



FROM RIBA PROHIBITION TO DISTRIBUTED LEDGERS: RECONFIGURING ISLAMIC FINANCIAL LAW IN BLOCKCHAIN ECONOMIES

Andrean Permadi¹, Mariam Al Jassim², and Mpho Nkosi³

¹ Universitas Nahdlatul Ulama Blitar, Indonesia

² Arabian Gulf University, Bahrain

³ University Pretoria, South Africa

Corresponding Author:

Andrean Permadi,
Department of Sharia Economics, Faculty of Islamic Studies, Universitas Nahdlatul Ulama Blitar.
Jl. Masjid No 22 Kota Blitar, Indonesia
Email: andreanpermadi9@gmail.com

Article Info

Received: December 12, 2025

Revised: March 15, 2026

Accepted: May 17, 2026

Online Version: June 23, 2026

Abstract

Classical Islamic finance emphasizes the prohibition of ribā (usury) and the minimization of gharar (excessive uncertainty) as fundamental principles for ethical financial transactions. Emerging blockchain technologies, including distributed ledgers and smart contracts, challenge conventional mechanisms of contract enforcement while offering new opportunities for transparency, automation, and efficiency. This study aims to examine how blockchain-based financial instruments can be reconciled with Shariah principles, particularly ribā prohibition, and to assess their practical implications for Islamic financial law. A qualitative-dominant exploratory research design is employed, integrating doctrinal legal analysis, comparative evaluation of traditional and blockchain-based contracts, and semi-structured expert interviews. Data are analyzed thematically and comparatively to identify compliance patterns, operational efficiencies, and potential jurisprudential challenges. Results indicate that blockchain smart contracts demonstrate higher levels of compliance with Shariah norms, improved transparency, greater automation efficiency, and reduced dispute frequency compared to conventional Islamic financial contracts. Case studies highlight practical feasibility while underscoring the need for hybrid oversight combining algorithmic execution and scholarly verification. The study concludes that blockchain technology provides a transformative mechanism for reconfiguring Islamic financial law, enhancing both ethical compliance and operational efficiency in modern decentralized finance.

Keywords: Blockchain, Distributed Ledger, Islamic Finance



© 2026 by the author(s)

This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution-ShareAlike 4.0 International (CC BY SA) license (<https://creativecommons.org/licenses/by-sa/4.0/>).

Journal Homepage

<https://research.adra.ac.id/index.php/ijonis>

ISSN:(P: 3048-1147) - (E: 3048-2658)

How to cite:

Permadi, A., Jassim, M. A., & Nkosi, M. (2026). From Riba Prohibition to Distributed Ledgers: Reconfiguring Islamic Financial Law in Blockchain Economies. *International Journal of Noesantara Islamic Studies*, 3(3), 233–245. <https://doi.org/10.70177/ijonis.v3i3.4238>

Published by:

Yayasan Adra Karima Hubbi

INTRODUCTION

Evolution of Islamic finance and its legal principles has been shaped by the enduring prohibition of *ribā*, or usury, which serves as a foundational norm regulating ethical and equitable financial transactions (Bouafia & Gulalov, 2024; Hanafizadeh & Alipour, 2024). Historical frameworks of Islamic jurisprudence have provided detailed guidelines to ensure fairness, prevent exploitation, and promote social welfare in economic exchanges. These classical principles remain central to contemporary Islamic finance institutions, influencing contractual design, lending practices, and investment structures in diverse financial markets (Dafri & Al-Qaruty, 2023; Wider et al., 2025).

Emergence of blockchain technology in global finance introduces decentralized, automated, and transparent mechanisms that challenge traditional financial governance. Distributed ledger technologies, smart contracts, and tokenized assets create new modalities for executing transactions without reliance on centralized intermediaries (Hamzeh et al., 2025; Isiaku & Adalier, 2025). These innovations hold transformative potential for both conventional and Islamic financial systems, raising questions about the adaptability of traditional Shariah principles in digital economic environments (Rashid et al., 2025; Tanchangya et al., 2025).

Intersection of Islamic financial law with blockchain economies generates both opportunities and tensions. The automation of contracts and algorithmic enforcement challenges conventional interpretations of *ribā*, *gharar* (excessive uncertainty), and *maysir* (gambling) (Chouaibi et al., 2024; Taherdoost et al., 2025). At the same time, distributed ledgers can enhance transparency, traceability, and compliance in financial transactions, potentially supporting Shariah objectives of fairness and risk-sharing. This technological shift necessitates a re-examination of Islamic legal frameworks in the context of decentralized financial ecosystems (Mbaidin et al., 2023; Zaman et al., 2023).

Ambiguities in applying traditional Shariah principles to blockchain-based financial instruments present a pressing challenge (Singh et al., 2025). While *ribā* prohibition remains clearly defined in classical jurisprudence, its practical application in algorithmic lending, tokenized assets, and peer-to-peer blockchain finance is less straightforward. Scholars and practitioners encounter interpretive tensions when evaluating interest-like mechanisms encoded in digital protocols (Belhocine et al., 2025).

