Blockchain Potential for Digital Cash Waqf Transparency at Indonesian Waqf Board

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ABSTRACT - The digitalization of cash waqf in Indonesia has expanded access and efficiency in fund collection, yet it has not automatically resolved persistent problems of transparency, traceability, and accountability. This study aims to analyze the potential of blockchain technology in enhancing the transparency of digital cash waqf at the Indonesian Waqf Board (BWI). A qualitative-descriptive approach was employed using content analysis of official BWI documents, waqf regulations, and relevant scholarly literature. The analysis mapped the transparency needs of digital cash waqf management against blockchain characteristics, including traceability, immutability, auditability, distributed ledger, and smart contracts. The findings reveal a strong alignment between the transparency needs of digital cash waqf and blockchain characteristics: traceability supports transaction tracking from collection to utilization, immutability safeguards data integrity, auditability facilitates verification and supervision, and distributed ledger enables information integration across stakeholders. However, implementation faces significant challenges, including infrastructure readiness, human resource capacity, regulatory alignment, data security, information validation, and institutional governance. The study concludes that blockchain has the potential to serve as a supporting technology for enhancing digital cash waqf transparency at BWI, but its effectiveness depends on institutional readiness, regulatory frameworks, technological infrastructure, and governance design. Blockchain should be positioned as part of a broader digital transformation and governance strengthening strategy, not as a single solution to all transparency problems. This study contributes a compatibility matrix between transparency needs and blockchain characteristics and identifies prerequisites for implementation in the Indonesian waqf context.
Keywords: Blockchain; Digital Cash Waqf; Transparency; Accountability; Indonesian Waqf Board

ABSTRAK – *Digitalisasi wakaf uang di Indonesia telah memperluas akses dan efisiensi penghimpunan dana, namun belum secara otomatis menyelesaikan masalah transparansi, keterlacakan, dan akuntabilitas. Penelitian ini bertujuan menganalisis potensi teknologi blockchain dalam meningkatkan transparansi wakaf uang digital pada Badan Wakaf Indonesia (BWI). Pendekatan kualitatif-deskriptif digunakan dengan analisis isi terhadap dokumen resmi BWI, regulasi wakaf, dan literatur ilmiah relevan. Analisis dilakukan dengan memetakan kebutuhan transparansi pengelolaan wakaf uang digital terhadap karakteristik blockchain, meliputi traceability, immutability, auditability, distributed ledger, dan smart contract. Hasil penelitian menunjukkan adanya kesesuaian yang kuat antara kebutuhan transparansi wakaf uang digital dengan karakteristik blockchain: traceability mendukung pelacakan transaksi dari penghimpunan hingga pemanfaatan, immutability menjaga integritas data, auditability memfasilitasi verifikasi dan pengawasan, serta distributed ledger memungkinkan integrasi informasi antar pemangku kepentingan. Namun, penerapan blockchain menghadapi tantangan signifikan, termasuk kesiapan infrastruktur, kapasitas sumber daya manusia, keselarasan regulasi, keamanan data, validasi informasi, dan tata kelola kelembagaan. Penelitian ini menyimpulkan bahwa blockchain berpotensi menjadi teknologi pendukung dalam meningkatkan transparansi wakaf uang digital di BWI, tetapi efektivitasnya bergantung pada kesiapan kelembagaan, kerangka regulasi, infrastruktur teknologi, dan desain tata kelola. Blockchain harus diposisikan sebagai bagian dari strategi transformasi digital dan penguatan tata kelola yang lebih luas, bukan sebagai solusi tunggal untuk semua masalah transparansi. Penelitian ini berkontribusi menyediakan matriks kesesuaian antara kebutuhan transparansi dan karakteristik blockchain serta mengidentifikasi prasyarat implementasi dalam konteks wakaf Indonesia.*

Kata Kunci: Blockchain; Wakaf Uang Digital; Transparansi; Akuntabilitas; Badan Wakaf Indonesia



INTRODUCTION

The rapid advancement of digital technology has fundamentally transformed the landscape of cash waqf management in Indonesia. Digitalization offers unprecedented opportunities for waqf institutions to expand public access to cash waqf, simplify the process of fund collection, and increase efficiency in management (Adinugraha et al., 2024). This transformation, however, also demands the existence of a management system capable of providing information in a more open, accurate, and easily explored manner by the community. (Adinugraha et al., 2024) show that digital transformation has become an important part of the development of cash waqf management in Indonesia because it requires technological support as well as synergy between stakeholder interests. However, developments in digitalization still need to be followed by strengthening transparency and accountability to build public trust in waqf management that can be maintained.

Although digitalization provides convenience in the collection and management of waqf, its development has not automatically resolved the problems of transparency and accountability. In waqf management, openness of information about the acceptance, management, distribution, and reporting of funds becomes crucial because it is related to the trust of the waqf (waqif) and interested parties. Research by (Siregar & Multajimah, 2026) shows that strengthening transparency in digital waqf must be supported by open financial reporting, audits, oversight, stakeholder engagement, and technology utilization. In line with this, (Lubis et al., 2024) found that waqf management still faces challenges in the form of difficulty in controlling activities, distributing waqf, and integrating systems, so that mechanisms are needed that enable the management process to be traced and monitored more effectively. This condition shows that digitalization of waqf not only requires transaction convenience but also systems capable of strengthening transparency, accountability, and traceability of waqf fund management.

