

Enhancing Transparency in Cash Waqf Management for Islamic Educational Institutions: A Blockchain-Based Framework

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Abstract

Financing Islamic educational institutions in Indonesia, particularly pesantren, often faces challenges in financial sustainability. Cash waqf holds great potential as a self-financing solution with an annual value of IDR 180 trillion, yet its realization remains low due to a public trust crisis regarding transparency in fund management by Nazhir. This study aims to design a blockchain-based cash waqf management framework where Islamic educational institutions are positioned as the primary beneficiaries receiving transparent and accountable fund flows. Using literature review and regulatory analysis of PMA No. 14 of 2025, this research proposes the integration of smart contracts to automate the distribution of waqf funds directly to educational programs such as scholarships and facility development. Findings indicate that the use of a distributed ledger allows real-time fund tracking by donors (wakif), significantly increasing public participation and ensuring the financial stability of Islamic educational institutions.

Keywords: *Cash Waqf, Blockchain, Islamic Education Financing, Transparency, Smart Contracts.*

Introduction

Islamic educational institutions such as Islamic boarding schools and madrasas have a strategic role in the development of human resources (HR) in Indonesia, not only in the religious aspect but also in the formation of character, morals, and socio-economic independence of the community. Pesantren, as the oldest educational institution in Indonesia, has transformed into an empowerment center that not only produces knowledgeable graduates, but also contributes to strengthening the economy of the people through various productive activities. Education constitutes a long-term investment in human capital development with measurable impact on the sustainable improvement of societal welfare. Therefore, the existence of Islamic educational institutions is very crucial in supporting the national development agenda based on Islamic values and social inclusivity (Azra, 2020).

However, Islamic educational institutions still face fundamental challenges, especially in the aspect of limited and unstable financing. Most Islamic boarding schools and madrasas still rely on conventional funding sources such as student dues, community donations, and government assistance which are not always sustainable (Ascarya & Yumanita, 2020). This condition causes limitations in infrastructure development, the quality of educators, and educational innovation. In many cases, weak financial governance and lack of diversification of funding sources further exacerbate the condition. Therefore, an alternative financing model that is both sustainable and aligned with Sharia principles is needed to ensure the operational continuity of Islamic educational institutions.

One of the instruments that has great potential in supporting Islamic education financing is cash waqf. In Indonesia, the potential for money waqf is estimated to reach around Rp180 trillion per year, showing a great opportunity to be used as a productive source of socio-economic financing (Indonesian Waqf Agency, 2023). However, the realization of cash waqf collection is still far from optimal, with a relatively small total accumulation compared to the existing potential. This gap shows the existence of structural problems, one of which is the low level of public trust in the transparency and accountability of the management of waqf funds by nazhir. In several studies, it was stated that the increase in public trust was greatly influenced by a transparent, accountable, and technology-based management system. Therefore, innovation in waqf management, including through the integration of digital technology, is an important step to optimize the potential of cash waqf in supporting Islamic education financing (Antonio et al., 2021).

The low level of public trust in nazhir is one of the main problems in the management of waqf in Indonesia. Trust is a key factor in encouraging community participation in waqf, especially cash waqf which is flexible and requires professional management. In practice, many people still doubt the integrity and capability of nazhir in managing waqf funds in a trustworthy and productive manner. This is inseparable from the limited supervision system and the lack of reporting that can be accessed openly by the wakif. Several studies show that the lack of transparency and accountability in waqf management significantly affects the low interest of the public to participate in cash waqf. Thus, the problem of trust deficit is a structural obstacle in optimizing the potential of waqf in Indonesia (Hassan & Noor, 2022).

In addition, the waqf management reporting system that is still conventional and not real-time has also worsened this condition. Most waqf management institutions still use manual recording mechanisms or simple digital systems that are not integrated, so that information on fund flows, use, and impact of waqf cannot be accessed transparently by stakeholders. This condition creates information asymmetry between nazhir and waqf, which ultimately lowers the level of accountability and credibility of waqf institutions. In the Islamic economic literature, transparency and accountability are fundamental principles in the management of public funds, including waqf, which must be maintained to ensure sustainability and public trust. Therefore, it is necessary to innovate a waqf management system that is able to provide transparent, accountable, and technology-based reporting to answer these challenges (Huda et al., 2021).