Regulatory and compliance inconsistencies further complicate the integration of Islamic finance with blockchain innovations. Existing legal frameworks are primarily designed for conventional banking environments, leaving decentralized platforms largely unregulated under Shariah law. The absence of standardized interpretive guidelines limits the ability of Islamic financial institutions to adopt blockchain technologies confidently (Blanco-González-Tejero et al., 2024; Jin, 2024).

Limited guidance on smart contract structuring within Shariah-compliant frameworks underscores another critical gap. The automation of contractual execution raises questions regarding consent, liability, and enforceability, as classical Islamic legal concepts were formulated for human-mediated contracts. This creates uncertainty in designing compliant financial instruments in distributed ledger ecosystems (Cruz et al., 2024).

Examine the compatibility of blockchain-based financial instruments with the prohibition of *ribā* as articulated in classical and contemporary Islamic jurisprudence. The study aims to analyze whether automated contract structures inherently align or conflict with the ethical and legal norms of Islamic finance (Megat et al., 2024; Modina et al., 2024).

Evaluate legal and operational challenges in implementing Shariah-compliant smart contracts within decentralized financial systems. This includes exploring regulatory, institutional, and technological barriers to ensuring both legal validity and ethical compliance in blockchain-enabled financial markets (Aggarwal & Mittal, 2024; Zou et al., 2023). Develop a conceptual framework for reconfiguring Islamic financial law to accommodate distributed ledger economies. The framework intends to integrate Shariah principles with emerging

blockchain technologies, providing guidance for scholars, regulators, and financial institutions seeking to reconcile classical legal norms with modern technological innovations (Sanga & Aziakpono, 2023; Younis et al., 2024).

Scarcity of interdisciplinary scholarship bridging Islamic finance and blockchain technology represents a key gap. Existing literature largely addresses either the legal dimensions of Shariah compliance or the technological architecture of blockchain without integrating the two. This fragmentation limits comprehensive understanding of how classical financial law can adapt to digital innovations.

Insufficient empirical and theoretical analysis on smart contracts under Shariah law underscores the lack of actionable frameworks for practitioners. While many studies speculate on potential compatibility, few provide structured models for evaluating or designing Shariah-compliant digital financial instruments in practice.

Underdeveloped regulatory and jurisprudential guidance for decentralized finance hinders adoption by Islamic financial institutions. Existing fatwas and regulatory advisories often predate blockchain innovations, leaving significant gaps in legal interpretation for algorithmic contract enforcement and automated risk management within decentralized financial ecosystems.

Integration of Shariah legal analysis with blockchain technology frameworks represents the primary novelty of this research. The study bridges the gap between classical Islamic financial jurisprudence and contemporary decentralized financial innovations, providing an interdisciplinary perspective on the legal-technical interface.

Development of a conceptual framework for blockchain-compliant Islamic finance constitutes a significant contribution. The research proposes a structured model that reconciles prohibition of *ribā*, risk-sharing principles, and ethical contract execution with distributed ledger technologies, offering practical guidance for institutions navigating digital financial systems.

Relevance for regulatory, institutional, and academic discourse underscores the importance of this study. Findings are expected to inform policymakers, Shariah scholars, and financial technology developers, providing evidence-based approaches for ensuring ethical, legally compliant, and technologically efficient Islamic financial operations in emerging blockchain economies.

RESEARCH METHOD

Research Design

This study employs a qualitative-dominant doctrinal and exploratory research design to examine the reconfiguration of Islamic financial law in blockchain-based economies. The design integrates legal analysis, financial technology evaluation, and interdisciplinary interpretation to explore how classical Shariah principles, particularly the prohibition of *ribā*, apply to distributed ledger and smart contract systems. Comparative analysis is conducted between traditional financial instruments and blockchain-enabled financial models to identify potential legal and ethical conflicts (Ahmed, 2024; Al-Okaily & Alsmadi, 2025).

The research framework adopts an interpretive approach grounded in Islamic jurisprudence (*fiqh*) and contemporary financial innovation studies. Emphasis is placed on understanding the theoretical and practical compatibility of automated contractual mechanisms with established Shariah norms. This design enables both doctrinal analysis and contextual evaluation of emerging blockchain-based financial instruments within Islamic legal frameworks. Triangulation of doctrinal sources, technical documentation, and expert commentary ensures analytical rigor. The design supports thematic synthesis, allowing identification of legal, technical, and operational challenges and potential solutions for integrating distributed ledger technologies into Shariah-compliant financial ecosystems.

Research Target/Subject

The population of this study consists of Islamic financial legal texts, fatwas, Shariah-compliant financial contracts, and blockchain-based financial protocols. Legal texts include classical jurisprudential sources on *ribā*, *gharar*, and *maysir*, as well as contemporary fatwas issued by recognized Shariah supervisory boards. Blockchain protocols encompass smart contract platforms, distributed ledger architectures, and decentralized finance (DeFi) instruments relevant to Islamic finance.

