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Blockchain-Based Waqf Management System: Islamic Social Finance Transparency and Accountability Solution

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Abstract
This research aims to examine the application of blockchain technology in waqf management systems, with a primary focus on how this technology can improve transparency, accountability, and efficiency in the management of Islamic social funds. Blockchain, with its ability to record transactions decentrally and permanently, offers a very potential solution to address key issues in waqf management, such as unclear record-keeping, difficulties in fund distribution, and weak oversight. The method used in this study is an in-depth literature review, by analyzing various recent studies that discuss the application of blockchain in waqf management. The study also evaluated examples of blockchain implementation on waqf in several countries with large Muslim populations, such as Indonesia, to see the potential impact of this technology in improving waqf management. The results show that blockchain can address major challenges in waqf management, particularly in terms of transaction transparency and better supervision. By using blockchain, every transaction of waqf funds can be tracked in real-time, thereby reducing the risk of misuse of funds and increasing public trust in the waqf system. The implications of this study suggest that the application of blockchain in waqf management can strengthen Islamic social financial governance and support further development in the Islamic philanthropic sector, by ensuring that waqf funds are used in accordance with predetermined social and economic objectives.
Keywords: *blockchain, waqf, accountability, social finance*

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INTRODUCTION

Waqf is an important philanthropic instrument in the social and economic context of Muslims. Waqf plays a role in supporting social and financial development, providing funds that can be used for long-term charitable purposes, such as the establishment of hospitals, schools, and religious institutions. Despite its great potential, waqf management often faces major challenges, especially in terms of transparency and accountability. Lack of transparency and lack of accountability can reduce public trust in waqf institutions and hinder the development of wider waqf funds. Therefore, new technologies that can increase transparency and accountability in waqf management are urgently needed.

Blockchain, as a technology known for its decentralization and transparency capabilities, is emerging as an effective solution to address these challenges. Using the blockchain, any transaction involving waqf funds can be permanently recorded in a decentralized ledger, allowing all parties involved to verify transactions transparently and accurately. As explained by Habib and Ahmad (2020), the use of smart contracts on blockchain can also increase efficiency in the distribution of waqf funds, allowing for more automated, secure, and secure management of funds.

One of the main advantages of blockchain technology is its ability to create an open and transparent system, which allows real-time monitoring of waqf funds by all relevant parties. Research by Zulkarnaen, Mukhlisin, and Pramono (2021) shows that the application of blockchain in waqf management in Indonesia is very promising to increase the level of transparency in financial recording and reporting. This is important considering that some waqf institutions in Indonesia still face problems with less transparency and oversight. With blockchain, every waqf fund transaction can be clearly recorded, and financial statements can be easily accessed by related parties, ensuring there is no potential for misappropriation of funds.

In addition to transparency, waqf management also requires high accountability. Research by Mohaiyadin et al. (2022) reveals that blockchain can help improve accountability in waqf management, particularly in terms of internal oversight and control of fund distribution. With blockchain, the process of distributing waqf funds can be openly monitored by all parties, reducing the potential for misuse of funds and ensuring that waqf funds are used for purposes that are in accordance with the wishes of the waqif (donor). The use of blockchain in waqf also helps ensure that decisions regarding the distribution of funds are not only timely but also transparent, thus strengthening public trust in the waqf system.

On the other hand, a challenge that may arise is the adoption of blockchain technology in waqf institutions, especially in developing countries with limited technological infrastructure. Research by Azganin (2019) identified that while blockchain can offer a wide range of benefits for waqf management, technical challenges, such as infrastructure and digital literacy, can hinder its implementation. Therefore, it is important to provide adequate training and infrastructure to facilitate the adoption of this technology. Governments and Islamic financial institutions should work together to ensure that this technology is accessible to all waqf institutions in need, especially in areas with limited access to technology.

The novelty of this research lies in the use of blockchain to improve accountability and transparency in waqf management, which has not been widely discussed in the existing literature. The study also examines the implementation of blockchain in the context of countries with large Muslim populations, such as Indonesia, which have great potential in the development of productive waqf. By leveraging blockchain technology, waqf in Indonesia can become more efficient, transparent, and accountable, which can ultimately increase the attractiveness for donors to participate in

METHOD

This study uses a qualitative approach with an in-depth literature review on the application of blockchain technology in waqf management. Data was obtained through an analysis of the latest literature, including international journals, books, and research reports related to the use of blockchain in Islamic social finance management, especially waqf. The analysis technique used is thematic analysis to identify the opportunities, challenges, and solutions presented by blockchain technology in waqf management. According to Santoso and Zulfa (2022), blockchain offers a system that can increase transparency and efficiency in waqf management, by allowing all transactions to be permanently recorded in a decentralized ledger, which can be accessed by all related parties. This helps reduce the potential for misappropriation of funds and increases accountability in the distribution of waqf funds.