A growing body of literature has examined the potential of blockchain technology to address these challenges. Blockchain is a technology with distributed data recording characteristics, such that every recorded transaction can be traced and is difficult to change unilaterally. These characteristics make blockchain potentially useful for strengthening transparency and accountability in waqf management. (Syaifullah et al., 2025) show that blockchain implementation in waqf management can help overcome problems of

accountability and transparency through improved transaction traceability, strengthened data integrity, and the provision of information that is easier for concerned parties to supervise. In the context of digital cash waqf, this capability can support recording cash flow from collection to its utilization, so that waqf management information can be more easily traced and verified.

However, the existing literature reveals a significant research gap. Studies on blockchain in waqf management have predominantly focused on developing governance models improving accountability (Syaifullah et al., 2025) and examining the general potential of the technology to overcome transparency problems. Meanwhile, studies that specifically connect the transparency needs of digital cash waqf with blockchain characteristics at the Indonesian Waqf Board (BWI)—an institution with a crucial role in the national waqf ecosystem—remain limited. Furthermore, recent systematic reviews have identified that while blockchain's potential for enhancing waqf governance is widely acknowledged, empirical research that specifically maps the transparency needs of digital cash waqf against blockchain's technical characteristics within the institutional context of BWI is still underdeveloped (Hidayat, 2025). A bibliometric analysis of 771 Scopus-indexed publications up to October 2025 confirmed that digital cash waqf research has increased significantly since 2015, with governance, sharia regulation, trust, transparency, and financial technology innovation emerging as dominant themes—yet integration between blockchain technology and institutional governance models remains an open area for investigation.

This gap is further underscored by the ongoing digital transformation at BWI. As the national waqf regulatory body, BWI has positioned digitalization as a core strategic direction. BWI encourages data integration, transaction processing, information and communication within the waqf ecosystem, and has developed online services, digital waqf collection mechanisms, e-reporting systems, and a national digital waqf catalogue. The Chairman of BWI has emphasized that the development of an Integrated Zakat and Waqf Data System will serve as the foundation for a new era of Islamic social finance governance in Indonesia. BWI has also launched the SatuWakaf platform, a crowdfunding platform designed specifically for waqf that facilitates both cash waqf and waqf through money. These developments demonstrate that the need for integrated, capable information systems that provide more open information has become increasingly important alongside the growing utilization of digital channels in



cash waqf collection. Therefore, BWI becomes a relevant object of study for examining how technology with data recording and tracking capabilities, such as blockchain, has the potential to support the improvement of digital cash waqf transparency (Jihad, 2024)

The academic discourse on blockchain for waqf has gained momentum globally. Studies have explored blockchain's application in Islamic social finance, including its capacity to enhance transparency, accountability, and Shariah compliance in banking, capital markets, and the administration of philanthropic funds such as zakat and waqf. Research specifically addressing the Indonesian context has investigated the implementation of blockchain in enhancing transparency and public trust in waqf institutions, finding that blockchain enables real-time recording of waqf transactions, improves accountability in asset management, and expands public participation in digital waqf (Kurniasari, Dewi; Hadi, 2026) A Delphi-Likert study involving academics, regulators, and practitioners in the waqf and blockchain fields concluded that blockchain needs to be implemented immediately in Indonesia, with a preference for hybrid and public networks, and that a limited open ecosystem balances the need for transparency with the protection of institutional internal data (Ihsan, 2025). Another study analyzing the implementation of blockchain technology on the SatuWakaf platform at BWI recommended strengthening BWI's human resource capacity, conducting gradual education campaigns on waqf and blockchain technology, collaborating with existing Shariah-compliant blockchain service providers, and proposing regulatory sandboxes for blockchain waqf projects (Nasywa & Lahuri, 2025)These studies collectively indicate that blockchain holds significant promise for supporting more transparent waqf governance, yet research that specifically analyzes blockchain potential based on the transparency needs of digital cash waqf at the Indonesian Waqf Board remains to be developed.

The urgency of this research is further reinforced by the persistent governance challenges in digital cash waqf systems. Recent studies have identified governance weaknesses, including the lack of standardized service delivery models, inadequate transparency mechanisms, and insufficient regulatory oversight, alongside adoption barriers such as low public awareness and suboptimal user experience (Faujiah, 2025). These governance, institutional, and technology gaps are mutually reinforcing rather than independent. Digitalization has been shown to enhance transparency, accountability, and



public participation, but significant challenges persist, including non-adaptive regulations, uneven technological infrastructure, and low public digital literacy (Lubis et al., 2024). Addressing these obstacles requires capacity-building, supportive regulatory development, and increased public education on digital cash waqf (Lubis et al., 2024). In this context, blockchain technology is not positioned as a panacea but as a potential technological enabler whose effectiveness depends on institutional readiness, regulatory alignment, and governance design.

Based on the preceding analysis, this study aims to analyze the potential of blockchain technology in enhancing the transparency of digital cash waqf at the Indonesian Waqf Board. The analysis is conducted by identifying the transparency needs in digital cash waqf management and then examining their compatibility with blockchain characteristics, particularly in the aspects of transaction traceability, data integrity, auditability, and information integration. Specifically, this study addresses the following research questions: (1) What are the transparency needs in digital cash waqf management at BWI? (2) How do blockchain characteristics align with these transparency needs? (3) What are the opportunities and challenges for implementing blockchain to enhance digital cash waqf transparency at BWI? This research is expected to provide a clear description of the opportunities and challenges of utilizing blockchain as a supporting technology for strengthening transparency in digital cash waqf management in Indonesia, while contributing to the theoretical development of blockchain-based waqf governance and offering practical recommendations for policymakers and waqf institutions.

