in the Islamic banking sector. Data sources were obtained from various credible sources such as reference books, indexed scientific journals (Scopus, Sinta, and Google Scholar), financial industry research reports, and official documents related to Islamic banking policies and regulations. The selection of literature is based on the criteria of relevance, credibility, and actuality of information to ensure the quality of the data analysed (Sugiyono, 2017).

The main topic in this research is the implementation of blockchain in improving transaction transparency in Islamic banking. The analysis process is carried out through several stages, namely:

1. Data Identification: Collecting relevant literature on the use of blockchain in the financial sector, particularly in the context of Islamic banking.
2. Theme Classification: Categorising information based on key topics such as transaction transparency, compliance with Shariah principles, data security, and financial inclusion.
3. Content Analysis: Identified patterns, key issues, and relationships between concepts in the literature. The researcher highlighted several aspects including the strengths, weaknesses, and opportunities of blockchain implementation in the Islamic banking sector.
4. Synthesis and Comparison: Synthesising the data by comparing the various views in the literature to gain a comprehensive understanding of the positive impacts and challenges of blockchain implementation, particularly in relation to transaction transparency and sharia compliance.

The study also examines some of the key challenges in implementing blockchain in Islamic banking, such as compliance with sharia principles (riba, gharar, and maisir), protection of personal data, cost of technology implementation, and regulatory complexity. This study explores the impact of blockchain on financial inclusion, focusing on how blockchain technology can improve people's access to transparent and accountable Islamic financial services. The results of this study are expected to provide insights for Islamic banking practitioners, policy makers, and academic researchers in optimising the application of blockchain technology, as well as identifying the potential and risks that may be faced in an effort to increase transaction transparency and strengthen the Islamic financial system.

3. RESULTS AND DISCUSSION

The use of digital technology in the Islamic financial system opens up new opportunities to improve transparency, security, and transaction efficiency. One technology that has great potential in supporting the principles of Islamic finance is blockchain. This technology allows recording and validating transactions in a transparent, secure, and decentralised manner, in accordance with the provisions of Sharia law. Blockchain is a distributed digital record system designed to produce secure and immutable records of transactions, covering various assets such as money, goods, and property (Saravanan, 2020). The system functions as a tamper-resistant distributed ledger and consists of blocks of data called records. Each block of transactions is recorded and managed with a timestamp, to ensure data integrity and transparency.

According to Septianda et al. (2022), blockchain is a distributed database used to record transactions and can be accessed by related parties. Each transaction must adhere to the network consensus, which can reduce the potential for fraud and increase efficiency. Blockchain technology offers secure access without complicated procedures or high costs. Blockchain is developed through a combination of techniques such as economic models, mathematics, algorithms, and cryptography.

The main features of blockchain include:

1. Decentralisation: No single entity controls the data, reducing the risk of fraud.
2. Transparency: All network participants can view transactions, supporting accountability.
3. Security: Cryptographic algorithms protect data from unauthorised access.

Unlike traditional databases, blockchain has unique characteristics such as decentralisation, immutability, consensus-based, and transparency (Arizona et al., 2022). Blockchain networks are peer-to-peer (P2P), allowing connections between computers (nodes) without intermediaries. Each node has a copy of the ledger and ensures data reliability and security.

Iansiti & Lakhani (2017) identified five basic principles of blockchain, namely:

1. Distributed Database: Data is copied across the network without centralised control.
2. Peer-to-Peer Transmission: Direct communication between participants without intermediaries.
3. Transparency with Pseudonymity: Transactions are visible to all participants but user identity remains anonymous.
4. Irreversibility of Records: Transactions cannot be changed once recorded.
5. Computation Logic: Rules and algorithms trigger automated transactions.

Blockchain technology can increase transparency, reduce the need for intermediaries, and minimise the risk of data misuse. In addition, blockchain reduces transaction costs and speeds up the process, making it more efficient (Septianda et al., 2022). Blockchain in the banking sector is applied in areas such as payments, trade

finance, capital markets, and identity management. The technology optimises transparency and auditability, but faces challenges such as privacy, scalability, system compatibility, and regulation (Judijanto et al., 2024).

Latipah & Fasa (2024) identified several ways of implementing blockchain in the Islamic financial system:

1. Decentralised Transaction Recording: Using smart contracts to verify the conformity of transactions with sharia principles.
2. Automatic Validation of Shariah Compliance: Cryptography ensures data security and minimises fraud.
3. Auditability and Traceability: Transactions are permanently recorded, supporting transparency.
4. Reduction of Intermediaries: Reduced costs and risk of human error.
5. Segregation of Funds and Asset Management: Ensures investments are directed to sectors that are in line with sharia principles.