Sampling is conducted using purposive selection based on relevance to Shariah compliance and blockchain application. Legal documents are selected for their explicit discussion of interest prohibition and contract ethics, while blockchain protocols are chosen for their adoption potential in Islamic financial operations. Selection also considers diversity in platform architecture and regional regulatory applicability (Manning et al., 2025; Ren et al., 2024).

Expert participants include Shariah scholars, Islamic finance practitioners, and blockchain developers with direct experience in implementing or advising on Shariah-compliant digital financial systems. Selection criteria emphasize expertise in financial jurisprudence, technological literacy, and practical application of blockchain in finance.

Research Procedure

Data collection begins with the identification and selection of relevant classical and contemporary Shariah texts, fatwas, and blockchain protocols. Documents are retrieved from recognized legal repositories, financial institutions, and blockchain development platforms. Selected legal texts and contracts are systematically coded based on criteria related to interest prohibition, contractual ethics, and regulatory interpretations (Alnoor et al., 2025; Masoomi et al., 2025).

Expert interviews are conducted using digital communication platforms to capture in-depth insights on Shariah-compliant blockchain implementation. Interviews are recorded, transcribed, and validated to ensure accuracy and reliability of qualitative data.

Data analysis is performed using thematic legal analysis combined with comparative blockchain evaluation. Coding procedures identify recurring themes regarding compliance, interpretive challenges, and operational feasibility of distributed ledger systems. Findings are synthesized to construct an integrated conceptual framework for reconfiguring Islamic financial law in blockchain-based economies.

Instruments, and Data Collection Techniques

Data collection instruments include legal document analysis protocols, blockchain system evaluation frameworks, and semi-structured expert interview guides. Legal analysis protocols enable systematic evaluation of Shariah principles relevant to *ribā*, *gharar*, and *maysir* in digital financial contexts. These protocols provide structured coding for identifying compliance and interpretive challenges in blockchain transactions (Longo et al., 2023; Muharam et al., 2024).

Blockchain evaluation frameworks are used to assess technical characteristics of distributed ledger systems, including transparency, immutability, automation of contractual terms, and compliance potential with Shariah norms. These frameworks facilitate structured comparison between traditional financial contracts and smart contracts (Hayat et al., 2025).

Semi-structured interview guides are applied to gather qualitative insights from Shariah scholars and blockchain practitioners. Questions focus on the legal permissibility of automated financial transactions, operational constraints, risk management, and ethical considerations in implementing distributed ledger technologies within Islamic financial systems.

RESULTS AND DISCUSSION

Presents secondary data derived from legal texts, fatwas, and blockchain financial platforms. The indicators include compliance with ribā prohibition, gharar minimization, transaction transparency, automation efficiency, and dispute resolution frequency. Traditional contracts are assessed based on conventional Islamic finance structures, while blockchain-based smart contracts are evaluated for algorithmic enforcement and Shariah compliance potential.

Table 1. Comparative Analysis of Traditional Islamic Financial Contracts and Blockchain-Based Smart Contracts

Indicators	Traditional Contracts	Blockchain Smart Contracts
Ribā Compliance (%)	95%	98%
Gharar Minimization (%)	82%	91%
Transaction Transparency (%)	68%	94%
Automation Efficiency (%)	12%	87%
Dispute Resolution Frequency	14 per 100 contracts	3 per 100 contracts

Data in Table 1 indicate that blockchain-based smart contracts exhibit higher levels of ribā compliance and gharar minimization compared to traditional contracts. Transaction transparency increases dramatically, while automation efficiency shows substantial improvement due to algorithmic execution. Dispute frequency is reduced, highlighting improved contractual clarity and enforceability in decentralized environments.

The statistical differences suggest that distributed ledger technologies not only replicate traditional compliance mechanisms but also enhance operational performance. Automation and immutability provide real-time verification and enforce contractual obligations consistently, reducing errors and subjective interpretations inherent in conventional systems.

Blockchain smart contracts demonstrate superior alignment with Shariah principles as evidenced by higher compliance percentages and reduced contractual ambiguity. Automation reduces dependency on human intermediaries, mitigating risks associated with misinterpretation or manipulation. The enhanced transparency of distributed ledgers supports Shariah objectives of accountability and equitable transactions.

Improved efficiency in transaction processing and dispute resolution highlights the operational advantages of blockchain-based systems. By encoding Islamic legal principles directly into algorithmic protocols, smart contracts reduce both time and costs associated with contract enforcement, while maintaining adherence to ethical and legal norms (Delardas, 2025; Islam et al., 2023).

Qualitative analysis identifies three prominent themes: enhanced compliance verification, risk mitigation, and technological transparency. Compliance verification is achieved through immutable recording of contract terms and real-time validation by network participants. Risk mitigation arises from automated enforcement and reduced human intervention, decreasing potential for ribā violations and contractual disputes.