LITERATURE REVIEW

Cash waqf is a form of Islamic endowment in which individuals or institutions donate a specific amount of money or liquid assets, with the principal preserved and the returns or profits used for charitable purposes in accordance with Shariah principles (Lubis et al., 2024). As an instrument of Islamic social finance, cash waqf has the potential to contribute significantly to poverty alleviation, education, healthcare, and infrastructure development. The digital transformation of cash waqf involves the utilization of digital platforms, mobile applications, electronic payment systems, and online crowdfunding mechanisms to facilitate the collection, management, and distribution of waqf funds. Digitalization offers numerous advantages, including expanded access



for donors, reduced transaction costs, increased efficiency in fund collection, and enhanced transparency through digital records (Adinugraha et al., 2024) However, digitalization alone does not automatically resolve longstanding issues of transparency, accountability, and trust. Research by (Lubis et al., 2024) on digital-based cash waqf management in six Indonesian waqf institutions found that while digitalization enhances transparency, accountability, and public participation, significant challenges persist, including non-adaptive regulations, uneven technological infrastructure, and low public digital literacy. The effectiveness of digital waqf systems therefore depends on the quality of governance, the robustness of information systems, and the capacity of institutions to manage and report funds responsibly.

Transparency in waqf management refers to the openness and accessibility of information regarding the collection, management, distribution, and reporting of waqf funds. It requires that stakeholders—including waqif (donors), nazhir (managers), beneficiaries, regulators, and the general public—have access to accurate, timely, and understandable information about how waqf assets are managed and utilized. Accountability, closely related to transparency, refers to the obligation of waqf institutions to answer for their actions, decisions, and use of resources (Siregar & Multajimah, 2026). In the context of digital cash waqf, transparency and accountability demand more than just the publication of financial reports; they require systems that enable traceability of transactions, integrity of data, verifiability of information, and real-time oversight (Sucianti, 2025). Despite the growing adoption of digital tools, many waqf institutions still face challenges such as fragmented data systems, manual reporting processes, limited audit capacity, and insufficient stakeholder engagement. Recent research by (Wijayanti, 2024) identifies governance weaknesses in digital cash waqf systems, including the lack of standardized service delivery models, inadequate transparency mechanisms, and insufficient regulatory oversight, alongside adoption barriers such as low public awareness and suboptimal user experience. These governance, institutional, and technology gaps are mutually reinforcing rather than independent, creating opportunities for technological innovations that can strengthen the transparency and accountability infrastructure of waqf management.

Blockchain is a distributed ledger technology that enables the recording of transactions across a network of computers in a way that is secure, transparent, and resistant to tampering. Each transaction is recorded in a block, which is cryptographically linked to the previous block, forming a chain. Key



characteristics of blockchain include decentralization, immutability, traceability, auditability, and the ability to execute smart. Decentralization means that no single entity controls the ledger, reducing the risk of manipulation. Immutability ensures that once data is recorded, it cannot be altered or deleted without leaving a trace, thereby preserving data integrity. Traceability allows any transaction to be tracked from its origin to its current state, providing a complete audit trail. Auditability enables authorized parties to verify transactions and ensure compliance with rules and regulations. Smart contracts are self-executing contracts with the terms of the agreement written directly into code, allowing for automated enforcement of conditions. A systematic literature review by (Manaf et al., 2026) examining literature indexed in Scopus, Web of Science, and SINTA published between 2015 and 2025 found that blockchain advances transparency through real-time tracking, reinforces nazhir accountability through immutable audit trails, and cultivates public trust that drives donor participation. These characteristics make blockchain a promising technology for applications requiring high levels of trust, transparency, and accountability.

The application of blockchain in waqf management has been explored as a means to enhance transparency, accountability, and operational efficiency. Blockchain can be used to record waqf transactions, track the flow of funds from collection to distribution, automate the execution of waqf agreements through smart contracts, and provide real-time access to information for authorized stakeholders (Syaifullah et al., 2025). By providing an immutable and transparent record of all transactions, blockchain can reduce the risk of fraud, mismanagement, and data manipulation. A systematic review by Garuda (2025) of 68 scholarly articles published between 2016 and 2025 identifies four central themes in blockchain adoption for Indonesia's zakat and waqf sectors: improving transparency and accountability; increasing operational efficiency and optimizing waqf asset utilization; building public trust; and assessing institutional readiness for digital transformation. The findings suggest that blockchain aligns well with Sharia principles by enabling real-time financial reporting, facilitating smart contract implementation, and offering reliable data-driven asset tracking. However, widespread adoption remains constrained by regulatory uncertainty, limited digital literacy, and insufficient technological infrastructure. In line with this, (Rahmawati & Ismail, 2025)developed a blockchain-based waqf governance model in the Indonesian context, emphasizing the importance of integrating technology, governance, and



stakeholder engagement. (Hidayat, 2025) further confirms that blockchain, AI, and ERP systems can strengthen transparency and accountability in Shariah public sector institutions, while (Nasywa & Lahuri, 2025) show that blockchain technology can support waqf accountability through structured transaction recording and stronger verification mechanisms.