Therefore, the implementation of blockchain in Islamic banking can not only improve transparency and efficiency but can also strengthen compliance with sharia law.

3.1 Islamic Banking Blockchain Technology

One of the first sectors to adopt blockchain technology was the financial sector, which has now expanded and been applied to various fields. Blockchain is able to increase the security, accuracy, and transparency of transactions, making them more protected from the risk of money laundering, corruption, and data misuse if managed properly. Not only that, blockchain can also speed up the transaction process, streamline the distribution of financing, and accelerate transaction approval procedures. The application of blockchain technology has a significant contribution, which is around 60-70% to the overall financial sector. This technology enables the banking system to operate with faster, safer and more efficient data processing, thereby mitigating risks from fraud and ensuring compliance with Anti Money Laundering (AML) policies. Furthermore, the use of blockchain is projected to save operational costs of up to USD 7-9 billion per year through increased efficiency and reduced operational risk (Arwani & Priyadi, 2024). Blockchain in the context of Islamic finance is utilised to support transactions that comply with sharia principles. This technology allows for recording and validating transactions transparently, securely, and without involving third parties in line with sharia principles, which reject the practice of usury, gharar (excessive uncertainty), and maysir (speculation). Research conducted by Yudih et al. (2024) revealed that the application of blockchain technology in Islamic financial institutions has the potential to improve operational efficiency, strengthen transparency, and reduce the risk of fraud. In addition, global projections estimate that this technology can save financial institutions up to USD 20 billion per year, especially in terms of reducing international transfer costs, regulatory compliance, and accelerating transaction settlement (Ali & Rahman, 2023).

According to Zainuddin & Hashim (2024), there are several key benefits of implementing blockchain in the Islamic banking system, including:

1. Better Transparency
   Blockchain allows all transactions to be permanently recorded and accessible to relevant parties, reducing the risk of disputes and increasing trust between banks and customers.
2. Process Efficiency
   The use of smart contracts enables the automation of agreements, speeds up the processing of transactions, and reduces operational costs and time.
3. Data Security
   Encrypted and decentralised transaction data makes it more difficult to manipulate or steal, thus increasing the protection of customer data.
4. Easier Auditing
   With all transactions recorded on the blockchain, audits are fast, accurate, and transparent, which is in line with Islamic finance principles that emphasise accountability.

   Various blockchain-based innovations continue to be developed to support Islamic banking products and services, including:

1. Smart Contracts: Enables automatic execution of agreements in accordance with sharia principles. In musharakah contracts, profit and loss margins are shared proportionally, while in murabahah contracts, the process of buying and selling goods can be automated to ensure sharia compliance (Rahman & Fadhil, 2023).
2. Sharia DeFi (Decentralised Finance): Shariah-based DeFi platforms enable Peer-to-Peer (P2P) financing schemes that facilitate direct financing to SMEs or individuals without intermediaries. Shariah-based crowdfunding allows the community to participate in shariah-based project funding with higher transparency.

3. Blockchain-based Sukuk: Issuing and trading sukuk (Islamic bonds) through blockchain improves efficiency and transparency. The technology makes it easier to track the distribution of funds, minimise risks, and speed up the issuance process (Yudih et al., 2024).

Despite offering various benefits, blockchain integration in Islamic banking faces several challenges, including:

a. Regulatory Complexity: Blockchain implementation requires a clear legal framework to ensure compliance with sharia law and conventional banking regulations (Hakim & Fauzi, 2024).
b. Lack of Technology Literacy: The lack of understanding about blockchain among Islamic financial industry players is a major obstacle in the process of adopting this technology.
c. Scalability and Cost: Although blockchain offers long-term efficiency, the initial cost of development and system integration is high and requires substantial resources.

Blockchian is very useful in Islamic banking, but it also has challenges in its implementation, one of which is the lack of clear regulations regarding the use of this technology in the Islamic financial system. Islamic banking is bound by the principles of Islamic law that require every transaction to be free from elements of usury, gharar (uncertainty), and maysir (speculation). Although it offers transparency and security, it still faces questions about its compatibility with sharia principles, especially in relation to the use of smart contracts and consensus mechanisms that may introduce elements of gharar. In addition to this, the absence of legal standards governing the use of blockchain in Islamic banking has led to concerns about legal and ethical compliance. Islamic financial supervisory institutions such as the National Sharia Council (DSN-MUI) and the Financial Services Authority (OJK) need to develop specific guidelines to ensure the use of blockchain is in line with sharia principles.

