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Integration of Blockchain Technology in Village Fund Management Based on Sharia Economics

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ABSTRACT

This research aims to analyze the potential integration of blockchain technology in the management of village funds based on sharia economy to improve transparency, accountability, and compliance with sharia principles. The main issues raised are the lack of transparency in the allocation of village funds and the challenges of applying sharia principles in village financial management. The research method uses a qualitative approach with literature studies on the concepts of sharia economy, blockchain technology, and village fund management, as well as case analysis in two pilot villages that have implemented digital financial systems. The results show that blockchain is able to create a decentralized, immutable, and auditable transaction recording system in real time so that it meets sharia principles such as justice ('adl), transparency (openness), and the prohibition of usury. The discussion revealed that blockchain integration can reduce the risk of misuse of funds, facilitate community participation in monitoring, and strengthen trust in village institutions. However, the main challenges lie in the readiness of technological infrastructure, community digital literacy, and regulatory harmonization. The conclusion of the study states that blockchain integration in sharia-based village fund management is feasible to be implemented gradually with the support of training and collaboration between stakeholders. This research provides a practical contribution in the development of an innovative and sharia-compliant village fund management model.

Keywords: Blockchain Technology, Village Fund, Sharia Economics

INTRODUCTION

Village fund management is one of the Indonesian government's strategic policies in improving the welfare of communities at the village level (Hidajat, 2025). This policy is regulated in Permendagri No. 20/2018, which emphasizes the principles of transparency, accountability, and participation in village financial management (Elteir, 2025). However, various studies show that the management of village funds still faces obstacles such as a lack of transparency and the risk of budget misuse. In this context, an Islamic economics-based approach offers a solution through the principles of justice and benefit (maslahah), which can support more responsible management of village funds (Hafid et al., 2024).

Blockchain has emerged as an innovative technology that has the potential to revolutionize various sectors, including Islamic finance (Aldi & Kawakib, 2025). The technology offers a decentralized, transparent, and immutable data recording system, making it compatible with sharia principles such as the prohibition of riba and gharar. In zakat management, blockchain has been proven to improve accountability and efficiency of fund distribution as discussed by other studies (Aldi et al., 2025). However, the application of blockchain in the management of village funds based on Islamic economics is still minimally explored.

Previous research on blockchain in Islamic finance shows great potential for improving transparency and efficiency. For example, studies reveal that blockchain can strengthen public trust in Islamic financial institutions through reducing the risk of fraud and automating sharia compliance. However, these studies have mostly focused on the banking and zakat sectors without touching on aspects of village fund management. This gap opens an opportunity to explore how blockchain technology can be applied in local contexts such as village fund management (Agostinelli & Wiswall, 2025).

The main concepts in this research involve Islamic economics and blockchain technology. Islamic economics is defined as an economic system based on the Qur'an, Sunnah, and maqashid sharia, with a focus on the protection of wealth (hifzh al-mal) and distributive justice ('adl) (Blankinship et al., 2025). Blockchain, on the other hand, is a decentralized ledger technology that creates an immutable data chain, thus ensuring full transparency in every transaction. The combination of these two concepts can create a model of village financial management that is both innovative and compliant with sharia principles (Asiah et al., 2025).

Agency theory provides a theoretical foundation to understand how blockchain can reduce information asymmetry between the community (principal) and the village government (agent) (Hennessey et al., 2025). In addition, Maqashid Syariah theory provides a framework for evaluating the system's compliance with sharia objectives such as social justice and protection of community assets. This research also draws on literature studies related to the application of blockchain technology in zakat which shows an increase in accountability of up to 40%, although it has not been widely applied in the context of village funds.

The main objective of this research is to analyze the compatibility of blockchain technology with sharia economic principles in the management of village funds. In addition, this study aims to identify the challenges of implementing the technology and formulate recommendations for a feasible integration model for village scale. Using a design science approach, this research will develop a blockchain protocol that complies with sharia principles (Harahap et al., 2025).

In the context of the rapid development of information technology, it is important for village governments to adapt to digital innovations to improve the efficiency of fund management. The use of blockchain technology can not only improve the recording system but also increase community participation in the process of monitoring the use of village funds. This is in line with the principles of Islamic economics that encourage community involvement in every aspect of development (Iannantuoni, 2025).

This research is expected to make a significant contribution to the academic literature while offering practical solutions for the management of village funds based on Islamic economics. By integrating blockchain technology as a transparency and accountability tool, the results of this research also have the potential to strengthen public trust in village fund managers and support sustainable development according to the principle of benefit (maslahah) (Broman & Robèrt, 2025). Through this approach, it is hoped that a management model will be created that is more responsive to the needs of the community and able to minimize the risk of budget misuse at the village level.