The academic discourse on blockchain for waqf has also gained momentum globally. A systematic literature review on FinTech application in Islamic social finance in Asia found that blockchain serves as a tool in waqf applications that can enhance transparency and trust with donors.(Kurniasari, Dewi; Hadi, 2026) Research specifically addressing the Indonesian context has investigated the implementation of blockchain in enhancing transparency and public trust in waqf institutions, finding that blockchain enables real-time recording of waqf transactions, improves accountability in asset management, and expands public participation in digital waqf. A Delphi-Likert study by (Ihsan, 2025) involving academics, regulators, and practitioners in the waqf and blockchain fields concluded that blockchain needs to be implemented immediately in Indonesia, with a preference for hybrid and public networks, and that a limited open ecosystem balances the need for transparency with the protection of institutional internal data. Another study analyzing the implementation of blockchain technology on the SatuWakaf platform at BWI recommended strengthening BWI's human resource capacity, conducting gradual education campaigns on waqf and blockchain technology, collaborating with existing Shariah-compliant blockchain service providers, and proposing regulatory sandboxes for blockchain waqf projects.(Masrukhan, 2024) These studies collectively indicate that blockchain holds significant promise for supporting more transparent waqf governance. Moreover, (Faujiah, 2025) emphasizes the importance of professional human resource development and public literacy in the digital era, while (Wijayanti, 2024) highlights that transparency in zakat and waqf management must be understood from the perspective of Shariah good governance. (Masrukhan, 2024)also shows that blockchain has the potential to overcome transparency and accountability problems in waqf and zakat management through traceable and verifiable transaction records. (Millenia et al., 2026) add that blockchain and smart contracts can support transparency in waqf asset management through a more verifiable recording system, and (Safitri et al., 2025)explain that blockchain can help address transparency and accountability challenges through structured transaction recording and stronger verification mechanisms. (Sani, 2025) further notes that digital-based cash waqf management in Indonesian waqf

institutions has the potential to support transparency and accountability but still faces infrastructure, regulatory, and digital literacy problems.

The literature also identifies several challenges that must be addressed for successful blockchain implementation. These include the need for adequate technological infrastructure, skilled human resources, clear regulatory frameworks, and robust data security measures. Additionally, blockchain cannot guarantee the accuracy of data entered into the system; the quality of initial data and the validation mechanisms remain critical (Syaifullah et al., 2025). Research on the sustainability of cash waqf using blockchain technology has found that traditional cash waqf systems face challenges such as opacity, accountability gaps, and inefficiency, which blockchain has the potential to address by reducing fraud and increasing accountability (Anwar et al., 2024). There are also concerns regarding privacy, scalability, energy consumption, and the alignment of blockchain-based systems with Shariah principles. Therefore, blockchain should be viewed as a supporting technology that must be integrated with sound governance, institutional readiness, and regulatory compliance. (Pratama, 2025) notes in the context of BWI, the institution has a strategic role in developing waqf in Indonesia, and its digitalization efforts require systems that are not only efficient but also transparent and accountable.

Theoretical Framework. The theoretical framework of this study draws on several interrelated theories that explain the relationship between transparency needs, blockchain characteristics, and institutional governance in waqf management. The first is Good Governance Theory, which emphasizes principles such as transparency, accountability, participation, rule of law, and responsiveness. In the context of waqf, good governance requires that waqf institutions operate with openness, integrity, and responsibility, and that they are accountable to stakeholders. Transparency is a core element of good governance, as it enables stakeholders to monitor performance and hold institutions accountable (Siregar & Multajimah, 2026). The second theory is Stakeholder Theory, which posits that organizations should consider the interests of all stakeholders, not just shareholders. In waqf management, stakeholders include waqif, nazhir, beneficiaries, regulators, and the wider community. Stakeholder Theory suggests that these groups have a right to information about how waqf funds are managed and that their trust is essential for the sustainability of waqf institutions. Transparency and accountability are therefore not merely regulatory requirements but ethical obligations to



stakeholders (Syaifullah et al., 2025). The third theory is the Technology-Organization-Environment (TOE) Framework, which explains how technological innovation adoption is influenced by technological, organizational, and environmental factors. In the context of blockchain adoption in waqf institutions, technological factors include the characteristics of blockchain itself, such as traceability and immutability. Organizational factors include institutional readiness, human resource capacity, and governance structures. Environmental factors include regulatory frameworks, Shariah compliance requirements, and the broader digital ecosystem. The TOE Framework helps to explain why the adoption of blockchain is not solely a technical decision but is shaped by organizational and environmental conditions (Ihsan, 2025). Finally, Shariah Enterprise Theory provides a normative foundation for understanding the objectives of waqf management. It emphasizes that economic and social institutions should operate in accordance with maqashid al-shariah (the objectives of Islamic law), which include the preservation of faith, life, intellect, progeny, and wealth. Transparency and accountability in waqf management are means to achieve these objectives, as they ensure that waqf assets are used for their intended purposes and that the rights of beneficiaries are protected. Blockchain technology, when aligned with Shariah principles, can support the achievement of these objectives by enhancing trust, integrity, and fairness in waqf transactions (Manaf et al., 2026). Based on these theories, a conceptual framework is proposed that links the transparency needs of digital cash waqf—openness of information, traceability of transactions, data integrity, and verification and oversight—with the characteristics of blockchain technology—distributed ledger, traceability, immutability, auditability, and smart contracts. The framework posits that blockchain can enhance transparency when its characteristics are aligned with the specific transparency needs of waqf management. However, the effectiveness of this alignment is moderated by institutional readiness, regulatory frameworks, and governance design. This theoretical framework provides the analytical lens for examining the potential of blockchain to enhance digital cash waqf transparency at the Indonesian Waqf Board.

METHODOLOGY

This study employs a qualitative-descriptive approach with a Qualitative Content Analysis (QCA) design, rather than a case study, because the data used are entirely secondary data collected through documentation techniques from official Indonesian Waqf Board (BWI) documents, waqf regulations (Law No.



41/2004 and Government Regulation No. 42/2006), and accredited scholarly literature (Scopus/Sinta 3+) published between 2019 and 2026. The analysis is conducted through seven stages: comprehensive reading, determination of analysis units, development of a deductive-inductive coding frame, pilot testing/double-coding, main coding, abstraction and interpretation, and reporting in the form of a compatibility matrix between the transparency needs of digital cash waqf and blockchain characteristics. The validity of the data is tested through trustworthiness criteria—credibility (source triangulation), dependability (transparent procedures), confirmability (chain of evidence), and transferability (thick description). The limitations of this study lie in the absence of primary data (interviews/surveys), its exploratory nature, and its scope restricted to the context of BWI and Indonesia, so the findings cannot be generalized. Therefore, this study does not require ethical approval because it only uses public data that is entirely cited academically, and this methodology is adapted from contemporary qualitative research best practices, including studies on blockchain and Islamic social finance.

RESULT AND DISCUSSION

Condition of Digitalization of Cash Waqf at the Indonesian Waqf Board. Based on the analysis of information and official publications of the Indonesian Waqf Board (BWI), digitalization has become part of the direction of waqf ecosystem development in Indonesia. BWI encouraged data integration, transactions, information, and communication within the waqf ecosystem and developed online services, digital waqf collection mechanisms, e-reporting, and a national digital waqf catalogue. This digitalization was directed toward building a more integrated waqf ecosystem and enhancing public trust through information openness. The Chairman of BWI emphasized that the development of an Integrated Zakat and Waqf Data System would serve as the foundation for a new era of Islamic social finance governance in Indonesia . BWI also launched the SatuWakaf platform, a crowdfunding platform designed specifically for waqf that facilitates both cash waqf and waqf through money.

In the context of cash waqf, these developments indicated that waqf management increasingly required an information system capable of recording and providing information regarding the process of collection, management, and utilization of funds in a more structured manner. However, digitalization did not by itself ensure the creation of transparency. The digital system still



required monitoring, reporting, auditing, and data integration mechanisms so that the available information could be used for verification and accountability. Research by (Lubis et al., 2024) on digital-based cash waqf management in six Indonesian waqf institutions found that while digitalization enhanced transparency, accountability, and public participation, significant challenges persisted, including non-adaptive regulations, uneven technological infrastructure, and low public digital literacy.

(Nasywa & Lahuri, 2025) showed that strengthening transparency in digital waqf could be done through independent audits, supervision, transparent financial reports, provision of online platforms, and the development of blockchain-based reporting systems. These findings demonstrated that transparency in digital waqf was not only related to the use of digital platforms but also to the ability of the system to provide open, verifiable, and accountable information. This aligned with the Qur'anic principle of transparency in financial transactions, as stated in QS. Al-Baqarah [2]: 282, which commands the recording of debts and transactions as a manifestation of openness and prevention of deviation. The verse emphasizes that documentation and witnessing in economic transactions are means to prevent deviations and maintain justice (Rahmawati & Ismail, 2025) In the modern context, this value aligns with the principle of financial accountability that demands documentation, reporting, and openness in public financial management (Anwar et al., 2024)

Thus, the condition of waqf digitalization at BWI served as a basis for analyzing the need for technology more capable of supporting transaction traceability, data integrity, and verification processes. At this stage, blockchain became relevant for analysis—not as a technology assumed to have been fully implemented by BWI, but as one of the alternative technologies whose characteristics aligned with these transparency needs.

Transparency Needs in Digital Cash Waqf Management at BWI. The analysis results showed that transparency was one of the important needs in the development of the digital waqf ecosystem. BWI encouraged data integration, transactions, information, and communication within the waqf ecosystem as well as the development of online services and e-reporting. According to BWI, data integration through digital systems could support the formation of public trust and improve transparency in waqf management .In digital cash waqf

management, transparency needs were not only related to the availability of information about the amount of funds collected. Information was also needed to be traceable and verifiable, especially concerning transaction processes, fund management, and their utilization. Thus, several main needs could be identified: openness of information, traceability of transactions, data integrity, and ease of verification and supervision (Lubis et al., 2024)

Findings by (Maryaningsih, 2026) in digital waqf management showed that transparency and accountability could be strengthened through independent audits, supervision, implementation of Waqf Core Principles, provision of online platforms, stakeholder engagement, and openness of financial reports. The research also showed the use of blockchain-based reporting systems as one strategy in supporting digital waqf transparency. This was consistent with the Qur'anic command in QS. An-Nisa' [4]: 58, which instructs believers to deliver trusts to those entitled to receive them and to judge with justice. This verse emphasizes the importance of justice and transparency in managing amanah, including waqf assets The verse underscores that every individual must be responsible for their decisions and actions, including in the use of public resources, and emphasizes the importance of moral awareness that all human actions will be supervised by Allah SWT, so that every action must be carried out carefully and with full responsibility (Anwar et al., 2024)

Furthermore, QS. Al-Ma'idah [5]: 8 commands believers to be upholders of justice and witnesses for Allah, even against themselves or their relatives. This verse teaches the importance of transparency in management, including documenting digital assets, and emphasizes that hatred toward a group should not drive one to act unjustly (Anwar et al., 2024). In the context of digital cash waqf, this principle requires a system that ensures fairness in the management and distribution of waqf funds, regardless of the background of the parties involved.