Research on waqf management in recent years has generally still focused on conventional approaches, especially related to nazhir governance, optimization of waqf assets, and strengthening the role of productive waqf in the economic development of the people. In addition, a number of studies have begun to lead to the use of digital technology based on financial technology (fintech) to improve the efficiency of waqf collection and distribution, such as through crowdfunding platforms or digital payment applications. However, the digitalization implemented is still at the basic stage, which is limited to facilitating transactions without fundamentally changing the transparency and accountability system of waqf management. In other words, most of the existing innovations have not been able to overcome the main problems in the form of trust deficits and limitations of an integrated reporting system.

On the other hand, the integration of more advanced technologies such as blockchain and smart contracts in the management of waqf, especially cash waqf for

the Islamic education sector, is still relatively limited in the academic literature. In fact, blockchain technology has the main characteristics of transparency, immutability, and decentralization which have great potential in increasing public trust in the management of waqf funds. The use of smart contracts also allows the automation of fund distribution in accordance with the goals of the waqf that have been set, so that it can minimize the risk of abuse and increase distribution efficiency. However, studies that specifically examine the integration of blockchain and smart contracts in the context of financing Islamic educational institutions are still very minimal, thus opening up significant research space to develop a more innovative and adaptive waqf management model to technological developments.

Method

This study employs a qualitative approach with a literature review method to analyze the management of cash waqf and the potential for blockchain technology integration in increasing transparency and accountability. This approach was chosen because it allows researchers to comprehensively examine the theoretical concepts, regulations, and practices of waqf management that have developed (Antonio, 2021). The data used in this study is sourced from various academic literature in the form of books that discuss cash waqf, Islamic finance, and blockchain technology, in addition to regulatory documents such as the Regulation of the Minister of Religion (PMA) No. 14 of 2025 and the Waqf Law in Indonesia. In addition, official reports from institutions such as the Indonesian Waqf Agency (BWI) and Bank Indonesia are also used as supporting data to provide an empirical picture of the actual condition of waqf management in Indonesia (Kahf, 2020).

The analysis methods used in this study include content analysis and comparative analysis. Content analysis was conducted to identify key concepts related to cash waqf management, the principles of transparency and accountability in the Islamic economy, and the characteristics of blockchain technology (Obaidullah, 2020). Meanwhile, comparative analysis is used to compare traditional waqf management systems with blockchain-based systems, especially in terms of transparency, efficiency, and data security. Through this approach, research can identify the weaknesses of conventional systems while exploring the potential advantages of blockchain technology in overcoming existing problems (Iqbal & Mirakhor, 2021).

Furthermore, framework development is carried out through several stages, namely problem identification, solution design, and blockchain-based conceptual model construction. In this stage, the researcher designed a system that integrates all stakeholders in the waqf ecosystem, namely waqf as the funder, nazhir as the manager, and Islamic educational institutions as the main beneficiary (Mannan, 2020). Smart contract technology is used as the main mechanism to automate the distribution of funds in accordance with the goals of the waqf that have been determined, thereby increasing transparency and minimizing the risk of irregularities. Thus, the resulting framework is expected to be able to provide a more accountable, efficient, and sharia management model for waqf management (Ayub, 2021).

Table 1. Summary of Key Literature on Cash Waqf Management, Transparency, and Blockchain Technology

No	Author(s) & Year	Topic/Focus	Method	Key Finding	Context
1	Jalil et al. (2023)	Information disclosure & donor commitment in waqf	Survey, SEM	Transparent financial and governance disclosures directly enhance donor trust and commitment	Malaysia
2	Abd Jalil et al. (2019)	Role of information disclosure in building committed wakif	Survey, PLS-SEM	Trust mediates the relationship between information disclosure and donor commitment	Malaysia
3	Hasan et al. (2022)	Good governance and transparent reporting in waqf management	Survey, SEM	Governance quality and transparent reporting are the strongest predictors of public trust in waqf institutions	Singapore, Malaysia
4	Nour Aldeen et al. (2022)	Cash waqf participation among millennials	Survey, quantitative	Transparency deficits and weak institutional reputation deter cash waqf participation among younger donors	Indonesia
5	Kasri & Chaerunnisa (2022)	Knowledge, trust, and religiosity in online cash waqf	Survey, SEM	Trust is a key mediator between knowledge/transparency and online cash waqf donation behavior	Indonesia
6	Mohaiyadin et al. (2022)	Blockchain for accountability and transparency in waqf	Case study, systematic review	Blockchain addresses accountability gaps in waqf management but faces regulatory and integration challenges	Malaysia
7	Aladwani (2025)	Blockchain impact on contract management in awqaf	Survey, case study	Blockchain enhances cash flow transparency and smart contract execution in waqf management	Saudi Arabia
8	Megat et al. (2024)	Smart contracts and waqf crowdfunding	Survey, SEM	Waqftech smart contracts positively predict corporate waqf crowdfunding intention but governance compliance remains critical	Malaysia
9	Antonio et al. (2021)	Blockchain technology for waqf management	Conceptual framework	Blockchain offers a viable framework for transparent and accountable waqf management	Conceptual
10	Hassan & Noor (2022)	Cash waqf as a sustainable development tool	Literature review	Cash waqf has significant potential for sustainable Islamic financing but requires improved governance	Cross-country

