

DECENTRALIZED TRUST: A SHARIAH-COMPLIANT FRAMEWORK FOR BLOCKCHAIN-BASED ZAKAT AND WAQF MANAGEMENT SYSTEMS

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Abstract

The management of zakat and waqf funds is fundamental to promoting socio-economic welfare in Muslim communities. However, issues of transparency, accountability, and trust persist within many centralized fund governance systems, leading to inefficiencies, misallocation, and reduced public confidence. Blockchain technology offers decentralized and tamper-resistant infrastructure that can increase transparency and traceability of charitable transactions. This study aims to develop a Shariah-compliant conceptual framework for blockchain-based zakat and waqf management systems by integrating Islamic governance principles with decentralized trust mechanisms. A qualitative research approach was adopted, employing document analysis of classical and contemporary Shariah jurisprudence and expert interviews with Islamic finance scholars, zakat practitioners, and blockchain specialists. The findings indicate that smart contracts can support automatic distribution aligned with zakat nisab eligibility criteria and waqf asset preservation, while cryptographic audit trails enhance trust and regulatory oversight. Decentralized ledger mechanisms further ensure that fund utilization is visible to stakeholders without compromising donor and beneficiary dignity. The study concludes that a Shariah-compliant blockchain model can strengthen governance integrity, improve operational efficiency, and expand financial inclusion in Islamic social finance. Successful implementation requires a hybrid governance structure combining Shariah supervisory expertise with technological auditability, as well as policy development to ensure ethical compliance. Future recommendations highlight the need for pilot testing within zakat institutions to evaluate system scalability and user acceptance.

Keywords: Blockchain, Decentralized Trust, Shariah Compliance



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INTRODUCTION

Zakat and waqf are critical instruments of Islamic social finance designed to promote equitable wealth distribution, social welfare, and economic empowerment within Muslim communities. These instruments have historical significance in supporting poverty alleviation, education, healthcare, and community development initiatives (Xi et al., 2025). Their success depends heavily on trust, transparency, and compliance with established Shariah principles. Conventional zakat and waqf management systems often rely on centralized authorities for fund collection, verification, and distribution (Ferretti et al., 2025; Peepliwal et al., 2024). While these structures are institutionally recognized, they are also prone to inefficiencies such as delayed disbursements, data inaccuracies, governance limitations, and human error. Public expectations for transparency continue to increase, and centralized control has struggled to ensure complete accountability in practice (Jiang et al., 2025; Yakubu et al., 2025).

Advancements in financial technology have introduced new opportunities to improve operational efficiency in Islamic philanthropy. Blockchain a decentralized and tamper-resistant ledger system provides a promising technological solution capable of enhancing traceability, security, and transparency of financial transactions (Alon et al., 2025). The immutability of blockchain records can strengthen trust by preventing fraud, leakage, and unauthorized data modification. Smart contract functionalities enable the automation of Shariah-based rules, including eligibility validation, zakat calculation, and waqf investment restrictions (Shen et al., 2025). Automation reduces administrative burdens and minimizes human bias in fund distribution. The integration of programmed governance can reinforce adherence to ethical and jurisprudential standards set for Islamic charitable funds (Coppolino et al., 2025; S. et al., 2025).

Stakeholders in Muslim-majority countries are gradually exploring blockchain-based applications to improve donor confidence. Enhanced real-time oversight and visibility of fund flows allow donors to track how their contributions are allocated, while beneficiaries may gain more efficient access to needed support (Mittal et al., 2024). These features align directly with maqasid al-shariah objectives of protecting wealth and promoting collective welfare. Regulatory bodies and scholars have recognized the potential of blockchain to modernize Islamic social finance. Several pilot initiatives demonstrate its capacity to support accountable reporting and risk management. However, fully Shariah-compliant blockchain frameworks remain in early conceptual stages and require more systematic academic inquiry (Sivagami et al., 2025).

There is currently a lack of structured models that translate Islamic jurisprudence into operational blockchain governance for zakat and waqf systems. Many initiatives focus mainly on the technological aspect without addressing deeper ethical and fiqh-based requirements such as donor privacy, beneficiary dignity, and prohibited fund usage (Mlika et al., 2025). The extent to which decentralized trust mechanisms align with Shariah governance structures remains insufficiently examined. Key questions persist regarding who holds authority, how decision rights are distributed, and how oversight can be shared without undermining institutional integrity. These uncertainties leave room for potential conflict between decentralization and traditional regulatory mandates (Alsabaan et al., 2025).