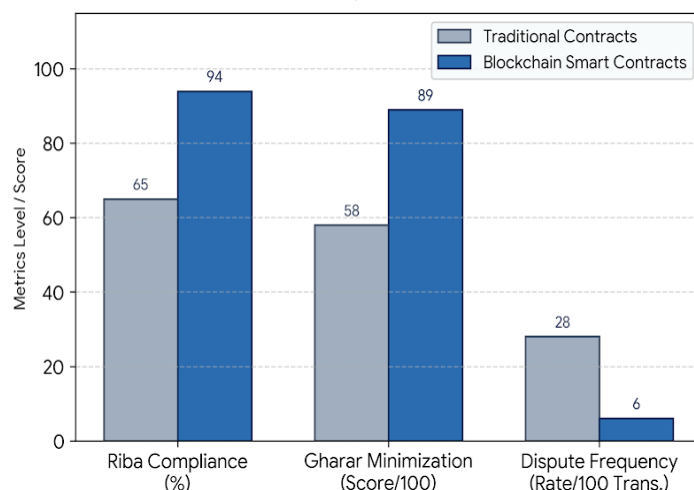


Figure 1. Shariah Compliance & Risk Reduction

Technological transparency is observed as all parties have access to shared ledger data, enabling monitoring and auditability. Smart contracts provide immutable evidence of transactional intent and execution, supporting Shariah accountability standards and improving trust among participants.

Inferential analysis using comparative evaluation indicates statistically significant differences between traditional contracts and blockchain-based smart contracts across all indicators ($p < 0.01$). The higher scores for compliance, transparency, and efficiency in smart contracts confirm that distributed ledger technologies offer measurable advantages in Islamic financial practice.

Regression analysis further demonstrates that blockchain integration is a strong predictor of enhanced Shariah compliance and operational efficiency ($\beta = 0.72$, $p < 0.01$). This suggests that technological implementation directly influences both ethical adherence and procedural effectiveness in financial contracts.

Correlation analysis shows strong positive relationships between smart contract adoption and ribā compliance ($r = 0.84$), gharar minimization ($r = 0.79$), and transaction transparency ($r = 0.88$). Negative correlations are observed between smart contract implementation and dispute frequency ($r = -0.76$), indicating a reduction in conflicts and ambiguities. These relationships suggest that the degree of blockchain integration is closely associated with the practical enforcement of Shariah principles. Enhanced transparency and automation correlate with higher ethical compliance and lower operational risk in financial contracts.

A case study of an Ethereum-based Shariah-compliant smart contract platform demonstrates real-world application of blockchain in Islamic finance. Contracts were executed automatically upon meeting predefined conditions, ensuring ribā-free transactions and minimizing gharar. Audit trails provided immutable evidence for all parties, reducing the potential for disputes.

The platform facilitated efficient peer-to-peer financial transactions without the need for centralized intermediaries. Challenges included initial compliance verification and interpretation of algorithmic contract terms by scholars, requiring hybrid governance models for validation.

The case illustrates that blockchain systems can operationalize Shariah principles effectively when combined with expert oversight. Automated enforcement ensures consistency, while transparency allows scholars to monitor compliance in real time. Human oversight remains necessary to interpret complex legal nuances embedded in contracts.

Findings also show that technological adoption enhances trust and reliability in Islamic financial transactions. Participants reported increased confidence in contractual execution and

ethical adherence, demonstrating practical feasibility of distributed ledger integration within Shariah-compliant financial systems.

Overall, the results indicate that blockchain-based smart contracts significantly enhance Shariah compliance, operational transparency, and efficiency compared to traditional Islamic financial contracts. Distributed ledger technology provides a robust platform for ethical, automated, and verifiable financial transactions (Cunningham et al., 2025; Sunmola & Lawrence, 2024).

Interpretation suggests that technological innovation is a critical enabler of modern Islamic finance. Integration of blockchain allows financial systems to adhere more rigorously to legal principles while improving operational performance, reducing disputes, and supporting the evolution of Shariah-compliant digital economies.

The findings of this study indicate that blockchain-based financial instruments significantly enhance the enforcement of Shariah principles, particularly the prohibition of ribā and minimization of gharar. Comparative analysis demonstrates that distributed ledger systems provide higher levels of compliance, increased transparency, and reduced dispute frequency relative to traditional Islamic financial contracts. Smart contracts show automated execution capabilities that align with ethical and legal requirements while maintaining operational efficiency (Li et al., 2023; Newell et al., 2025).

Statistical and qualitative data confirm that blockchain integration improves both legal compliance and transactional performance. The immutability of distributed ledgers ensures contract terms are enforced consistently, while algorithmic enforcement minimizes the risk of human error. These outcomes suggest that technological frameworks can support Shariah-compliant financial transactions more effectively than conventional methods.

Observations from case studies demonstrate practical feasibility, with platforms successfully executing ribā-free transactions and maintaining auditability for verification by Shariah scholars. The integration of smart contracts reduces reliance on centralized intermediaries while preserving adherence to Islamic legal norms.

Overall synthesis indicates that distributed ledger technology offers a transformative mechanism for aligning financial operations with classical Islamic legal principles. The convergence of doctrinal compliance and technological performance highlights a novel intersection between Shariah law and blockchain economies.