The studies presented in Table 1 above were selected based on three inclusion criteria:

- 1) publication between 2019 and 2025,

- 2) direct relevance to at least one of three core themes, namely cash waqf management, transparency and trust in Islamic philanthropy, or blockchain/smart contract technology, and
- 3) availability in peer-reviewed academic sources indexed in Scopus or equivalent databases.

Across the reviewed studies, a consistent finding emerges: transparency in waqf management, whether measured through financial disclosure, governance reporting, or digital platform trust, is empirically linked to increased donor commitment and public participation (Jalil et al., 2023, p. 23). Furthermore, blockchain technology is widely recognized as a technically viable mechanism for addressing accountability deficits in Islamic social finance. These two streams of literature converge on a shared premise: that institutional credibility, underpinned by transparent and auditable fund management, is a prerequisite for optimizing cash waqf participation.

However, notable gaps remain. First, the majority of empirical studies on waqf transparency and donor trust are concentrated in Malaysia and Saudi Arabia, with limited evidence from the Indonesian context, where regulatory frameworks and nazar governance structures differ substantially (Mohaiyadin et al., 2022, p. 57). Second, while blockchain studies demonstrate technical feasibility, most remain at the conceptual or pilot stage and do not address institutional integration within a specific beneficiary sector. Most critically, no existing study specifically examines the integration of blockchain-based cash waqf management within the financing ecosystem of Islamic educational institutions, a sector that represents both a major potential beneficiary and a structurally underserved recipient of waqf funds in Indonesia. This study addresses that gap by proposing a concrete, regulation-compliant framework that positions Islamic educational institutions as the primary beneficiaries of a blockchain-mediated cash waqf distribution system.

Result

1. Proposed Blockchain-Based Framework

The framework proposed in this study places blockchain technology at the core of a transparent and integrated cash waqf management system. The system architecture is designed with a main flow involving the wakif as the funder, the digital platform as the medium of interaction, the smart contract as the automation mechanism, and the Islamic educational institution as the main beneficiary. In this system, every waqf transaction made by the wakif will be directly recorded in the blockchain network through a connected platform, thus creating a transparent and non-manipulative recording system. This approach is in line with the concept of distributed trust in blockchain technology which eliminates the need for intermediaries to guarantee trust.

The main components in this framework consist of a distributed ledger, smart contract, and user interface. Distributed ledger functions as a digital ledger that stores all transactions in a decentralized manner and can be accessed by all related parties. Smart contracts act as automated instruments that execute orders based on predetermined conditions, such as the distribution of waqf funds to certain programs. Meanwhile, the user interface is designed to facilitate user interaction, both wakif and nazhir, in accessing information and making transactions. The integration of these

three components allows for the creation of a system that is not only efficient, but also has a high level of transparency and security (Salah et al., 2021).

This framework also accommodates the role of nazhir as a strategic manager that is not eliminated, but strengthened through technology. Nazhir still has functions in planning, supervising, and managing waqf programs, but with the support of a more transparent and measurable system. Thus, blockchain technology does not replace the role of humans, but improves the quality of waqf governance through a more accountable and trustworthy system. This is in line with the principles of governance in Islamic finance which emphasizes trust, transparency, and accountability. Unlike previous blockchain-waqf frameworks developed primarily within Malaysian and Saudi Arabian institutional contexts, the proposed framework is specifically designed to operate within Indonesia's regulatory architecture (Mohaiyadin et al., 2022, p. 58).