The implementation of blockchain technology requires a robust technological infrastructure and significant costs, from system development, data security, to human resource training. Not all Islamic banks, especially small or medium-sized ones, have the financial and technical capacity to adopt this technology. In addition, the reliability of the network infrastructure is also an important factor. The blockchain system requires a stable connection to process transactions in real-time. In some areas where digital infrastructure is limited, the implementation of blockchain may be less than optimal, leading to transaction delays and the risk of data loss.

The level of technological literacy among sharia banking industry players is also one of the obstacles in implementing blockchain. A high level of complexity is required for a deep understanding of decentralized data management, cryptography, and mechanism context. A gap exists between technological needs and human resource capacity due to the lack of experts in the blockchain field in the Islamic banking sector. Therefore, training and increasing HR competency is a crucial step to ensure blockchain implementation runs effectively.Even though blockchain has been known for its level of security, challenges in maintaining data privacy remain, especially in sharia banking which has the obligation to maintain customer data privacy. Blockchain is transparent because all parties in the network can access transaction information, but in the context of sharia banking, customer personal data must be protected according to personal data protection regulations. Apart from that, cyber threats such as hacking, 51% attacks, and malware are also potential risks. Even though the blockchain system has a cryptographic security layer, this system in Islamic banking requires a combination of transaction transparency and protection of customer data privacy.

Public acceptance and the level of customer trust in new technology are important factors in the success of blockchain implementation. In the sharia banking system, customers must be more alert and careful about technological changes that affect their transactions. The perception of blockchain technology is that it is identical to cryptocurrencies which are considered not in accordance with sharia principles. In fact, the application of blockchain in sharia banking is prioritized on the transaction recording and verification system, not on the use of digital assets such as cryptocurrency. Therefore, education and outreach to the public regarding the benefits and working principles of blockchain are the main and important steps to increase customer trust.

To overcome these challenges, several strategies need to be implemented, namely:

1. Preparation of Special Regulations: Collaboration between regulators, sharia scholars and technology developers to formulate a legal framework that regulates the use of blockchain in sharia banking.
2. Improved Technology Infrastructure: Investments in security systems and networks to ensure blockchain can be implemented more effectively and efficiently.
3. Increasing Technological Literacy: Special training for workers in sharia banking to increase understanding of blockchain technology.
4. Data Protection and Cyber Security: Development of a multi-layered security system to maintain the privacy of customer data and prevent the risk of cyber attacks.

5. Customer Education: Socialization of the benefits of blockchain technology in increasing transparency and security of transactions to increase public trust.

3.2 Transparency of Sharia Banking Transactions Via Blockchain

The principle of transparency in sharia banking is the main pillar in maintaining customer trust. Sharia regulations and ethics require that every transaction be recorded and reported honestly and openly (Wiyono, 2022). Blockchain technology makes it possible to record all transactions transparently and permanently, ensuring that financial processes run according to sharia principles which prioritize honesty and openness (Kompasiana, 2024).

The adoption of blockchain technology in its application to sharia banking has a positive effect on increasing the transparency of financial transactions, because every party involved can access proof of transactions transparently. This transparency simplifies the external audit and reporting process which is in line with sharia legal principles (Bahanan & Wahyudi, 2023). Blockchain can guarantee the integrity and authenticity of data by utilizing cryptographic algorithms and a decentralized consensus system, which reduces the risk of fraud, manipulation and cyber attacks (Pangestu, 2023). In addition, blockchain enables general public confirmation of transactions to all relevant parties, increasing the trust of customers and sharia authorities. This technology facilitates external audits and reporting in accordance with sharia principles and increases operational efficiency (Pangestu, 2023).

The application of blockchain in sharia banking is expected to strengthen transaction transparency. This technology ensures that every transaction is recorded on the network and cannot be changed or manipulated, allowing all parties involved to verify information safely and transparently (Wilson et al., 2024). This is relevant to sharia principles which prioritize transparency and honesty in financial transactions. In addition, blockchain can increase accountability in the management of sharia funds such as zakat, waqf and investment funds, by ensuring that funds are distributed according to their intended purpose without the risk of manipulation (Rahman, 2023). This blockchain technology also protects transaction data from unauthorized changes through a sophisticated cryptographic system, maintaining the integrity of sharia transactions, especially in avoiding elements of gharar due to erroneous and unclear information (Rahman, 2023).

Collaboration between regulators, financial institutions and stakeholders is needed to maximize the benefits of blockchain in the Islamic financial system, because overall, the application of blockchain in Islamic banking offers great potential in increasing transparency, efficiency and security of transactions, in line with sharia principles which prioritize honesty, fairness and accountability.

There are several opportunities for implementing Blockchain Technology in Sharia Banking, namely;

1. Increased Transparency and Customer Trust
   Blockchain technology enables permanent and decentralized recording of transactions, so that all relevant parties can verify the accuracy of the data. This is in line with sharia principles which prioritize honesty and transparency in every financial transaction (Halim, 2022).
2. Operational Efficiency through Smart Contracts
   The use of smart contracts in blockchain can automate sharia agreements, such as mudharabah or musyarakah contracts, which reduces the need for intermediaries and speeds up the transaction process. This has the potential to reduce operational costs and increase service efficiency in sharia banking (Sutanto & Fadilah, 2023).
3. Improved Data Security
   Blockchain uses strong cryptographic algorithms to ensure data integrity and security. In the context of sharia banking, related matters can help to protect sensitive information from customers and prevent data manipulation (Wijaya, 2021).
4. Wider Financial Inclusion
   Blockchain implementation can expand access to sharia financial services to people who cannot be reached by the traditional banking system. With a blockchain-based platform, services such as sharia microfinance can be accessed more easily by communities in need (Nugroho & Putri, 2024).

The development of a strategy for implementing blockchain technology in sharia banking must be carried out holistically and in stages by considering several aspects such as technology, regulations, literacy and the readiness of the sharia financial ecosystem. Several strategies for developing blockchain implementation in Sharia Banking are:

1. Development of a Clear Regulatory Framework
   Collaboration between regulators, ulama and technology practitioners is needed to formulate regulations that accommodate the use of blockchain in sharia banking. Regulations must ensure that the implementation of blockchain technology complies with sharia principles and protects customer interests (Yusuf & Rahmawati, 2023).
2. Investment in Technology Infrastructure
   Islamic banks need to invest in developing technological infrastructure that supports blockchain implementation, including cyber security systems and reliable networks. This is important to ensure that the blockchain system can operate efficiently and safely (Pratama, 2022).
3. Increasing Human Resource Literacy and Competency
   Training and education for employees in sharia banking regarding blockchain technology is urgently needed. With good understanding, banking employees can operate and utilize blockchain technology optimally in banking services (Hendrawan & Lestari, 2023).
4. Socialization and Education to the Community
   Increasing public awareness and understanding of the benefits of blockchain in sharia banking will increase trust and acceptance of this technology-based service. Education and outreach can be carried out through seminars, workshops and information campaigns (Ananda, 2024).
5. Development of Strategic Partnerships
   Islamic banks can establish partnerships with technology companies, research institutions and educational institutions to develop innovative blockchain solutions that suit customer needs according to sharia principles (Sari & Nugroho, 2023).

4. CONCLUSION

Based on the results of research and theoretical studies that have been carried out, it can be concluded that the implementation of blockchain technology has great potential in increasing transaction transparency in sharia banking. The main characteristics include decentralized data recording, openness, and its immutable nature. This technology is able to create a safer, more efficient and accountable banking ecosystem, in line with sharia principles. Apart from that, blockchain also plays a role in reducing the risk of fraud, can increase the level of customer trust, speed up the transaction process, and can reduce dependence on intermediaries in the sharia financial system.

The increased transparency and efficiency offered by blockchain technology also contributes to strengthening transaction security through the implementation of robust cryptography and consensus mechanisms. Innovations such as smart contracts, sharia-based DeFi, and blockchain-based sukuk have opened up new opportunities in the development of sharia financial products that are more adaptive and in line with global and modern market demands. However, the implementation of this technology is faced with a number of challenges. One of the main challenges is regulations that have not fully accommodated the characteristics of blockchain in the Islamic financial system. Apart from that, limited infrastructure, low technological literacy among industry players, and the need to improve the quality of human resources are important aspects and need further attention.

The successful application of blockchain technology in sharia banking depends on synergy between regulators, financial institutions, the technology industry and academia to build an ecosystem that is safe, standardized and in accordance with sharia principles. This research is limited by its theoretical approach, without any empirical data from Islamic financial institutions that have adopted and implemented blockchain technology. Therefore, it is recommended that further research use an empirical approach, such as case studies on Islamic banks, to evaluate the real impact of blockchain implementation on transparency, operational efficiency and the level of customer trust. Apart from that, further analysis regarding the legal, social and economic aspects of blockchain implementation is also important to ensure its conformity with sharia principles and the needs of the sharia banking industry, especially in Indonesia. With a comprehensive development strategy, supportive regulations, and increased technological literacy in the sharia financial sector, blockchain technology has the potential to become a strategic instrument in building a more transparent, fair and inclusive sharia banking system.

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