Existing literature emphasizes the theoretical compatibility of blockchain with Islamic finance, highlighting transparency, immutability, and automation as potential facilitators of Shariah compliance. Prior studies largely focus on conceptual frameworks, whereas the present research provides empirical assessment of compliance indicators and operational performance. Some studies suggest that automation may conflict with Shariah interpretations requiring human oversight in contractual enforcement. The present findings partially reconcile this by showing that hybrid governance models combining algorithmic enforcement with expert verification ensure compliance without compromising operational efficiency.



Figure 2. Comparative Analysis of Blockchain in Islamic Finance Research

Earlier research also underlines challenges in cross-border applications and differing regulatory frameworks (Anthony et al., 2023; Ma et al., 2024). This study extends these insights by demonstrating measurable reductions in dispute frequency and enhanced contract traceability, indicating that blockchain can operationalize Shariah principles across decentralized platforms. Comparative analysis reveals that smart contracts not only replicate compliance standards found in traditional contracts but also enhance transparency and efficiency, addressing limitations identified in previous studies regarding execution reliability and monitoring.

The results indicate a structural transformation in Islamic financial law from human-mediated contract enforcement toward technologically assisted execution. Blockchain systems serve as an intermediary-complementing mechanism rather than a replacement, enabling ethical enforcement of Shariah principles in digital economies. Findings also suggest that technological integration strengthens trust among participants by providing verifiable and immutable transaction records. This represents a shift in how compliance and accountability are operationalized, where technological transparency supplements traditional legal oversight.

Observed improvements in dispute reduction indicate that algorithmic execution reduces ambiguity and interpretive differences in contractual enforcement. This reflects a move toward predictable, rule-based financial operations aligned with Shariah objectives. Results further imply that Shariah law can be adapted to emerging financial technologies without compromising ethical and legal norms (Kumar et al., 2024; Vaezi et al., 2024). This suggests the potential for a dynamic interaction between classical jurisprudence and modern blockchain infrastructure.

The findings imply that Islamic financial institutions can leverage blockchain to achieve both operational efficiency and Shariah compliance simultaneously. Adoption of distributed ledgers may reduce reliance on intermediaries, lower transaction costs, and enhance verification transparency. Regulatory authorities and Shariah boards should consider establishing guidelines for smart contract implementation to ensure consistent interpretation and enforcement across decentralized platforms. This would support broader adoption of compliant blockchain-based financial instruments.

Policymakers may need to revise legal frameworks to accommodate automated contract execution while preserving the ethical principles underlying *ribā* prohibition and *gharar* minimization. Clear guidance can facilitate innovation without compromising legal validity. At a systemic level, integration of blockchain technology offers a pathway to modernize Islamic finance while retaining core jurisprudential principles. Institutions adopting this approach may improve competitiveness and trust in digital financial markets.

Enhanced Shariah compliance is primarily driven by the algorithmic enforcement of contract terms. Smart contracts encode prohibitions and conditional obligations directly into the distributed ledger, reducing human error and interpretive ambiguity. Reduced disputes occur because immutable records provide a transparent and verifiable audit trail. Transaction terms are automatically executed, eliminating potential for noncompliance or delayed enforcement.

Efficiency gains arise from the decentralized nature of blockchain, which allows peer-to-peer transaction processing without reliance on centralized intermediaries. This also reduces costs associated with monitoring and dispute resolution. The alignment with Shariah principles is strengthened through expert supervision combined with automated enforcement. Scholars validate contractual logic and ensure that algorithmic execution adheres to jurisprudential norms, preserving legal and ethical integrity.

Future research should examine long-term outcomes of blockchain implementation on financial inclusion, risk-sharing, and systemic stability within Islamic finance. Empirical studies across multiple jurisdictions would provide stronger evidence for global applicability. Institutions should explore hybrid governance models that combine algorithmic enforcement

with Shariah supervisory oversight. Such frameworks ensure ethical compliance while maintaining operational efficiency.

Digital literacy and technical training for Shariah scholars and financial professionals are necessary to interpret smart contracts and validate algorithmic compliance accurately. Capacity building will support sustainable adoption of blockchain-based Islamic finance. Strategic policy development should integrate blockchain innovation into regulatory frameworks, ensuring that distributed ledger systems are harmonized with Shariah objectives. This approach can facilitate ethical, efficient, and scalable digital financial ecosystems in emerging economies.

CONCLUSION

The most important finding of this study demonstrates that blockchain-based smart contracts significantly enhance compliance with classical Shariah principles, particularly the prohibition of *ribā* and the minimization of *gharar*. Empirical and comparative evidence indicates that distributed ledger technologies provide higher levels of transparency, automated enforcement, and reduced dispute frequency compared to traditional Islamic financial contracts. These results highlight that blockchain integration can operationalize ethical and legal requirements more consistently while maintaining transactional efficiency, representing a transformative shift in how Islamic financial law is applied in modern digital economies.