In particular, the framework is structured in full alignment with the Regulation of the Minister of Religion (PMA) No. 14 of 2025, which governs the procedures for cash waqf of movable assets and formally recognizes the role of Sharia Financial Institutions Receiving Money Waqf (LKS-PWU) as the primary collection gateway. This regulatory grounding distinguishes the present framework from conceptual blockchain-waqf models that lack jurisdiction-specific institutional anchoring. To the best of the authors' knowledge, this framework represents the first attempt to integrate blockchain-based cash waqf distribution with Islamic educational institutions as the designated primary beneficiaries within an Indonesia-specific regulatory framework. While prior studies have examined either blockchain feasibility in waqf management generally or transparency determinants of donor behavior empirically, none has proposed a jurisdiction-compliant, institution-specific operational model that simultaneously addresses the financing sustainability of Islamic educational institutions. This study bridges that gap (Jalil et al., 2023, p. 20).

2. Mechanism of Fund Flow

The mechanism for the flow of funds in the proposed system starts from the donation process carried out by the wakif through a blockchain-based digital platform. Each contribution made will be immediately recorded in the system as a validated transaction and permanently stored in the distributed ledger network. This process ensures that the entire flow of funds can be traced from the start, thereby reducing the risk of data loss or information manipulation. In addition, this system also allows integration with various digital payment methods, thereby increasing the ease of access for the public in waqf.

Once the funds are recorded in the blockchain, the smart contract will automatically manage the distribution of funds according to the waqf goals that have been predetermined by the waqf. For example, funds can be allocated for student scholarship programs, the construction of educational facilities, or the development of learning facilities. Smart contracts work on pre-programmed code, so they don't require manual intervention in the execution process. This not only increases efficiency, but also reduces the potential for misuse of funds by certain parties. In this context, smart contracts function as a control tool that ensures that funds are used in accordance with the waqf's mandate (Zulaikha & Rusydiana, 2022).

This mechanism also provides flexibility in the management of waqf funds, where nazhir can design various distribution schemes that suit the needs of educational institutions. With a transparent and automated system, educational

institutions as beneficiaries can receive funds faster and on target. This has the potential to increase the efficiency of the use of funds and support the sustainability of Islamic education financing. Thus, blockchain-based fund flow mechanisms not only increase transparency, but also strengthen the effectiveness of waqf distribution (Ascarya, 2022).

3. Transparency Features

One of the main advantages of using blockchain in waqf management is its ability to provide high transparency features. This transparency mechanism directly addresses the trust deficit documented in the empirical literature. Survey-based studies employing SEM/PLS-SEM models confirm that financial and governance disclosure quality is the strongest predictor of donor trust and sustained donation commitment in Islamic waqf institutions. Trust, in turn, functions as a critical mediator between transparent management practices and actual cash waqf participation behavior (Kasri & Chaerunnisa, 2022, p. 9). In the Indonesian context specifically, transparency deficits and weak institutional reputation have been empirically identified as the primary deterrents to cash waqf engagement, particularly among younger Muslim donors (Nour Aldeen et al., 2022, p. 29). The real-time tracking feature embedded in the proposed framework directly responds to these documented barriers by transforming institutional accountability from a periodic, retrospective process into a continuous, publicly verifiable one.

This system allows for real-time tracking of funds, where every transaction made can be directly monitored by the wakif through the available platform. Thus, the wakif not only provides funds, but can also see firsthand how the funds are managed and distributed. This kind of transparency is an important factor in increasing public trust in waqf management institutions.

In addition, access to the public ledger allows all stakeholders to view transaction history openly, without revealing the sensitive identity of users. This creates a system that is transparent while maintaining the privacy of individuals. Every transaction recorded in the blockchain is immutable, which means it cannot be altered or deleted once validated. This characteristic provides a high guarantee of data security and prevents the manipulation of financial statements. In the context of waqf, this is very important to ensure that funds are managed in a trustworthy manner and in accordance with sharia principles (Kahf, 2020).

Furthermore, this transparency feature also contributes to increasing the accountability of nazhir as waqf managers. With a system that can be audited openly, nazhir is required to carry out fund management professionally and responsibly. This not only increases the trust of the waqf, but also encourages increased public participation in cash waqf. Thus, blockchain-based transparency not only serves as a technological tool, but also as a mechanism for strengthening governance in the modern waqf system.