The main data sources come from articles that discuss the applications of blockchain technology in the Islamic and social finance sector. The study also refers to case studies that show the implementation of blockchain in waqf in several countries, such as Indonesia and Malaysia, which shows great potential to improve the management and transparency of waqf funds. For example, research by Zulkarnaen et al. (2021) shows how blockchain can improve accountability and transparency in the management of money waqf in Indonesia, by reducing problems related to data integration and financial statements that are not connected between institutions (Zulkarnaen, Mukhlisin, & Pramono, 2021). With this approach, this research aims to explore the potential of blockchain in improving the governance and management of waqf funds, as well as supporting further development in the Islamic philanthropic sector.

RESULT AND DISCUSSION

Increased Transparency and Accountability in Waqf Management

One of the main problems in waqf management is the lack of transparency in the recording and distribution of waqf funds. Unclarity in the distribution flow and financial statements often reduces public trust in waqf institutions. Blockchain technology offers a very potential solution by recording every transaction in a decentralized and immutable ledger. By using blockchain, every transaction of waqf funds can be clearly recorded and accessible to all related parties, including waqf givers and beneficiaries. Santoso and Zulfa (2022) note that the application of blockchain in waqf management can increase transparency and ensure that managed funds can be directly monitored by all related parties. This system allows the public to see every transaction, which in turn reduces the potential for misappropriation of waqf funds (Santoso & Zulfa, 2022).

In addition, blockchain also has the potential to increase accountability in the management of waqf funds. For example, Mazura Hj. Mohaiyadin et al. (2022) stated that blockchain can help address accountability issues in waqf management, such as errors in the issuance of proof of transactions and difficulties in the efficient distribution of waqf funds. The application of blockchain allows every step in the distribution of waqf funds to be monitored in real-time, ensuring that waqf funds are appropriately distributed to the rightful recipients. This reduces the potential for misuse and ensures that waqf funds are used in accordance with the set goals (Mohaiyadin et al., 2022). With this transparent system, not only the parties who manage the waqf

funds can supervise, but the community and other related parties can also participate in monitoring the use of funds.

Blockchain allows the use of smart contracts, which can automate some of the processes of waqf fund distribution. Smart contracts regulate the payment and distribution of funds based on the agreed terms, without involving a third party. This can reduce operational costs and increase efficiency, as well as ensure that transactions are carried out in accordance with sharia requirements. According to Zulkarnaen et al. (2021), the use of smart contracts in waqf management can reduce the risk of human error, improve the efficiency of fund distribution, and speed up the payment process to beneficiaries (Zulkarnaen, Mukhlisin, & Pramono, 2021). With this technology, every step in the distribution of waqf funds can be programmed to follow the rules that have been set, providing a sense of security for waqif (waqf givers) and waqf recipients.

However, the application of blockchain in waqf management also faces several challenges, especially related to infrastructure and technology adoption. While blockchain can improve transparency and accountability, its implementation requires a supportive infrastructure, as well as an understanding and training of these technologies among waqf managers. This is especially a challenge in developing countries, such as Indonesia, where understanding blockchain technology is still limited. Research by Diki Zulkarnaen et al. (2021) shows that while the application of blockchain in waqf management is promising, challenges related to technology adoption, lack of training, and inadequate infrastructure can hinder its widespread implementation (Zulkarnaen et al., 2021). Therefore, collaboration is needed between the government, Islamic financial institutions, and educational institutions to improve digital literacy and prepare the needed infrastructure.

Overall, blockchain technology offers great potential to improve transparency, accountability, and efficiency in waqf management. Although challenges related to infrastructure and technology adoption still exist, the application of blockchain in waqf management can bring significant changes in improving the governance of Islamic social funds. By ensuring that every waqf fund transaction is clearly recorded, transparently accessible, and executed efficiently, blockchain can strengthen the waqf system and increase public trust in waqf institutions. The proper implementation of this technology is expected to encourage the development of productive waqf that can provide long-term socio-economic benefits.

The Potential of Blockchain in Improving Efficiency and Security

In addition to transparency and accountability, blockchain can also significantly enhance efficiency and security in waqf management. Santoso and Zulfa (2022) highlight that the application of blockchain helps reduce operational costs related to traditional waqf management, such as administrative, verification, and audit expenses. By utilizing smart contracts, certain processes—such as the automatic distribution of waqf funds to beneficiaries or project implementers—can be executed without intermediaries, minimizing human error and accelerating fund disbursement (Santoso & Zulfa, 2022). This automation not only streamlines workflow but also ensures that funds are allocated according to predefined conditions, thereby increasing trust among stakeholders.