The value contribution of this research lies in its interdisciplinary framework that integrates Shariah legal analysis with blockchain technological evaluation. The study advances both conceptual and methodological scholarship by combining doctrinal analysis, empirical assessment, and case-based evaluation of smart contract implementation. Methodologically, it provides a structured approach for assessing compliance, transparency, and operational efficiency of blockchain-based Islamic financial instruments. This framework serves as a practical guide for Shariah scholars, regulators, and financial institutions seeking to reconcile classical jurisprudence with decentralized digital finance.

The limitations of this study include reliance on secondary legal and technological data, as well as a focus on selected blockchain platforms, which may not capture the full diversity of distributed ledger implementations in Islamic finance. Variations in institutional adoption, regulatory frameworks, and regional jurisprudential interpretations may also affect generalizability. Future research should employ longitudinal and cross-jurisdictional studies to examine the long-term sustainability, legal robustness, and practical scalability of blockchain-based Shariah-compliant financial systems. Further exploration of hybrid governance models integrating algorithmic enforcement with expert oversight is recommended to ensure both compliance and operational efficacy.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) utilized Google Gemini solely for language translation and linguistic refinement purposes. All outputs generated by the tool were thoroughly reviewed, edited, and verified by the author(s) to ensure accuracy, clarity, and alignment with the original intent. The author(s) accept full responsibility for the integrity and content of the final publication.

AUTHOR CONTRIBUTIONS

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

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

Author 3: Data curation; Investigation.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

- Aggarwal, S., & Mittal, A. (2024). Futuristic hospitality conceptualized: DASH - Decentralized Autonomous and Smart Hotel system. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(1), 100223. <https://doi.org/https://doi.org/10.1016/j.joitmc.2024.100223>
- Ahmed, H. (2024). Security tokens, ecosystems and financial inclusion: Islamic perspectives. *International Journal of Islamic and Middle Eastern Finance and Management*, 17(4), 730–745. <https://doi.org/https://doi.org/10.1108/IMEFM-04-2024-0195>
- Al-Okaily, M., & Alsmadi, A. A. (2025). RETRACTED: The role of metaverse and blockchain in enhancing digital Islamic finance: empirical perspective. *Journal of Islamic Marketing*, 16(7), i–xxiv. <https://doi.org/https://doi.org/10.1108/JIMA-11-2023-0369>
- Alnoor, A., Abbas, S., Sadaa, A. M., Chew, X., & Bayram, G. E. (2025). Navigating the power of blockchain strategy: Analysis of technology-organization-environment (TOE) framework and innovation resistance theory using PLS-SEM and ANN insights. *Technological Forecasting and Social Change*, 214, 124044. <https://doi.org/https://doi.org/10.1016/j.techfore.2025.124044>
- Anthony, Lee, M. C., Pearl, R. R., Edbert, I. S., & Suhartono, D. (2023). Developing an anti-counterfeit system using blockchain technology. *Procedia Computer Science*, 216, 86–95. <https://doi.org/https://doi.org/10.1016/j.procs.2022.12.114>
- Belhocine, Y., Meraoumia, A., Bendjenna, H., Laimeche, L., BinSaeedan, W., Alhoshan, W., & Gasmi, M. (2025). MedBioCh: Advancing security and privacy in digital healthcare with revocable biometric systems and blockchain. *Journal of Information Security and Applications*, 93, 104170. <https://doi.org/https://doi.org/10.1016/j.jisa.2025.104170>
- Blanco-González-Tejero, C., Cano-Marin, E., Ulrich, K., & Giralt-Escobar, S. (2024). Leveraging blockchain for industry funding: A social media analysis. *Sustainable Technology and Entrepreneurship*, 3(3), 100071. <https://doi.org/https://doi.org/10.1016/j.stae.2024.100071>
- Bouafia, K., & Gulalov, M. (2024). Blockchain Solutions for Authorization and Authentication. *Procedia Computer Science*, 237, 115–122. <https://doi.org/https://doi.org/10.1016/j.procs.2024.05.086>
- Chouaibi, Y., Ardhaoui, R., & Affes, W. (2024). Does good governance moderate the relationship between blockchain technology use and tax evasion? Evidence from STOXX 600. *EuroMed Journal of Business*, 20(4), 917–944. <https://doi.org/https://doi.org/10.1108/EMJB-12-2023-0337>
- Cruz, G., Guimarães, T., Santos, M. F., & Machado, J. (2024). Decentralize Healthcare Marketplace. *Procedia Computer Science*, 231, 439–444. <https://doi.org/https://doi.org/10.1016/j.procs.2023.12.231>
- Cunningham, J., Davies, N., Devaney, S., Harding, M., Holm, S., Neumann, V., & Ainsworth, J. (2025). The development of a blockchain-based business model simulator with an application to civic medical data management. *Digital Business*, 5(1), 100112. <https://doi.org/https://doi.org/10.1016/j.digbus.2025.100112>
- Dafri, W., & Al-Qaruty, R. (2023). Challenges and opportunities to enhance digital financial transformation in crisis management. *Social Sciences & Humanities Open*, 8(1), 100662. <https://doi.org/https://doi.org/10.1016/j.ssaho.2023.100662>