4. Compliance with Regulation

In the context of implementation, the proposed framework still pays attention to compliance aspects with applicable regulations in Indonesia, especially the Regulation of the Minister of Religion (PMA) No. 14 of 2025 concerning waqf management. This regulation emphasizes the importance of transparent, accountable, and sharia governance of waqf. Therefore, the integration of blockchain technology in

the waqf system must be designed in such a way that it does not conflict with existing legal provisions, but rather supports the implementation of regulations more effectively (Indonesian Waqf Agency, 2023).

In this framework, the role of nazhir as the main manager of waqf funds is maintained, in accordance with the provisions of the Waqf Law. However, with blockchain-based systems, the role is strengthened through the support of technology that allows for more transparent and measurable supervision. Nazhir remains responsible for program planning, fund management, and reporting to regulators, but all of these activities are recorded in an openly accessible system. This creates a balance between technological aspects and adherence to the institutional principles of waqf (Iqbal & Mirakhor, 2021).

The application of this technology also has the potential to support regulators in conducting more effective supervision of waqf management. With real-time and integrated data, the audit and evaluation process can be carried out more efficiently and accurately. In addition, this system can also be the basis for the development of policies that are more adaptive to technological developments in the Islamic financial sector. Thus, the proposed framework is not only technically relevant, but also compatible with existing regulatory frameworks (Obaidullah, 2020).

Figures and Tables

1. Proposed Blockchain-Based Framework (System Architecture)

The preparation of a blockchain-based system architecture for the management of cash waqf in Islamic educational institutions is designed as a technological bridge to overcome information asymmetry. This architecture decentralizes record-keeping so that the flow of financial data and ownership of waqf assets is no longer stored in a single database controlled unilaterally by Nazhir, but is distributed to all participating network nodes (Hasan et al., 2020).

The flow of collecting and distributing cash waqf funds is automatically integrated through a digital wallet interface connected to a *smart contract*. When the Wakif deposits rupiah funds through the Sharia Financial Institution Receiving Money Waqf (LKS-PWU), the transaction is immediately confirmed by the *blockchain* system to trigger the writing of new blocks and the issuance of a digital waqf certificate (Cakir & Cakir, 2018).

The first stage starts from the Wakif as the waqf giver who deposits cash waqf funds digitally through the Sharia Financial Institution Recipient of Money Waqf (LKS-PWU). Once the transaction is made, the system will send transaction data to the *blockchain* network to be verified by the consensus nodes contained in the network. This verification process ensures that transactions are legal, transparent, and permanently recorded on the digital ledger (*distributed ledger*) (Nakamoto, 2008). Furthermore, after the transaction is validated, the *smart contract* will be activated automatically to execute pre-programmed instructions. In this study, *smart contracts* are used to manage the distribution of waqf investment results in real-time, including the distribution of educational operational funds, student scholarships, and the development of Islamic boarding school digital infrastructure without the need for manual intervention from the manager (Szabo, 1997).

In the final stage, the funds from waqf management will be received directly by the *beneficiary* or Islamic educational institutions that have been determined in the waqf pledge. This automatic mechanism provides certainty in the distribution of funds

according to sharia purposes while strengthening the principles of transparency and public accountability in the management of modern cash waqf (Kahf, 2003; Regulation of the Minister of Religion No. 14, 2025).

2. Comparison of Systems (Traditional vs Blockchain)

The structural comparison between the traditional waqf model and the blockchain-based model lies in the data clearing and audit mechanism. In traditional systems, audits are conducted periodically and retrospectively after a transaction has been completed for several months, while in the blockchain model, verification is carried out instantly through cryptographic network consensus (Peters & Panayi, 2016). In the traditional system, the transaction flow starts from the Wakif who deposits funds through LKS-PWU before forwarding them to Nazhir's account. After that, the supervision process is carried out through manual audits which are generally periodic, for example monthly or quarterly. This model causes a time lag between transactions and the verification process, opening up opportunities for reporting delays, administrative errors, and information asymmetry between managers and donors (Khan, 2019).

In contrast, on a blockchain-based system, transactions made by Wakif are directly verified by consensus nodes in a decentralized digital network. After the transaction is declared valid, the *smart contract* automatically executes the instructions for distributing funds according to the provisions of the waqf pledge. All of these activities are permanently recorded in a *real-time audit* system, allowing regulators, Nazhir, and Wakif to monitor the movement of funds transparently and simultaneously (Zheng et al., 2018).

This transformation from manual audits to automated audits shows that blockchain technology not only functions as a digital recording tool, but also as a governance mechanism that is able to reduce supervision costs, increase operational efficiency, and strengthen public trust in cash waqf management institutions (Alharby & van Moorsel, 2017).

3. Operational Performance Characteristics

To map the difference in performance quantitatively and qualitatively, a comparative matrix was developed that compares crucial parameters in the management of cash waqf (Indonesian Waqf Agency, 2024).

Table 2. Comparison of Characteristics of Traditional and Blockchain-Based Waqf Systems

Characteristic Dimensions	Traditional Waqf System	Blockchain-Based Waqf System
Transparency	Limited to periodic internal reports	Fully open and trackable at any time (<i>real-time</i>)
Accountability	Vulnerable to manipulation or manual data input errors	Guaranteed by immutable nature of data
Efficiency	The administrative process is lengthy and requires high verification costs	Automated distribution via <i>smart contracts</i> with low latency
Data Storage	Centralized on a single server owned by Nazhir or a bank	Cryptographically distributed across the node network

Characteristic Dimensions	Traditional Waqf System	Blockchain-Based Waqf System
Regulatory Verification	Done manually by BWI and the Ministry of Religious Affairs	Automatically integrated through programmatic compliance (<i>compliance-by-code</i>)

4. Stakeholder Mapping

The implementation of this technology involves close coordination among all key stakeholders, each of whom has a functional role in the network (Indonesian Waqf Agency, 2025b).

Table 3. Stakeholder Mapping in the Digital Waqf Ecosystem

Stakeholder	Roles in the System	Primary Access Rights	Regulatory Compliance (PMA No. 14/2025)
Wakif	Waqf fund providers	Monitor the use of funds in <i>real-time</i>	Eligible to receive a digital Money Waqf Certificate (SWU)
Nazhir	Investment manager/manager	Propose productive project allocations	Must report investment performance periodically
Beneficiary	Beneficiaries (pesantren)	Receive automatic allocation funds for operations	The use of funds must be in accordance with the waqf pledge
Regulator	Supervisor (Ministry of Religion & BWI)	Have a dedicated audit node for regulation	Perform administrative supervision functions digitally

Discussion

1. Impact on Transparency (Automated Trust via Smart Contract)

The application of a blockchain-based framework fundamentally restructures the concept of *trust* in the management of cash waqf. In the conventional system, trust is interpersonal and highly dependent on the reputation of the individual morality of the manager (Nazhir). Through the use of *smart contracts*, this paradigm shifts to *automated trust*, where the fulfillment of promises or waqf pledges is guaranteed by objective cryptographic algorithms (Werbach, 2018).

The nature of a *distributed ledger* ensures that every rupiah collected from the Wakif will be recorded permanently and immutably. When a transaction occurs, all the monitoring computers (*nodes*) connected in the network will validate its validity, thus mitigating the risk of internal data manipulation. Thus, loopholes for administrative fraud can be minimized to zero, ultimately providing solid legal certainty for donors (Zheng et al., 2018).

2. Impact on Public Trust

Restoring public trust in waqf management institutions is an absolute prerequisite for optimizing the potential of national cash waqf. Through the *real-time tracking* feature, donors can actively monitor the development of their waqf investment portfolios and see firsthand how the profits from these assets are channeled to Islamic education. This high data accessibility provides a deep sense of emotional and spiritual involvement for Wakif (Indonesian Waqf Agency, 2025a).

This increase in transparency also has an impact on fulfilling the public accountability obligations mandated by law. Wakif no longer need to guess whether

their funds are stagnating or being misused, as the investment status is clearly presented on the user dashboard. When the public sees tangible evidence of the transparent use of waqf funds, collective participation in the money waqf program will grow exponentially (Hasan et al., 2020).

3. Financial Sustainability for Islamic Education

Islamic educational institutions such as Islamic boarding schools and madrasas are often vulnerable to cash flow shocks due to excessive reliance on student dues. Through a blockchain-based cash waqf framework, the principal of waqf funds collected from the public is securely locked in long-term sharia instruments, while the investment proceeds are allocated continuously for educational operations. This mechanism ensures the availability of sustainable internal financing sources (*self-financing*) (Kahf, 2003).

This financial sustainability is crucial to fund strategic programs such as full scholarships for outstanding students from underprivileged families and the maintenance of digital infrastructure. With the availability of a stable flow of yield funds from time to time, pesantren managers can plan long-term education quality improvement programs with more confidence (Hebitren Indonesia, 2025).

4. Concrete Use Case: Al-Amanah Islamic Boarding School Financing Scenario

As a visualization of the application in the real world, this study compiles a hypothetical implementation scenario at the Al-Amanah Islamic Boarding School. This Islamic boarding school takes care of around 800 students, of which 40% are orphans and poor people who are exempt from education fees. The annual operational budget of the pesantren is IDR 900,000,000.00 (Ministry of Religion of the Republic of Indonesia, 2025).

Through a blockchain-based digital waqf platform, Al-Amanah Islamic Boarding School in collaboration with LKS-PWU launched a large-scale cash waqf fundraising project with a target of IDR 10,000,000,000.00 (P). The principal funds are then safely invested in Retail State Sharia Securities (SBSN) instruments with a projected annual yield of 6.5% ($r = 0.065$). The smart contract is programmed to cut the portion of Nazhir's management rights to a maximum of 10% ($N = 0.10$) in accordance with regulations and distribute the remaining net funds of Rp585,000,000.00 automatically to the account of the poor scholarship program, digital infrastructure, and the foundation's operational costs without human intermediaries (Government Regulation No. 42, 2006; Regulation of the Minister of Religion No. 14, 2025).

5. Challenges (Implementation Challenges)

Despite its theoretical advantages, the implementation of this *blockchain* framework is faced with a number of significant operational challenges in the field. The main challenge is the low level of digital and technological literacy among traditional Islamic boarding school administrators and local Nazhir. *Private key* management and interaction with smart contracts requires technical skills that are often not mastered by managers at the rural level (Indonesian Internet Service Providers Association [APJII], 2025).

The second challenge has to do with the high initial investment costs for system development, smart contract code security audits, as well as API integration with

Islamic banking systems. In addition, there is no regulation that explicitly regulates the legal validity of the execution of automatic smart contracts in civil disputes in Indonesia, creating a legal gray area that needs to be resolved immediately by the relevant authorities (Financial Services Authority, 2025a).

6. Theoretical Implication

Theoretically, this research makes a valuable contribution to the study of contemporary Islamic social financial management. This research expands on traditional *agency theory* by proving that information asymmetry between principals (Wakifs) and agents (Nazhir) can be overcome not through expensive manual supervision mechanisms, but through database decentralization and deal automation (Werbach, 2018).

In addition, this model offers the concept of *programmable Shariah compliance*. If previously sharia compliance was assessed periodically after the transaction occurred, this model offers real-time prevention of violations of sharia principles by rejecting transactions that do not meet the criteria of fiqh law from the beginning of the programming process. This strengthens the implementation of the principles of justice and transparency that are at the core of Maqashid al-Shariah (Alharby & van Moorsel, 2017).

7. Practical Involvement

For waqf practitioners, especially Islamic boarding schools and universities, the results of this study provide a tactical *roadmap* to mobilize endowments independently and professionally. By adopting this decentralized platform, educational institutions can act as Nazhir's active partners to manage productive waqf projects independently (Indonesian Waqf Agency, 2025b).

For regulators such as the Ministry of Religion and BWI, this study presents a very efficient digital surveillance model. The existence of a *dedicated audit node* allows regulators to conduct administrative compliance supervision without having to drain human resources to go to the field, making it easier to enforce national compliance rules (Indonesian Waqf Agency, 2024).

8. Key Findings

The main findings of this study show that the integration of decentralized technology is able to provide undeniable data disclosure guarantees, restore public trust (*trust restoration*), and ensure the sustainability of independent Islamic boarding school operational financing. In addition, the automation of the return of the principal of temporary waqf is proven to be mathematically manageable through timecode programming to prevent the risk of moral hazard of default (Hasan et al., 2020).

9. Recommendation

It is recommended to the Ministry of Religious Affairs of the Republic of Indonesia and the Indonesian Waqf Agency to formulate technical guidelines regarding the *regulatory sandbox* for the operation of blockchain-based Islamic social finance systems. In addition, Islamic banks as LKS-PWU are expected to open API integration options for waqf innovation platforms for ease of verification of customer deposits (Financial Services Authority, 2025a).

10. Future Research

Future research needs to be directed at empirical testing of this system prototype through a limited-scale *field study* in the pesantren environment. Further research should also be conducted on a large-scale quantitative analysis to test the direct influence of the level of transparency of the blockchain on the donation motivation of the Muslim community (Hasan et al., 2020).

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