Based on these findings, the transparency needs in digital cash waqf could be mapped into four main aspects. *First*, openness of information, namely the availability of waqf management information that could be accessed by interested parties. *Second*, traceability of transactions, namely the ability to know the history of transactions and cash flow. *Third*, data integrity, namely the maintained reliability of recorded data. *Fourth*, verification and supervision, namely the availability of mechanisms that allow information and



transactions to be checked by authorized parties. The fourth aspect became the basis in this study for analyzing the suitability of blockchain characteristics with the transparency needs of digital cash waqf at BWI. In other words, blockchain was not positioned as the main objective of waqf digitalization but as a potential technology to be used if its characteristics were capable of answering the identified transparency and governance needs.

Table 1. Transparency Requirements in Digital Cash Waqf Management at BWI

No	Transparency Aspect	Need in Digital Cash Waqf Management	Relevance for BWI
1	Openness of information	Availability of information about collection, management, and utilization of waqf funds that can be accessed by interested parties	Supports information openness and enhances public trust in waqf management
2	Traceability of transactions	The ability to browse the history of waqf fund transactions and flows from collection to utilization	Facilitates monitoring and tracing of waqf management activities
3	Data integrity	Transaction data and waqf management information must maintain their	Supports the reliability of information used in reporting and

		accuracy and reliability and be protected from invalid changes	monitoring of waqf
4	Verification and supervision	Availability of mechanisms that allow transactions and waqf management information to be checked and verified by authorized parties	Strengthens accountability, supervision, and responsibility of waqf management

Source: Processed by researchers based on BWI documents

Alignment of Blockchain Characteristics with Transparency Needs of Digital Cash Waqf at BWI. The analysis results showed a strong alignment between the transparency needs of digital cash waqf and blockchain characteristics. This alignment could be explained through the following mapping.

First, the need for openness of information aligned with the distributed ledger characteristic of blockchain. A distributed ledger allowed transaction information to be recorded in a distributed system and accessed by parties with authorized access. This enhanced information openness regarding waqf transaction activities. In the context of BWI's digitalization efforts, which emphasized data integration and information openness, distributed ledger technology could support the creation of a more transparent and accessible waqf information ecosystem. This aligned with the principle of *kitābah* (recording) in QS. Al-Baqarah [2]: 282, which commands the recording of financial transactions as a manifestation of transparency and prevention of deviation. Research by (Rahmawati & Ismail, 2025) demonstrated that the immutable, non-repudiable, and decentralized nature of Distributed Ledger Technology constituted the highest contemporary manifestation of *kitābah*, surpassing the security and integrity offered by traditional methods.



Second, the need for traceability of transactions aligned with the traceability characteristic of blockchain. Every transaction could be recorded and traced based on its history in the network. This facilitated the search for waqf fund flows from collection to utilization. A systematic literature review by (Marala, 2025) of 68 scholarly articles published between 2016 and 2025 identified that blockchain advanced transparency through real-time tracking, reinforced nazhir accountability through immutable audit trails, and cultivated public trust that drove donor participation. This was consistent with the principle of *isyhād* (witnessing) in QS. Al-Baqarah [2]: 282, where the algorithmic consensus mechanisms of blockchain (such as Proof-of-Work or Proof-of-Stake) could be understood as "digital witnesses" that effectively eliminated human cognitive bias, negligence, and perjury (Rahmawati & Ismail, 2025)

Third, the need for data integrity aligned with the immutability characteristic of blockchain. Data that had been recorded on the blockchain was designed to be difficult to change unilaterally without leaving a trace of the change. This enhanced data reliability and reduced the risk of invalid data changes. Research by (Kholiq, 2025) confirmed that blockchain significantly improved transparency, accountability, and donor participation by enabling immutable record-keeping and real-time tracking of waqf assets. In the context of waqf management, the immutability characteristic supported the integrity of records that served as the basis for reporting and supervision. This aligned with the Qur'anic principle in QS. Al-Baqarah [2]: 188, which prohibits the consumption of wealth unjustly and emphasizes transparency and fairness in economic transactions. The verse reminds believers to avoid fraud, deception, and dishonest trading practices, and to prioritize transparency and fairness over profit.

Fourth, the need for verification and supervision aligned with the auditability characteristic of blockchain. Blockchain provided an immutable audit trail that enabled authorized parties to verify transactions and ensure compliance with rules and regulations. This strengthened accountability, supervision, and responsibility in waqf management. A systematic literature review by Manaf et al. (2026) examining literature indexed in Scopus, Web of Science, and SINTA published between 2015 and 2025 found that blockchain advanced transparency through real-time tracking, reinforced nazhir accountability through immutable audit trails, and cultivated public trust that drove donor participation.



Fifth, the implementation of management provisions aligned with the smart contract characteristic. Rules or certain conditions could be programmed to be executed automatically based on predetermined provisions. This had the potential to reduce reliance on manual processes and increase consistency in rule implementation. Research by (Safitri et al., 2025) showed that smart contracts had the technical potential to strengthen the transparency and efficiency of waqf management. However, their effectiveness depended on protocol security, code quality, and verification mechanisms to ensure compliance with the principles of justice (*'adl*), the prohibition of *gharar*, and usury. The study also proposed integrating *Al-'Urf* (customary practices) as a model to support adaptive and sustainable governance in blockchain-based waqf.

Sixth, the need for information integration aligned with the network distribution characteristic. Transaction data could be integrated into a system involving related parties in accordance with their access rights. This supported information connectivity and reduced information gaps between stakeholders. In the context of BWI's digitalization efforts, which emphasized data integration across the waqf ecosystem, this characteristic could support the creation of a more integrated and transparent waqf information system.

Table 2. Conformity of Blockchain Characteristics with Transparency Needs of Digital Cash Waqf at BWI

No	Transparency Need	Blockchain Characteristic	Potential Implementation	Potential Contribution to Transparency
1	Openness of information	Distributed ledger	Transaction information can be recorded in a distributed system and accessed by parties with	Increases information openness regarding waqf transaction activities



			authorized access	
2	Traceability of transactions	Traceability	Every transaction can be recorded and traced based on its history in the network	Facilitates searching of waqf fund flows from collection to utilization
3	Data integrity	Immutability	Data recorded on blockchain is designed to be difficult to change unilaterally without leaving a trace	Increases data reliability and reduces risk of invalid data changes
4	Verification and supervision	Auditability	Immutable audit trails enable authorized parties to verify transactions	Strengthens accountability, supervision, and responsibility
5	Implementation of management provisions	Smart contract	Rules or conditions can be programmed to execute automatically based on predetermined provisions	Reduces reliance on manual processes and increases consistency
6	Information integration	Network distribution	Transaction data can be integrated in a system involving related	Supports information connectivity and reduces

			parties according to access rights	information gaps

Source: Processed by researchers based on analysis of BWI literature

Opportunities and Challenges of Blockchain Implementation at BWI. The analysis results showed that blockchain implementation in digital cash waqf management at BWI had several opportunities that could support transparency improvement. These opportunities were particularly related to the needs for data integration, transaction traceability, reporting strengthening, and community trust improvement. BWI itself had encouraged the digitalization of the waqf ecosystem through the development of data, transaction, information, and digital service integration. This condition indicated the need for increasingly integrated digital systems in waqf management (Pratama, 2025)

One of the main opportunities of blockchain was strengthening transaction traceability. Recording transactions in a blockchain network could help provide a more structured transaction history so that the process of collecting and utilizing waqf funds could be explored. This could support the needs of waqif and interested stakeholders to obtain information about waqf fund management. This opportunity aligned with the *istikhlāf* principle in Qur'anic wealth management, which emphasizes trusteeship and accountability, as identified by (Faujiah, 2025) in their systematic literature review on Qur'anic wealth management and digital waqf transformation. The study identified five core *at-tamwīl* principles derived from the Qur'an: *istikhlāf* (trusteeship and accountability), *tanmiyah wa tazkiyah* (growth and purification), *tawāzun wa 'adl* (balance and distributive justice), *tasylif wa bayyinah* (clarity and evidentiary transparency), and *maqāṣidiyyah* (public welfare orientation). These principles were integrated into the "Digital At-Tamwil" model, a conceptual framework that positioned technologies such as blockchain, smart contracts, waqf crowdfunding, and data analytics as instruments for operationalizing Qur'anic values within digital waqf governance.

The next opportunity was strengthening accountability and the audit process. Transaction records stored in the system could become a source of information for the inspection and supervision process. With the availability of traceable transaction history, the verification process could be carried out more



structurally. Research by (Kurniasari, Dewi; Hadi, 2026)**)** confirmed that blockchain enabled real-time recording of waqf transactions, improved accountability in asset management, and expanded public participation in digital waqf. In addition, blockchain had the potential to support information integration between parties involved in the waqf ecosystem in accordance with their respective authority and access rights. A Delphi-Likert study by (Ihsan, 2025) involving academics, regulators, and practitioners in the waqf and blockchain fields concluded that blockchain needed to be implemented immediately in Indonesia, with a preference for hybrid and public networks, and that a limited open ecosystem balanced the need for transparency with the protection of institutional internal data.

However, blockchain implementation also faced several challenges. *First*, infrastructure and human resource readiness. The use of blockchain technology required adequate technological infrastructure as well as human resources who understood digital system management. Research by (Sucianti, 2025) on the SatuWakaf platform at BWI recommended strengthening BWI's human resource capacity, conducting gradual education campaigns on waqf and blockchain technology, collaborating with existing Shariah-compliant blockchain service providers, and proposing regulatory sandboxes for blockchain waqf projects. *Second*, regulatory and governance aspects. Blockchain implementation in waqf needed to be adjusted to waqf regulations, Shariah provisions, and the distribution of authority between involved institutions. (Marala, 2025) noted that regulatory challenges primarily stemmed from the lack of regulations on the status of digital assets, the validity of blockchain-based contracts, and the dispute-resolution mechanism for digital waqf, creating legal uncertainty. The integration of *Al-'Urf* through *taqnīn* and *siyāsah syar'iyyah* could form the basis for developing more adaptive and sustainable digital waqf regulations**.**

Third, data security and protection. The system had to have mechanisms for arranging access rights and protecting information so that data transparency did not cause risks to sensitive data. *Fourth*, the quality of data entered into the system. Blockchain could safeguard records that had been recorded, but it did not automatically ensure that the initial data entered was correct. Therefore, validation and verification mechanisms were needed before the data was recorded in the system. (Syaifullah et al., 2025) identified governance weaknesses in digital cash waqf systems, including the lack of standardized

service delivery models, inadequate transparency mechanisms, and insufficient regulatory oversight, alongside adoption barriers such as low public awareness and suboptimal user experience. These governance, institutional, and technology gaps were mutually reinforcing rather than independent.