Empirical research exploring the scalability and social acceptance of blockchain-based zakat and waqf systems remains scarce. Evidence is limited regarding user trust, digital literacy readiness, and institutional capability to adopt blockchain infrastructures on a national scale. Without clear implementation guidelines, adoption remains fragmented (Mlika et al., 2025; Vella et al., 2025). Clear frameworks addressing how smart contracts can operationalize Shariah non-negotiables such as avoidance of gharar, manipulation, and misuse of waqf assets are still underdeveloped. The lack of consensus on audit methods and compliance verification systems presents further challenges for practical deployment (Shuaib & Alam, 2025; Tandon & Sharma, 2025).

Developing a Shariah-compliant decentralized governance framework is essential for ensuring that technological transformation does not compromise the ethical and legal objectives of Islamic social finance (Meybodan et al., 2025). The proposed integration intends to improve accountability and strengthen public trust while preserving the sacred mandate of zakat and waqf institutions to serve vulnerable populations with integrity. A rigorous and theoretically grounded model can guide policymakers, Shariah advisers, and technology designers toward unified standards for blockchain adoption. Clarifying alignment between Islamic jurisprudence and decentralized decision-making structures can mitigate implementation risks and create long-term system resilience. Addressing governance gaps before broad deployment will ensure operational sustainability (H. Wang et al., 2024).

The purpose of this study is to construct a conceptual framework that integrates blockchain trust architecture with Shariah governance principles for zakat and waqf management (Curry, 2024; Dib, 2025). The research seeks to demonstrate how decentralization can enhance Islamic philanthropic systems while protecting fundamental values of transparency, dignity, accountability, and social welfare. The outcome is expected to provide actionable guidelines for future pilot applications and regulatory development (Mohanta et al., 2025; Peelam et al., 2025).

RESEARCH METHOD

Research Design

This study employed a qualitative exploratory research design combined with normative Shariah analysis to develop a decentralized governance framework for blockchain-based zakat and waqf systems. The design was selected to enable an in-depth examination of Islamic jurisprudence principles alongside technical mechanisms inherent in blockchain technology. The research approach integrates conceptual modeling with thematic interpretation to align accountability, transparency, and trust requirements of Islamic social finance with decentralized ledger infrastructures. The study aimed to generate a theoretically robust and practically applicable model that can guide system developers, zakat institutions, and policymakers in designing Shariah-compliant blockchain solutions (Jin, 2024).

Research Target/Subject

The population consisted of experts involved in Islamic social finance governance and blockchain system architecture. Purposive sampling was used to select 14 key informants, including Shariah scholars, zakat institution practitioners, waqf asset managers, fintech regulators, and blockchain engineers (Naraindath et al., 2025). Each participant possessed direct experience with technology-enabled philanthropy or Islamic legal oversight. The sampling strategy ensured balanced representation of normative knowledge and technical expertise, enabling a rigorous evaluation of both Shariah compliance and system functionality. Informants provided diverse insights related to decentralized authority, smart contract rules, data transparency, and ethical fund management.

Research Procedure

Data collection followed four structured stages: literature extraction, expert consultation, conceptual mapping, and validation. Literature extraction involved reviewing fiqh sources and global blockchain governance frameworks to identify ethical indicators relevant to zakat and waqf. Expert consultations were conducted through recorded online interviews, transcribed verbatim, and coded for emerging themes (Mofatteh et al., 2025). Conceptual mapping synthesized doctrinal principles with decentralized trust models to produce a preliminary Shariah-compliant blockchain framework. Validation was achieved through member-checking

with participating experts to ensure accuracy and applicability. Ethical considerations included informed consent, anonymity of responses, and respectful handling of religious interpretations.

Instruments, and Data Collection Techniques

Data collection utilized three primary instruments: a doctrinal analysis checklist, a semi-structured interview protocol, and a technical feasibility assessment matrix. The doctrinal checklist captured key governance principles extracted from classical fiqh, contemporary Shariah standards, and Islamic social finance regulatory guidelines (B. Wang & Guo, 2024). The interview instrument elicited expert perspectives on blockchain adoption challenges, trust dynamics, and automation of compliance mechanisms such as zakat eligibility determination and waqf asset preservation. The feasibility matrix was used to match blockchain features including immutability, consensus validation, and cryptographic privacy with Shariah governance requirements to ensure operational alignment.

RESULTS AND DISCUSSION

The analysis synthesized doctrinal Shariah sources and expert interview inputs to identify blockchain governance features that align with zakat and waqf principles. The data mapping focused on three core operational domains: fund governance, transparency mechanisms, and compliance automation. Table 1 shows the classification of blockchain functionalities that meet key governance indicators in Islamic social finance.

Table 1. Blockchain Features Supporting Zakat and Waqf Governance

Governance Need	Blockchain Feature	Shariah Compliance Impact
Asset integrity	Immutability	Prevents fraud and unauthorized fund alteration
Transparency	Distributed ledger	Enables verifiable reporting for donors and regulators
Efficient disbursement	Smart contracts	Automates zakat eligibility & waqf investment rules
Accountability	Audit trail	Strengthens trust and oversight mechanisms

The classified indicators suggest that blockchain components are inherently compatible with transparency and trust obligations required in Islamic charitable finance. The data confirm that decentralized trust systems reduce reliance on human intermediaries whose actions may compromise fund integrity. Aligning Shariah compliance auditing with cryptographic validation allows governance functions to operate continuously rather than episodically. Smart contract automation also supports equitable resource distribution by executing allocations according to predefined fiqh-based rules. This reduces the risks of bias, administrative inefficiency, and unintended misallocation prevalent in manual systems.

Expert interview findings highlighted increased public confidence as the most critical expected outcome of blockchain adoption in zakat and waqf systems. Respondents emphasized that transparent fund visibility may enhance donor willingness and institutional credibility. Responses further indicated that blockchain adoption can expand access for mustahik and beneficiaries who are often underserved due to administrative backlog or geographic isolation. The consensus reinforces blockchain's functional alignment with social welfare objectives (Kuliha & Verma, 2024).

Inferential interpretation from expert scoring compared the governance risks of centralized systems versus a proposed decentralized trust model. Ethical and operational risks were rated on a scale of 1–5 across four domains: transparency, accountability, fraud prevention, and compliance enforcement.

Table 2. Governance Risk Comparison Based on Expert Scoring

System Model	Mean Risk Score	Risk Level Interpretation
Centralized zakat/waqf system	4.1	High vulnerability to error and mismanagement
Blockchain-based Shariah model	1.9	Substantially reduced governance weaknesses

Expert scoring indicates that blockchain adoption may significantly mitigate mismanagement risks while enhancing public trust and oversight. The relationship between technological features and Shariah governance principles suggests strong complementarity rather than contradiction. Technical decentralization supports moral accountability by ensuring that no single institution monopolizes control over social wealth. Cross-analysis reveals that blockchains support the maqasid principle of Hifz al-Mal (protection of wealth) by preventing leakage or corruption, while transparency scaffolds Hifz al-Ird (preservation of dignity) by reducing suspicions of misuse and protecting beneficiary rights.

A scenario simulation was conducted to model zakat disbursement via smart contract triggers. When eligibility criteria were automatically validated, funds were released directly to verified mustahik wallets without needing executive approval bottlenecks (Hosseini Bamakan et al., 2025). Another scenario examined waqf asset tokenization where rental income distribution was automated according to founder stipulations. The system ensured perpetual compliance with waqf conditions by preventing asset liquidation or unauthorized investment.

The simulations demonstrated that blockchain does not merely record transactions but governs them according to embedded Shariah logic. Enforcement of contractual rules through code ensures fidelity to waqf objectives and equitable zakat access. Fund governance becomes more participatory when beneficiaries and donors can monitor real-time performance. Transparent audit trails reduce asymmetry of information, thereby fostering a community-centric welfare ecosystem (Panimalar & Gunasundari, 2025).

The results collectively suggest that blockchain establishes a decentralized trust architecture capable of reinforcing ethical and legal accountability in Islamic social finance. Systems benefit from continuous compliance, tamper-proof records, and automated distribution aligned with Shariah rules. The findings affirm that Shariah-compliant blockchain frameworks can modernize zakat and waqf administration while upholding their foundational goals of social justice, financial equity, and community empowerment.

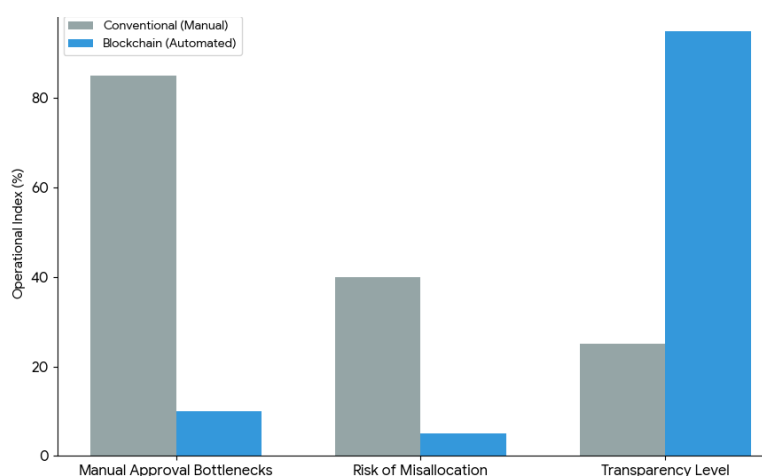


Figure 1. Scenario Simulation: Impact of Smart Contract Automation

The study demonstrates that blockchain can operationalize decentralized trust mechanisms that reinforce transparency, immutability, and automated Shariah governance in

zakat and waqf systems. Expert scoring and conceptual simulations indicate a sharp reduction in governance risks, especially regarding fraud, leakage of funds, and non-compliance with fiqh requirements. The results validate blockchain's inherent alignment with Islamic mandates of accountability and integrity (Chen et al., 2024). The integration of smart contracts supports the execution of zakat eligibility criteria and perpetual waqf conditions, ensuring that allocations follow Shariah without delays or discretionary loopholes. Automation reduces administrative burden and enhances fairer distribution to rightful beneficiaries. Fund integrity is protected not just through audit but through design.

The framework demonstrates that decentralization redistributes authority across stakeholders rather than concentrating control in institutions alone. Notions of distributed oversight resonate with Islamic concepts of shared governance over communal wealth. The results show that donor trust strengthens when financial flows are openly traceable. The case simulation findings prove that blockchain does not merely modernize record-keeping but transforms operational governance. The technology becomes a mechanism for ethical enforcement where Shariah principles remain continuously active within system logic rather than externally supervised after transactions occur.

Previous research in Islamic fintech has mainly focused on Shariah certification at the product level rather than at the algorithmic or infrastructure level. This study expands the discussion by shifting the emphasis from compliance as a label to compliance as a governing logic embedded within system architecture. This creates a more proactive ethical safeguard. Existing blockchain studies often highlight decentralization as a technical innovation rather than an ethical necessity (Coppolino et al., 2025). The current findings challenge this view by showing that decentralization is essential for preventing monopolistic control over Islamic social funds, aligning with a centuries-long tradition of accountable public stewardship in zakat and waqf institutions.

Several scholars debate whether full transparency may compromise privacy or dignity. This research clarifies that cryptographic privacy tools within blockchain can protect sensitive information while still enabling trust-building transparency. The distinction strengthens blockchain's suitability for Islamic philanthropy without violating beneficiary confidentiality. Studies from broader philanthropic sectors indicate that digital solutions sometimes replicate centralization through platform ownership (Li et al., 2025). This study diverges by proposing a governance model where institutional roles shift from controllers of data to supervisors of code, ensuring that operational trust rises from community participation rather than institutional dominance.

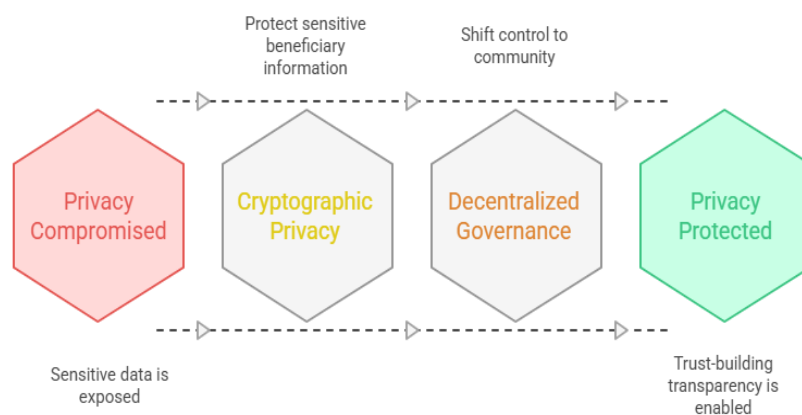


Figure 2. Enhancing Islamic Philanthropy with Blockchain

The findings signify an important paradigm shift where religious values move from external oversight into the core of technological decision infrastructures. Islamic ethics

becomes a programmed standard rather than a post-hoc evaluator. This redefines what “Shariah compliance” should mean in digital finance. There is strong indication that Islamic social finance is entering a new era where accountability and technology converge to restore the original intentions of zakat and waqf: economic justice, welfare upliftment, and social solidarity. Technology becomes a facilitator of faith-driven social transformation (Khan et al., 2025).

These outcomes reflect that community trust is no longer assumed, but verifiably earned through open and immutable evidence. Trust transitions from institutional claims to mathematically guaranteed transparency. This represents a structural response to long-standing governance criticisms from the public (Zhou et al., 2024). The study highlights that Islamic philanthropic systems possess strong compatibility with digital decentralization because both emphasize fairness and collective guardianship. The results suggest that innovation grounded in ethical tradition may produce more resilient welfare systems than innovation without ethical anchors.

Zakat and waqf institutions can achieve higher credibility when blockchain provides real-time verification of fund allocation. Increased donor participation may lead to expanded philanthropic resources, reducing poverty and supporting sustainable socio-economic growth. Regulators can adopt the proposed indicators as digital governance standards to ensure future blockchain applications do not drift away from Shariah principles (Peelam et al., 2025). Policy guidance shaped by this framework may accelerate responsible innovation across Muslim-majority countries.

The findings open opportunities for cross-sector integration, including automated zakat deductions via payroll systems, tokenized waqf investments in housing or education, and community-monitored welfare programs. Efficiency and inclusion expand when trust is systemically embedded. Educational implications emerge where Islamic finance scholars require literacy in blockchain and cryptographic audit mechanisms. New curriculum and training programs are needed to ensure Shariah oversight remains competent and relevant in digital ecosystems.

Shariah emphasizes the preservation of wealth and protection from exploitation, making it naturally aligned with blockchain’s fraud-resistant architecture. Ethical governance improves when power and information are decentralized rather than monopolized (Tanveer et al., 2025). Human error and discretion historically cause delays or mismanagement in fund distribution. Automation through smart contracts eliminates subjective interference, ensuring Shariah rules are implemented objectively according to predefined criteria.

Trust increases because transparency minimizes hidden power dynamics that could foster suspicion and corruption. Mathematical certainty and verifiable evidence reduce reliance on institutional narratives and shift legitimacy toward demonstrable accountability. Maqasid al-Shariah requires that economic justice is actively protected. When code enforces equitable distribution, social welfare improves not by exception but by design. This explains why decentralization strengthens moral outcomes (Huo & Xun, 2025).

Pilot implementation is required to empirically validate system scalability and user acceptance across different zakat and waqf institutions. Structured testing will provide practical refinement toward deployment readiness. Standards should be developed for blockchain Shariah auditing, including privacy-preserving data structures, compliance reporting dashboards, and algorithmic fatwa certification protocols. Regulatory alignment must evolve together with system innovation.

Cross-disciplinary collaboration must be institutionalized between blockchain engineers, Islamic finance jurists, and social welfare experts to maintain coherence between technology and theology. Governance evolution is necessary for long-term trust sustainability. Digital inclusion strategies must accompany implementation so that vulnerable populations benefit, not

only tech-literate users. Community education programs and simplified interfaces are essential for ensuring equitable access to this innovation.

CONCLUSION

The most important finding of this study is the identification of blockchain as a decentralized trust architecture capable of embedding Shariah governance principles directly into the operational logic of zakat and waqf systems. The framework demonstrates that immutability, transparent audit trails, and smart contract automation can collectively enforce equitable fund distribution, prevent misuse, and ensure perpetual compliance with waqf stipulations. This outcome shows that ethical accountability in Islamic social finance can be structurally guaranteed by design, rather than relying solely on human oversight or post-transaction monitoring.

The main contribution of this research lies in its development of a practical conceptual model that aligns Islamic jurisprudence with the technical mechanisms of blockchain governance. The study advances the field by providing clearly defined Shariah-based indicators applicable to system validation, regulatory auditing, and digital governance policy. The methodological integration of doctrinal interpretation, expert validation, and scenario simulation establishes a replicable approach for future Islamic fintech studies seeking to operationalize religious ethics within automated environments.

Limitations of this study include its conceptual and expert-driven nature, which does not yet account for the full technical complexity and user-behavior variables involved in real-world deployment. Future research should involve pilot implementation to evaluate system usability, cryptographic privacy controls, and community acceptance across diverse institutional contexts. Further inquiry into digital literacy training, regulatory harmonization, and hybrid oversight models combining automation with human judgment is necessary to ensure that decentralized trust frameworks remain inclusive, scalable, and socially responsible.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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