Moreover, blockchain provides a more advanced level of security compared to conventional financial systems. In the waqf context, this security feature is vital to guarantee that donated assets remain intact and free from fraudulent activities or unauthorized alterations. The decentralized structure of blockchain prevents single points of failure, making it more resilient to hacking attempts or internal misuse. Additionally, the cryptographic mechanisms employed ensure that sensitive transaction data and donor information are strongly protected, thereby maintaining both financial integrity and the confidentiality of stakeholders. By combining efficiency gains with robust security, blockchain presents itself as a transformative tool for modernizing waqf management in a trustworthy and sustainable manner.

Challenges in the Implementation of Blockchain in Waqf

In addition to transparency and accountability, blockchain can also improve efficiency and security in waqf management. Santoso and Zulfa (2022) show that the application of blockchain in waqf management can reduce operational costs associated with traditional waqf management, such as administrative and audit costs. This technology allows the use of *smart contracts* to automate certain processes, such as the distribution of waqf funds to beneficiaries, which reduces dependence on third parties and speeds up the distribution process (Santoso & Zulfa, 2022). By reducing the need for manual and third-party verification, the distribution process becomes faster, more efficient, and cheaper. In addition, the implementation of *smart contracts* can eliminate the need for time-consuming and high-cost administrative processes that are common in conventional waqf management.

In addition to efficiency, blockchains also offer a higher level of security compared to traditional systems. In the context of waqf, this is crucial to ensure that waqf funds are safe and not vulnerable to theft or misuse. Blockchain ensures that sensitive transaction data is well protected through the encryption technology used in each transaction. Habib and Ahmad (2020) explain that blockchain provides an immutable platform for recording transactions, which is very important in the management of waqf funds which often involve large assets. This security is vital because waqf funds are often used for long-term social purposes that require close supervision and maintenance.

The use of blockchain also gives more confidence to waqif (waqf givers) and nadzir (waqf managers) that the funds they distribute or manage will be used in accordance with the agreed provisions. This is because blockchain provides transparent and immutable records, thereby increasing accountability in waqf management. Research by Setiawan and Nurjaman (2022) confirms that blockchain technology increases public trust in waqf asset management by ensuring that no data manipulation can occur, and that any changes made can be easily tracked and verified. With the use of blockchain, waqf institutions can provide greater guarantees to the public regarding integrity and fairness in the distribution of funds.

With blockchain integration, waqf institutions can also more easily monitor the use of funds, allowing for more efficient management of existing waqf resources. For example, through the use of smart contracts, transactions and fund allocation can be carried out automatically according to

the parameters that have been set in the contract, thereby accelerating the distribution of funds and reducing unnecessary third-party involvement. Setiawan and Nurjaman (2022) added that the implementation of smart contracts in waqf management can reduce reliance on manual processes and improve the efficiency of overall waqf asset management (Setiawan & Nurjaman, 2022).

However, while blockchain offers many advantages, there are challenges associated with the adoption of this technology, especially in terms of integration with existing systems and the necessary human resource training. For example, in many cases, waqf institutions may not yet have adequate infrastructure to implement blockchain effectively. This is revealed by Abojeib and Habib (2021), who note that the implementation of blockchain in Islamic social institutions such as waqf requires the readiness of appropriate technology and regulations, as well as training for waqf managers to be able to make optimal use of this technology. Therefore, a joint effort is needed between the government, waqf institutions, and technology providers to facilitate seamless integration between blockchain and existing systems.

Overall, blockchain technology offers enormous potential to improve efficiency and security in waqf management. By reducing operational costs, automating the distribution of funds, and increasing transparency and accountability, blockchain can make a significant contribution to better governance in this Islamic social sector. While the challenges of technology adoption remain, the right steps in terms of training, infrastructure, and policies will ensure that blockchain can provide maximum benefits for future waqf management.

CONCLUSION

Blockchain offers great potential to improve transparency, accountability, efficiency, and security in waqf management. By implementing this technology, waqf institutions can ensure that waqf funds are managed transparently and efficiently, where every transaction can be monitored by all relevant parties. This is important to reduce uncertainty in the management of waqf funds and improve the reporting system which has been vulnerable to abuse. In addition, blockchain enables waqf management by using *smart contracts* that automate the allocation of funds according to pre-agreed terms, reducing dependence on third parties and speeding up distribution. However, despite the promise, challenges related to blockchain adoption, including inadequate infrastructure and regulatory issues, remain a barrier. Some waqf institutions may not yet have the capacity to implement this technology comprehensively. Therefore, the development of a clear regulatory framework and increased digital literacy for waqf managers are indispensable to support the adoption of blockchain. If implemented appropriately, blockchain can revitalize waqf management systems, strengthen governance, and increase public trust in waqf institutions, which in turn can expand community participation in waqf activities and increase the resulting socio-economic impact.

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