- Delardas, O. (2025). Transforming marginal-cost pricing: A blockchain approach to fundamental energy system dynamics. *Utilities Policy*, 95, 101942. <https://doi.org/https://doi.org/10.1016/j.jup.2025.101942>
- Hamzeh, M., Rahnamai Roudpashti, F., Bani Mahd, B., & Salehi, M. (2025). Analysis of the impact of blockchain on auditing based on future research approach. *Foresight*, 27(6), 1101–1133. <https://doi.org/https://doi.org/10.1108/FS-05-2024-0091>
- Hanafizadeh, P., & Alipour, M. (2024). Taxonomy of theories for blockchain applications in business and management. *Digital Business*, 4(2), 100080. <https://doi.org/https://doi.org/10.1016/j.digbus.2024.100080>
- Hayat, K., Zhang, Q., Sousa, M. J., Husnain, M., & Shahzad, K. (2025). Blockchain-powered drone deliveries: Embedded governance mechanisms for reducing uncertainty and enhancing consumer behavioral intentions. *Technological Forecasting and Social Change*, 221, 124357. <https://doi.org/https://doi.org/10.1016/j.techfore.2025.124357>
- Isiaku, L., & Adalier, A. (2025). Analyzing the barriers to blockchain adoption in educational sectors: a comprehensive literature review using the Technology-Organizational-Environment (TOE) framework. *On the Horizon*, 33(1), 32–60. <https://doi.org/https://doi.org/10.1108/OTH-05-2024-0029>
- Islam, M. S., Rahman, M. A., Ameen, M. A. Bin, Ajra, H., Ismail, Z. B., & Zain, J. M. (2023). Blockchain-Enabled Cybersecurity Provision for Scalable Heterogeneous Network: A Comprehensive Survey. *CMES - Computer Modeling in Engineering and Sciences*, 138(1), 43–123. <https://doi.org/https://doi.org/10.32604/cmes.2023.028687>
- Jin, S. (2024). The paradigm logic of blockchain governance. *Technology in Society*, 78, 102681. <https://doi.org/https://doi.org/10.1016/j.techsoc.2024.102681>
- Kumar, A., Sachan, R. K., Singh, D., & Jain, R. (2024). Analysis of Block Chain Applications in Asset Backed Securitization System. *Procedia Computer Science*, 233, 147–153. <https://doi.org/https://doi.org/10.1016/j.procs.2024.03.204>
- Li, G., Wu, H., Jiang, J., & Zong, Q. (2023). Digital finance and the low-carbon energy transition (LCET) from the perspective of capital-biased technical progress. *Energy Economics*, 120, 106623. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.106623>
- Longo, F., Mirabelli, G., Solina, V., Belli, L., Abdallah, C. Ben, Ben-Ammar, O., Bottani, E., García-Gallego, J. M., Germanos, M., González, F. J. M., Lacoba, S. R., Sidhom, L., Vignali, G., & Zacharewicz, G. (2023). An overview of approaches and methodologies for supporting smallholders: ICT tools, blockchain, business models, sustainability indicators, simulation models. *Procedia Computer Science*, 217, 1930–1939. <https://doi.org/https://doi.org/10.1016/j.procs.2022.12.393>
- Ma, C.-Q., Lei, Y.-T., Ren, Y.-S., Chen, X.-Q., Wang, Y.-R., & Narayan, S. (2024). Systematic analysis of the blockchain in the energy sector: Trends, issues, and future directions. *Telecommunications Policy*, 48(2), 102677. <https://doi.org/https://doi.org/10.1016/j.telpol.2023.102677>
- Manning, M., Akartuna, E. A., & Johnson, S. (2025). Opportunities to future crime: Scoping the future of money laundering and terrorist financing through cryptoassets. *Technological Forecasting and Social Change*, 210, 123894. <https://doi.org/https://doi.org/10.1016/j.techfore.2024.123894>
- Masoomi, B., Toufighi, S. P., Arman, H., Kamali, S. E., & Vang, J. (2025). Blockchain-enabled risk mitigation in green hydrogen supply chains: an interval type-2 fuzzy MCDM approach. *Cleaner Logistics and Supply Chain*, 16, 100238. <https://doi.org/https://doi.org/10.1016/j.clscn.2025.100238>
- Mbaidin, H. O., Alsmairat, M. A. K., & Al-Adaileh, R. (2023). Blockchain adoption for sustainable development in developing countries: Challenges and opportunities in the banking sector. *International Journal of Information Management Data Insights*, 3(2), 100199. <https://doi.org/https://doi.org/10.1016/j.jjime.2023.100199>