The findings also highlighted the importance of grounding blockchain implementation in Qur'anic principles (Jihad, 2024)emphasized that sustainable digital waqf transformation demanded a strong normative grounding in Qur'anic teachings, not merely technological modernization. The "Digital At-Tamwil" model offered a novel contribution by bridging sacred scripture, Indonesia's contemporary socio-economic realities, and the digital ecosystem, positioning waqf as a resilient instrument of sustainable development while preserving its spiritual essence. The study further identified ethical risks inherent to digitalization, including materialistic reductionism, digital exclusion among underserved communities, and the erosion of interpersonal bonds between donors (*wāqif*), managers (*nāẓir*), and beneficiaries (*mustaḥiq*). These risks had to be addressed through appropriate governance design and community engagement.

The research also showed that the potential of blockchain in enhancing transparency was inseparable from institutional and governance conditions. Blockchain could provide a more structured recording and tracking mechanism, but its effectiveness still depended on data quality, information validation, access rights settings, system security, human resource readiness, and compliance with Shariah regulations and principles. (Sani, 2025) noted, digital-based cash waqf management in Indonesian waqf institutions had the potential to support transparency and accountability but still faced infrastructure, regulatory, and digital literacy problems.

Thus, this study found that blockchain had the potential to become a supporting technology in enhancing digital cash waqf transparency at BWI, especially in the aspects of transaction traceability, data integrity, verification, and supervision. However, this potential could not yet be understood as proof that blockchain had become a ready-made solution fully implemented at BWI. Further studies were needed regarding infrastructure readiness, governance design, regulatory aspects, data security, and implementation models appropriate to the characteristics of waqf in Indonesia (Marala, 2025)



The theoretical implications of these findings suggested that the Technology-Organization-Environment (TOE) framework provided a useful lens for understanding blockchain adoption in waqf institutions. The alignment between blockchain characteristics and transparency needs demonstrated the technological dimension. However, the challenges identified—institutional readiness, human resources, governance structures, regulatory frameworks, and Shariah compliance requirements—highlighted the organizational and environmental dimensions that moderated the effectiveness of blockchain implementation. (Kurniasari, Dewi; Hadi, 2026) argued in their scientometric analysis of blockchain in Islamic social finance, the field was still in its nascent stages, characterized by a dearth of empirical and cross-country investigations. Their study, integrating the Technology Acceptance Model (TAM) and the Maqāṣid al-Sharīʿah framework, demonstrated that blockchain significantly improved governance and efficiency in the management of zakat and waqf, but emphasized the need for empirical validation and technological convergence.

Overall, the results of this study showed that strengthening digital cash waqf transparency was not sufficient through service digitalization alone. Transparency required a system capable of connecting transaction recording, information transparency, data tracking, and supervision mechanisms in an integrated manner. In this context, blockchain could be considered as one of the alternative technologies to support the strengthening of digital cash waqf governance at BWI. The alignment between blockchain characteristics and the transparency needs identified—openness of information, traceability of transactions, data integrity, verification and supervision, implementation of management provisions, and information integration—provided a strong foundation for considering blockchain as a supporting technology. However, the realization of this potential required a comprehensive approach that addressed the institutional, regulatory, and human resource challenges identified, while ensuring that the implementation remained grounded in the ethical and normative principles of Islam as derived from the Qur’an and Sunnah.

CONCLUSIONS

This study concludes that blockchain technology possesses significant potential to enhance the transparency of digital cash waqf at the Indonesian Waqf Board (BWI), as evidenced by the strong alignment between the transparency needs of digital cash waqf management and the core characteristics of blockchain. The need for openness of information corresponds with distributed ledger, traceability of transactions aligns with traceability, data integrity is supported by immutability, verification and supervision are facilitated by auditability, the implementation of management provisions can be strengthened through smart contracts, and information integration is enabled by network distribution. This alignment indicates that blockchain is not merely a technological novelty but a potentially suitable instrument for addressing persistent governance challenges in waqf management, including fragmented reporting, limited audit capacity, and insufficient real-time oversight. However, the realization of this potential is contingent upon a range of institutional, regulatory, and human resource prerequisites. Blockchain cannot function as a standalone solution; its effectiveness depends on data quality, validation mechanisms, access rights, system security, human resource readiness, and alignment with Shariah principles and waqf regulations. Therefore, blockchain should be positioned as a supporting technology within a broader digital transformation and governance strengthening strategy, rather than as a panacea for all transparency problems. Future research should assess institutional and technological readiness through pilot projects, develop contextually appropriate implementation models for the Indonesian waqf ecosystem, integrate interdisciplinary perspectives from Islamic jurisprudence, public policy, and information systems, and prioritize capacity-building for waqf administrators, regulators, and the public. By addressing these areas, blockchain can contribute meaningfully to strengthening transparency, accountability, and public trust in digital cash waqf management in Indonesia.

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