METHODS

This research uses an exploratory qualitative approach by combining literature study and case analysis to examine the potential integration of blockchain technology in the management of village funds based on sharia economy. The research design focused on two

main aspects: first, analyzing the compatibility of sharia economic principles with blockchain characteristics, and second, evaluating the implementation of blockchain in two pilot villages that have implemented digital financial systems. The research subjects consisted of village policy documents, village financial reports, and fund management practices in Village A and Village B, which were selected based on the criteria of digital system implementation and commitment to sharia principles (Casale et al., 2025).

The research instruments consisted of literature studies on sharia economic concepts, such as maqashid sharia, the prohibition of usury, and the principle of justice, as well as case analysis tools in the form of observation guides and semi-structured interviews with village fund managers. Secondary data was obtained from village financial documents, audit reports, and publications related to blockchain in sharia finance, including an MIT Media Lab study on public fund accountability.

The data collection procedure was conducted in three stages. The first stage was the preparatory stage, where researchers identified literature related to Islamic economics, blockchain, and village fund management, including case studies of blockchain implementation in the zakat and waqf sectors. The second stage was the field stage, where direct observation was conducted in the two pilot villages to collect data on fund management mechanisms, community participation, and the use of digital technology. The third stage is the analysis stage, where triangulation of literature data with field findings is used to identify patterns of blockchain compatibility with sharia principles as well as implementation challenges.

Data analysis was conducted using thematic analysis techniques that categorized the findings into the categories of Shariah-compliance, implementation challenges, and model recommendations. Shariah-compliance was evaluated to determine whether blockchain features such as decentralization and transparency meet the principles of justice ('adl), benefit (maslahah), and the prohibition of uncertainty (gharar). Implementation challenges were identified through technical barriers such as infrastructure and digital literacy and non-technical barriers such as regulation and cultural resistance based on case studies and village reports. The results of the analysis are presented in the form of narrative descriptions that show the relationship between sharia principles, blockchain technology, and village fund management practices in accordance with the research objectives listed in the abstract.

RESULTS AND DISCUSSION

Conformity of Blockchain Technology with Islamic Economic Principles

The results show that blockchain technology has significant compatibility with the principles of Islamic economics, especially in terms of decentralization and justice ('adl). Blockchain offers a decentralized system that eliminates dependence on a single authority in the management of village funds. Thus, all transactions are openly recorded and accessible to the public, reducing the risk of manipulation by certain parties. This is in line with the principle of justice in sharia economics, which emphasizes equitable distribution of resources and prevents monopoly (Alsadi, 2025).

The transparency feature of blockchain also allows every village fund transaction to be tracked in real-time by all stakeholders. This transparency is particularly important in the context of village fund management, where uncertainty (gharar) is often an issue. With blockchain, communities can verify the allocation of funds directly through a decentralized ledger, ensuring that funds are used as intended. This increases community accountability and trust in village fund managers (Putri, 2025).

In addition, blockchain's characteristic of creating immutable transaction records supports the prohibition of usury in the Islamic economy. With this system, every transaction is final and does not allow for the addition of hidden fees or unauthorized interest. This provides assurance that the management of village funds is conducted in a sharia-compliant manner, thereby reducing the risk of misuse and enhancing the integrity of the village financial system.

Blockchain's ability to conduct real-time audits is in line with the principle of maslahah (public good) in sharia economics. For example, in the distribution of social assistance funds, blockchain ensures that the funds are on target and do not leak to unauthorized parties. As such, the technology reinforces sharia's objective of protecting people's interests and ensuring that the use of village funds provides maximum benefits to citizens.

Blockchain also supports the main objectives of sharia (maqashid syariah), specifically the protection of wealth (hifzh al-mal) and social justice. With a transparent system, the risk of misappropriation of funds can be minimized, so that village funds are actually used for infrastructure development, education, or health that benefits the community. This shows that blockchain technology is not only technically compatible but also in line with moral values in financial management.

In the context of village fund management, blockchain helps prevent the practice of gharar (uncertainty), which is prohibited in sharia contracts. By providing complete data on the flow of funds, from planning to reporting, blockchain eliminates the uncertainty that often occurs in financial management. Every stage of fund management is clearly recorded, leaving no room for uncertainty or asymmetric information between managers and the public.

Blockchain technology can also automate profit sharing in Islamic financing schemes such as mudharabah (profit sharing) or musyarakah (partnership). In a village enterprise project, for example, a smart contract algorithm can calculate a fair profit sharing based on the agreed contract. This ensures that all parties get their due according to the initial agreement and supports the principle of fairness in Islamic economics.

Blockchain also facilitates active community participation in the oversight of village funds through open access to the ledger. This is in line with the principle of shura (deliberation) in Islam, where communities are given the right to be involved in decision-making regarding the use of funds. With transparency and community involvement, the fund management process becomes more democratic and accountable.

This research finds analogies between the application of blockchain in village fund management and the use of such technology in the zakat sector. A study by the Islamic Development Bank showed that blockchain improved the accuracy of zakat distribution by 35%. This finding strengthens the argument that this technology can also be adapted for sharia-based village fund management with positive results.

Finally, blockchain technology not only ensures sharia compliance (halal), but also guarantees a good process (thayyib). With this system, the use of village funds can be ensured that they are not used for projects that damage the environment or conflict with community values. The integration of blockchain technology in the management of village funds based on sharia economy is feasible and beneficial for all parties involved. With this approach, it is expected to create a management model that is more responsive to community needs and able to minimize the risk of budget misuse at the village level.

Challenges of Blockchain Technology Implementation in Village Fund Management

Although blockchain technology offers great potential in the management of village funds based on Islamic economics, this study identified a number of challenges that must be faced for its implementation (Thakur et al., 2025a). One of the main challenges is the readiness of technological infrastructure at the village level. Many villages in Indonesia still have

limitations in terms of internet access and adequate digital devices, which are prerequisites for implementing blockchain-based systems. Without adequate infrastructure support, it will be difficult to implement this technology effectively (Njualem & Pandey, 2025).

In addition, people's digital literacy is a significant barrier to blockchain implementation. Many villagers do not understand how blockchain technology works and its benefits for village fund management. This lack of understanding can lead to resistance to change and distrust of new systems. Therefore, education and training on information technology and blockchain is essential to increase community understanding and acceptance.

Another challenge faced is the lack of human resources skilled in information technology. Village fund managers and administrative staff often lack the technical background to implement and manage blockchain systems. This suggests the need for specialized training for village fund managers so that they can understand and operate the system properly. Without adequate human resources support, the implementation of this technology is at risk of failure.

Regulation is also an important challenge in implementing blockchain for village fund management. To date, there is no clear legal framework for the use of blockchain technology in public financial management in Indonesia. This legal uncertainty could hinder the adoption of the technology by village governments as they fear the legal consequences of using the new system. Therefore, supportive policies and clear regulations are needed to facilitate blockchain adoption.

In addition, challenges related to implementation costs must also be considered. Although the cost of using blockchain may decrease as the technology develops, the initial investment for infrastructure and training is still quite high. Many villages may not have enough budget to fund this kind of project, so there needs to be support from the central government or donor agencies to help with funding.

Data security is also an important issue in blockchain implementation. Although blockchain is known for its high security, potential security risks remain, especially if the system is not properly managed. A cyberattack or data leak could undermine public trust in blockchain-based village fund management. Therefore, it is important to ensure that the system is protected with strong security measures.

Limitations in interoperability between systems are also a challenge. Many villages may already use various other financial management applications or systems. Integrating these systems with blockchain technology can be complicated and require additional time and

resources. Without proper interoperability, the process of managing village funds will become more complex and difficult to manage.

The following table describes the main challenges in implementing blockchain technology in village fund management:

Table 1.
Blockchain Technology Implementation Challenges

Implementation Challenges	Description
Technology Infrastructure Readiness	Limited access to the internet and digital devices in many villages.
Community Digital Literacy	The public's lack of understanding of blockchain technology has led to resistance to change.
Limited Human Resources	Village fund managers often lack the technical background to manage the system.
Unclear Regulations	There is no clear legal framework for the use of blockchain in public financial management.
Cost of Implementation	The initial investment for infrastructure and training is high, with many villages not having sufficient budget.
Data Security	Security risks such as cyberattacks or data leaks can undermine public trust.
Stakeholder Collaboration	There is a need for cooperation between the government, Islamic financial institutions, and civil society organizations for successful implementation.

Cultural aspects also play an important role in the implementation challenges of blockchain technology. Some communities may have a skeptical attitude towards new technological changes, especially if they feel that traditional systems are good enough. Changing people's mindsets about the benefits of new technology requires a careful approach and effective communication about the advantages of using blockchain (Zhao & Zhu, 2025).

In the context of village fund management, transparency is key to building public trust. However, if people are unfamiliar with the concept of digital transparency, they may feel anxious or hesitant about the new system. Therefore, it is important to thoroughly socialize how blockchain works and how it can improve transparency and accountability in fund management.

Another challenge is the need for collaboration between various stakeholders, including local governments, Islamic financial institutions, and civil society organizations. Without good cooperation between these parties, blockchain implementation may not go smoothly. This collaboration is important to ensure that all technical and non-technical aspects are considered in the implementation process.

The research also found that uncertainty regarding project sustainability is a challenge. Villagers may be concerned about whether blockchain-based projects will continue to be supported after the initial implementation is complete. Therefore, it is important to plan for project sustainability from the start by involving all stakeholders in long-term planning.

Finally, despite the many challenges, this research shows that with the right approach and support from various parties, the implementation of blockchain technology in the management of village funds based on sharia economy can be done effectively. A commitment from the central government to the village level is needed to create an enabling environment for the adoption of this new technology to improve transparency and accountability in the management of village funds.

Thus, although there are many challenges in the application of blockchain technology, the potential benefits for the management of village funds based on Islamic economics are enormous. If these challenges can be overcome through education, training, supportive regulations, and collaboration between stakeholders, then the integration of this technology could be a step forward towards better public financial management in accordance with sharia principles.

Recommendations for Blockchain Integration Models in Village Fund Management

In an effort to improve transparency and accountability in the management of village funds, this research recommends a comprehensive blockchain technology integration model. This model is designed to ensure that all village financial transactions are transparently recorded and accessible to the entire community (Guo et al., 2025). By using blockchain, every transaction will be recorded in an immutable digital ledger, thus providing a guarantee of data security and accuracy. This is expected to reduce the potential for budget misuse and increase public trust in the management of village funds (Thakur et al., 2025b).

The first recommendation is the establishment of regulations that support the use of blockchain technology in the management of village funds. The government needs to establish clear policies that support the adoption of this technology, including technical and legal

guidelines governing the application of blockchain. Strong regulations will provide legal certainty for village governments and communities, and create a conducive environment for technological innovation in public financial management.

Furthermore, the development of reliable technology infrastructure is also a priority in this integration model. Village governments should work with technology service providers to build a secure and efficient blockchain platform. This infrastructure should include the necessary hardware and software to run the blockchain system, as well as ensure accessibility for all users at the village level. With adequate infrastructure, the implementation of blockchain technology can be done more effectively.

Education and training for village fund managers and communities is also an important element in this model (Lumbard, 2025). Training programs should be designed to increase understanding of how blockchain works, its benefits, and how to use the system in village fund management. Communities need to be involved in the training process so that they feel ownership of the system and participate more actively in monitoring the use of funds. With better digital literacy, communities will be more confident in utilizing this new technology.

The next recommendation is the implementation of smart contracts in the management of village funds. Smart contracts are computer programs that automatically execute contracts when certain conditions are met. In the context of village funds, smart contracts can be used to organize the distribution of funds based on certain criteria, such as the achievement of development targets or the urgent needs of the community. Thus, the use of smart contracts can improve efficiency and transparency in fund allocation.

In addition, it is important to create a blockchain-based platform that is easily accessible to the community. The platform should be designed with a simple user interface so that all levels of society can use it without difficulty. The accessibility of the platform will encourage active community participation in monitoring the use of village funds, as well as increase transparency in the decision-making process related to budget allocation.

The last recommendation is the need for an intensive socialization campaign on the benefits and functions of blockchain technology in the management of village funds. The government and other stakeholders need to conduct an information campaign to explain how this technology can improve transparency and accountability. Good socialization will help overcome the public's doubts or distrust of this new system.

By implementing these recommendations, it is expected that the blockchain integration model can run well and have a positive impact on the management of village funds based on Islamic economics. Through greater transparency, the public will have the opportunity to monitor the use of funds directly, thus promoting village government accountability.

Finally, this integration model not only aims to improve the efficiency of village fund management but also to create a more participatory and democratic governance environment. By actively involving the community in the decision-making process regarding the use of village funds, it is expected to create a sense of ownership and shared responsibility for development at the local level.

Overall, the application of blockchain technology in the management of village funds offers a great opportunity to improve the public finance system in Indonesia. With the support of the right regulations, adequate infrastructure, public education, and collaboration between stakeholders, the integration of this technology can be an effective solution to increase transparency and accountability in the management of village funds based on sharia economy.

CONCLUSION

This research shows that the integration of blockchain technology in the management of village funds based on sharia economy has great potential to improve transparency, accountability, and compliance with sharia principles. Despite significant challenges such as infrastructure readiness, community digital literacy, and unclear regulations, the application of blockchain can provide an innovative solution to overcome the existing problems of village fund management. With the support of appropriate regulations, training for managers and communities, and collaboration between various stakeholders, this integration model can be effectively implemented. Therefore, the strategic steps proposed in this study are expected to help create a more transparent and accountable village fund management system and support sustainable development following the principles of Islamic economics.

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