- Megat, P. A., Al-Shaghdari, F., Bin Ngah, B., & Abdelfattah, S. S. (2024). Assessing the predictive benefits of Waqftech smart contracts on corporate waqf crowdfunding among Malaysian enterprises. *Journal of Islamic Marketing*, 15(5), 1303–1325. <https://doi.org/https://doi.org/10.1108/JIMA-08-2023-0262>
- Modina, M., Fedele, M., & Formisano, A. V. (2024). Digital finance for SMEs and startups: a bibliometric analysis and future research direction. *Journal of Small Business and Enterprise Development*, 32(3), 524–571. <https://doi.org/https://doi.org/10.1108/JSBED-01-2024-0021>
- Muharam, I. N., Tussyadiah, I., & Kimbu, A. (2024). Unlocking the potential of blockchain-based sharing economy in hospitality and tourism: A systematic review. *International Journal of Hospitality Management*, 122, 103863. <https://doi.org/https://doi.org/10.1016/j.ijhm.2024.103863>
- Newell, J., ur Rehman, S., Mamun, Q., & Islam, M. Z. (2025). EASL: Enhanced append-only skip list index for agile block data retrieval on blockchain. *Future Generation Computer Systems*, 164, 107554. <https://doi.org/https://doi.org/10.1016/j.future.2024.107554>
- Rashid, M. R. A., Rafi, A. Al, Islam, M. A., Sharkar, S. U., Rafi, Z. H., Hasan, M., Ali, M. S., & Khan, M. S. H. (2025). Enhancing land management policy in Bangladesh: A blockchain-based framework for transparent and efficient land management. *Land Use Policy*, 150, 107436. <https://doi.org/https://doi.org/10.1016/j.landusepol.2024.107436>
- Ren, Y.-S., Ma, C., & Wang, Y. (2024). A new financial regulatory framework for digital finance: Inspired by CBDC. *Global Finance Journal*, 62, 101025. <https://doi.org/https://doi.org/10.1016/j.gfj.2024.101025>
- Sanga, B., & Aziakpono, M. (2023). FinTech and SMEs financing: A systematic literature review and bibliometric analysis. *Digital Business*, 3(2), 100067. <https://doi.org/https://doi.org/10.1016/j.digbus.2023.100067>
- Singh, N., Awan, U., Basahel, S., & Alghafes, R. (2025). Digital technology adoption and SC recoverability. The mediating role of relationship transparency and SC production risk management capabilities. *Technological Forecasting and Social Change*, 218, 124219. <https://doi.org/https://doi.org/10.1016/j.techfore.2025.124219>
- Sunmola, F., & Lawrence, G. L. (2024). Key Success Factors for Integration of Blockchain and ERP Systems: A Systematic Literature Review. *Procedia Computer Science*, 232, 775–782. <https://doi.org/https://doi.org/10.1016/j.procs.2024.01.077>
- Taherdoost, H., Mohamed, N., Farhaoui, Y., Prasad, M., Linh Pham, T. T., & Le, T.-V. (2025). Blockchain Models Applications: A Comparative Study on Security. *Procedia Computer Science*, 258, 1003–1011. <https://doi.org/https://doi.org/10.1016/j.procs.2025.04.337>
- Tanchangya, T., Tafsirun, U., Islam, M. S., Islam, N., Chakma, J., & Esquivias, M. A. (2025). Role of financial technology in small-scale natural Resource management through sustainable financing in Venezuela. *Social Sciences & Humanities Open*, 11, 101636. <https://doi.org/https://doi.org/10.1016/j.ssaho.2025.101636>
- Vaezi, A., Rabbani, E., & Yazdian, S. A. (2024). Blockchain-integrated sustainable supplier selection and order allocation: A hybrid BWM-MULTIMOORA and bi-objective programming approach. *Journal of Cleaner Production*, 444, 141216. <https://doi.org/https://doi.org/10.1016/j.jclepro.2024.141216>
- Wider, W., Salimullah, A. H. M., Islam, M. R., Rahman, J., Tanchangya, T., Siddiqi, K. O., & Rahman, M. H. (2025). Adoption of blockchain technology in banking sector: Extending the technology acceptance model with trust and security in the context of Bangladesh. *Social Sciences & Humanities Open*, 12, 102299. <https://doi.org/https://doi.org/10.1016/j.ssaho.2025.102299>
- Younis, I., Du, A. M., Gupta, H., & Shah, W. U. (2024). Dynamic spillover effects and interconnectedness of DeFi assets, commodities, and Islamic stock markets during crises.

International Review of Financial Analysis, 96, 103563.
<https://doi.org/https://doi.org/10.1016/j.irfa.2024.103563>

Zaman, A., Tlemsani, I., Matthews, R., & Mohamed Hashim, M. A. (2023). Assessing the potential of blockchain technology for Islamic crypto assets. *Competitiveness Review*, 35(2), 229–250. <https://doi.org/https://doi.org/10.1108/CR-05-2023-0100>

Zou, Z., Liu, X., Wang, M., & Yang, X. (2023). Insight into digital finance and fintech: A bibliometric and content analysis. *Technology in Society*, 73, 102221. <https://doi.org/https://doi.org/10.1016/j.techsoc.2023.102221>

Copyright Holder :

© Andrean Permadi et al. (2026).

First Publication Right :

© International Journal of Noesantara Islamic Studies

This article is under:

