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From FinTech to Shariah-Compliant Distributed Ledgers: A Systematic Synthesis of Blockchain Adoption, Governance, and Socio-Technical Barriers in Islamic Financial Systems

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Abstract

This study examines the role of blockchain technology in Islamic finance, focusing on its implications for transparency, operational efficiency, financial inclusion, and governance within Shariah-compliant financial systems. The study investigates how blockchain aligns with Islamic financial principles and influences the development of more transparent, efficient, and inclusive financial systems, while identifying regulatory, governance, and adoption barriers affecting its implementation. Using a qualitative literature synthesis approach, the study analyzes prior empirical studies, systematic reviews, and conceptual analyses related to blockchain, Islamic fintech, and Shariah governance. The findings show that blockchain enhances transparency through immutable transaction records, improves operational efficiency via smart contract automation, and supports financial inclusion by reducing access barriers for underserved communities. However, its implementation depends on regulatory harmonization, Shariah governance standardization, digital literacy, and institutional readiness. The study also highlights that blockchain is compatible with Islamic financial principles such as justice, transparency, and asset-backing, although adoption remains uneven due to fragmented regulations and differing levels of technological maturity. The study concludes that blockchain has transformative potential for Islamic finance, but successful adoption requires collaboration among regulators, Shariah supervisory bodies, and financial institutions to ensure compliance, trust, and scalability. Future research should emphasize empirical validation of blockchain applications in Islamic financial ecosystems, particularly in Southeast Asia, to evaluate long-term sustainability and policy effectiveness.

KEYWORDS

blockchain; Islamic finance; financial inclusion; Shariah governance; fintech; transparency; digital transformation.

Introduction

Indonesia represents one of the most significant emerging markets for Islamic finance globally due to its status as the country with the largest Muslim population in the world, estimated at approximately 240 million people. Despite this demographic advantage and the strong cultural and religious alignment with Shariah-compliant financial principles, the penetration of Islamic banking in Indonesia remains relatively modest, accounting for approximately 7–8 percent of the national banking sector. This discrepancy between potential demand and actual market share highlights a structural inefficiency in the development of Islamic financial services. At the same time, Indonesia is undergoing rapid digital

transformation characterized by more than 220 million internet users and over 100 million fintech users, positioning the country as one of the most dynamic digital economies in Southeast Asia. The convergence of these two trends—untapped Islamic financial demand and accelerated digital adoption—creates a fertile environment for examining how emerging technologies such as blockchain can transform Islamic financial systems.

Recent literature on Islamic fintech and digital transformation in Southeast Asia emphasizes that Indonesia and Malaysia serve as regional anchors for Islamic finance development, although their trajectories differ in terms of institutional maturity and regulatory readiness. Malaysia is often identified as having a more developed Islamic fintech ecosystem with clearer regulatory frameworks, whereas Indonesia demonstrates rapid expansion in digital Islamic financial services but continues to face challenges related to regulatory harmonization, financial literacy, and infrastructure readiness (Prasetyo et al., 2020). Across the broader Southeast Asian context, Islamic finance is increasingly recognized as a strategic component of financial inclusion and ethical investment, particularly in Muslim-majority populations where demand for Shariah-compliant products is structurally embedded (Mohamed et al., 2023). However, despite this regional momentum, Islamic banking and fintech penetration remain uneven, with conventional financial systems still dominating market structures in most countries.

Within this context, digital transformation has been identified as a key driver of financial inclusion in developing Muslim-majority economies. The proliferation of mobile banking, digital payment systems, peer-to-peer lending platforms, and Islamic fintech solutions has enabled broader access to financial services, particularly among unbanked and underbanked populations. Studies in Islamic fintech literature highlight that digital platforms can significantly enhance access to Shariah-compliant financial services when supported by appropriate governance frameworks and regulatory clarity (Ali et al., 2019; Qudah et al., 2023). However, the degree of inclusion achieved through digital transformation is not uniform and depends heavily on factors such as regulatory support, consumer literacy, trust in digital systems, and the availability of Shariah-compliant product structures.

Blockchain technology has emerged as one of the most promising technological innovations in this space due to its decentralized, transparent, and immutable characteristics. In financial systems, blockchain is defined as a distributed ledger technology that enables secure, tamper-resistant, and transparent recording of transactions through consensus mechanisms and cryptographic validation (Amin et al., 2023; Razak et al., 2020). In the context of Islamic finance, these features are particularly relevant because they align with core Shariah principles such as transparency (*al-wuduh*), justice (*'adl*), and the avoidance of uncertainty (*gharar*). Blockchain-based systems also enable smart contracts, which allow automated execution of financial agreements when predefined conditions are met, thereby reducing reliance on intermediaries and improving operational efficiency.

The alignment between blockchain technology and Islamic financial principles has been widely discussed in recent literature. Scholars argue that blockchain can support *maqasid al-shariah* by enhancing trust, ensuring fair transaction execution, and reducing information asymmetry in financial systems (Mohamed et al., 2023;

Takidah & Kassim, 2022). Moreover, blockchain applications in Islamic finance extend to various financial instruments, including *sukuk* (Islamic bonds), *zakat* distribution systems, *waqf* asset management, and Shariah-compliant crowdfunding platforms. Tokenization of *sukuk* assets, for instance, allows for fractional ownership and broader investor participation, thereby increasing liquidity and market accessibility. Nevertheless, the implementation of such technologies requires strong regulatory oversight and Shariah governance frameworks to ensure compliance with Islamic legal principles.

Despite the theoretical alignment between blockchain and Islamic finance, significant challenges remain in practice. One of the primary issues is the lack of standardized Shariah governance frameworks for emerging financial technologies. While institutions such as DSN-MUI in Indonesia and similar bodies in Malaysia provide Shariah oversight, there is still limited consensus on how blockchain-based financial instruments should be evaluated under Islamic law. This creates uncertainty for financial institutions seeking to adopt blockchain solutions at scale. Additionally, regulatory fragmentation across jurisdictions in Southeast Asia further complicates cross-border Islamic financial transactions and inhibits the scalability of blockchain-based financial ecosystems.

Another critical barrier identified in the literature is the limited level of digital literacy and technical expertise among stakeholders in Islamic financial institutions. Studies indicate that both financial consumers and institutional actors often lack sufficient understanding of blockchain technology, leading to reduced trust and slower adoption rates. Furthermore, cybersecurity risks and concerns regarding data privacy present additional challenges that must be addressed to ensure secure implementation of blockchain systems in financial environments.

Given these conditions, there is a clear research gap in understanding how blockchain technology can be effectively integrated into Indonesia's Islamic financial system while maintaining compliance with Shariah principles and addressing institutional constraints. Existing studies have largely focused on either fintech adoption in general or blockchain applications in conventional financial systems, with limited integration of Islamic finance perspectives in the Indonesian context. Moreover, empirical studies that combine technological readiness, regulatory frameworks, and Shariah compliance considerations remain relatively scarce.

Therefore, this study aims to address this gap by examining the opportunities presented by blockchain technology in enhancing transparency, operational efficiency, and financial inclusion within Indonesia's Islamic financial system. The study is grounded in the hypothesis that blockchain adoption can significantly improve the performance of Islamic financial institutions by reducing transaction inefficiencies, increasing transparency in financial reporting, and expanding access to financial services for underserved populations. However, the realization of these benefits is contingent upon the development of supportive regulatory frameworks, improved digital literacy, and robust Shariah governance structures.

In summary, the intersection of Islamic finance, digital transformation, and blockchain technology presents a significant opportunity for financial innovation in Indonesia. While the potential benefits are substantial, including improved transparency, efficiency, and inclusion, the successful implementation of blockchain-based Islamic

financial systems requires careful consideration of regulatory, technological, and Shariah-related challenges. This study therefore contributes to the growing body of literature by providing a comprehensive analysis of blockchain opportunities within Indonesia's Islamic financial ecosystem, while identifying critical gaps that must be addressed to enable sustainable adoption in the future.

Methods

Research Design

This study adopts a conceptual–descriptive research design combined with a structured literature synthesis approach. The purpose of this design is to systematically integrate findings from existing studies on blockchain technology, Islamic financial systems, and digital transformation in order to identify patterns, frameworks, and adoption determinants relevant to Indonesia and broader Muslim-majority Southeast Asia. The approach is appropriate because the research topic spans technological, financial, and Shariah governance dimensions, which require both conceptual interpretation and structured analytical mapping.

The study does not rely on primary data collection but instead synthesizes secondary data and scholarly literature. This includes empirical studies, bibliometric reviews, policy analyses, and conceptual papers addressing blockchain adoption, Islamic fintech development, and financial inclusion. The integration of these sources enables a multi-dimensional understanding of adoption mechanisms and governance structures.

Data Sources and Literature Selection

The data used in this study are derived from peer-reviewed journal articles, systematic reviews, bibliometric analyses, and policy-related studies focusing on blockchain, Islamic fintech, and financial technology adoption. The literature is selected based on three inclusion criteria: (1) relevance to blockchain or fintech adoption, (2) focus on Islamic financial systems or Muslim-majority contexts, and (3) methodological rigor, particularly studies employing empirical or structured conceptual frameworks.

The selected literature includes both global studies and region-specific research from Southeast Asia, particularly Indonesia and Malaysia, as these countries represent the most developed Islamic fintech ecosystems in the region. This ensures contextual relevance and allows comparative insights into regulatory and institutional differences.

Research Framework

The analytical framework of this study is structured around three core constructs: blockchain transparency, financial efficiency, and financial inclusion. These constructs are derived from the synthesis of literature on blockchain applications in financial systems and Islamic finance principles.

Blockchain transparency refers to the ability of distributed ledger systems to provide immutable, real-time, and auditable financial records. Financial efficiency refers to the reduction of transaction costs, elimination of intermediaries, and acceleration of settlement processes through smart contracts. Financial inclusion refers to the expansion of financial services to unbanked and underserved populations through digital platforms.

These constructs are analyzed within the context of

Islamic financial principles such as transparency (*al-wuduh*), justice (*'adl*), and avoidance of uncertainty (*gharar*), ensuring that technological evaluation is aligned with Shariah compliance considerations.

Analytical Approach

The study employs a comparative conceptual analysis method to evaluate traditional financial systems against blockchain-based Islamic financial systems. This involves mapping existing financial processes and comparing them with blockchain-enabled alternatives in terms of efficiency, transparency, and accessibility.

In addition, thematic synthesis is used to categorize findings from the literature into key thematic areas: (1) blockchain applications in Islamic finance, (2) regulatory and governance frameworks, (3) adoption determinants, and (4) financial inclusion outcomes. This thematic classification allows for structured interpretation of heterogeneous studies.

Methodological Approaches in Literature

The reviewed literature demonstrates that blockchain and Islamic fintech adoption studies commonly employ three major methodological approaches.

First, bibliometric and systematic literature review methods are used to map the development of blockchain and Islamic fintech research. These methods identify dominant themes such as regulatory frameworks, cryptocurrency governance, and Shariah compliance integration.

Second, qualitative methods are widely applied in studies focusing on governance, Shariah interpretation, and regulatory frameworks. These include document analysis of fatwas, policy reviews, and interviews with Shariah scholars and financial regulators. Such approaches are particularly useful in understanding institutional constraints and normative considerations in Islamic finance.

Third, quantitative methods using structural equation modeling (SEM) and partial least squares SEM (PLS-SEM) are extensively applied to test technology adoption models. These studies typically extend frameworks such as the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Unified Theory of Acceptance and Use of Technology (UTAUT). They examine determinants such as perceived usefulness, trust, religiosity, and regulatory support in shaping adoption intention.

Analytical Frameworks for Technology Adoption

The dominant analytical frameworks identified in the literature include TAM, TPB, UTAUT, and their extended models. TAM is the most widely used framework, often extended with constructs such as trust, religiosity, Shariah compliance, and perceived risk. TPB is used to assess behavioral intention based on attitudes, subjective norms, and perceived behavioral control.

UTAUT and UTAUT2 models are used to capture additional factors such as facilitating conditions, social influence, and habit formation. These frameworks are frequently implemented using SEM-PLS due to its suitability for complex models and small to medium sample sizes.

In Islamic financial contexts, these frameworks are further adapted by integrating Shariah-specific constructs such as *maqasid al-shariah* compliance, ethical finance principles, and religious obligation factors. This integration ensures that adoption models are not only technologically valid but also aligned with Islamic ethical frameworks.

Validity and Reliability Considerations in Literature

Although this study is conceptual in nature, methodological rigor is ensured through triangulation of

multiple sources. The use of peer-reviewed literature, systematic reviews, and empirical studies enhances the reliability of synthesized findings. Cross-validation between qualitative and quantitative findings in the literature further strengthens the robustness of the analysis.

Additionally, convergence across multiple studies is used as a validation mechanism. When similar findings emerge across different methodological approaches and geographical contexts, the credibility of conclusions regarding blockchain adoption in Islamic finance is strengthened.

Summary of Methodological Positioning

Overall, the methodology of this study is grounded in structured literature synthesis combined with conceptual comparative analysis. It integrates findings from bibliometric studies, qualitative governance research, and quantitative adoption modeling to construct a comprehensive framework for understanding blockchain adoption in Indonesia's Islamic financial system.

This methodological approach is particularly suitable for emerging interdisciplinary fields such as Islamic fintech and blockchain, where empirical data may still be developing, but conceptual and policy-relevant insights are essential for guiding future research and implementation.

Result and Discussion

Blockchain and Transparency in Islamic Financial Systems

Enhancement of Transaction Transparency

The literature consistently demonstrates that blockchain technology significantly enhances transparency in financial systems through the provision of a shared, immutable, and append-only distributed ledger. In such systems, all authorized participants maintain synchronized copies of transaction records, ensuring that financial data cannot be altered retroactively without detection. This structural characteristic reduces information asymmetry between stakeholders and strengthens overall trust in financial ecosystems (Lombardi et al., 2021a).

In the context of Islamic finance, this transparency aligns strongly with Shariah principles emphasizing accountability (*amanah*) and clarity in contractual relationships. Blockchain's ability to provide real-time auditability ensures that financial transactions are observable and verifiable, thereby reducing ambiguity (*gharar*) in financial reporting and execution processes (Fabri & Fabri, 2019).

Fraud Reduction and Audit Integrity

Empirical and review-based studies indicate that blockchain's immutability significantly reduces opportunities for financial fraud. Once recorded, transactions cannot be modified without consensus across the network, making fraudulent manipulation highly detectable. This feature strengthens audit integrity and enhances financial accountability mechanisms (Karunamurthy et al., 2023; Marchenko & Dombrovskaya, 2023).

Blockchain-enabled auditing systems, often referred to as continuous auditing or Audit 4.0, allow for real-time monitoring of financial transactions. This shifts traditional auditing from periodic verification to continuous verification, thereby improving fraud detection speed and

accuracy (Dashkevich et al., 2024).

In Islamic financial instruments such as Sukuk, smart contracts embedded within blockchain systems further reduce moral hazard by enforcing transparent execution of contractual obligations (Septiana & Sanjayawati, 2021).

Real-Time Auditing and Financial Monitoring

The literature highlights the emergence of triple-entry accounting systems enabled by blockchain technology, where transactions are simultaneously recorded by sender, receiver, and distributed ledger validation systems. This architecture enables near real-time auditing capabilities and enhances regulatory oversight efficiency (Natarajan et al., 2017).

Regulatory studies also emphasize that blockchain-based auditing systems allow financial supervisors and institutions to access near real-time transaction flows, improving governance transparency and reducing settlement disputes (Dashkevich et al., 2020).

Case Applications in Islamic and Public Finance

Case-based findings indicate that blockchain applications in Islamic finance, particularly smart Sukuk issuance, enhance transparency in asset-backed securities. These systems enable investors and regulators to track fund flows and asset utilization in real time, thereby increasing trust in Shariah-compliant financial products.

Additionally, blockchain-based public finance applications, including zakat distribution systems and government financial registries, demonstrate improved traceability of funds and increased donor confidence in Islamic social finance systems (Mokodenseho et al., 2024).

Efficiency Gains in Blockchain-Enabled Financial Systems

Reduction of Transaction Costs

The reviewed literature indicates that blockchain technology reduces transaction costs by eliminating intermediaries and automating reconciliation processes. This disintermediation effect lowers administrative overhead and reduces friction in financial transactions, particularly in cross-border payments and trade finance systems (Ariyibi et al., 2024).

By replacing centralized verification systems with distributed consensus mechanisms, blockchain reduces duplication of verification tasks and streamlines operational processes. This results in lower processing costs and improved financial efficiency (Natarajan et al., 2017).

Smart Contracts and Process Automation

Smart contracts are identified as a core driver of efficiency improvements in blockchain-based financial systems. These programmable contracts automatically execute predefined conditions without human intervention, reducing delays and operational errors.

In Islamic finance, smart contracts are increasingly discussed in relation to Murabaha, Mudarabah, Musharakah, and Sukuk structures. These contracts automate payment execution, ownership transfer, and compliance verification, thereby reducing documentation burdens and administrative inefficiencies (Septiana & Sanjayawati, 2021).

However, studies also emphasize that Shariah governance mechanisms must be integrated into smart contract logic to ensure compliance with Islamic contractual principles.

Settlement Speed and Financial Finality

Blockchain systems significantly improve settlement speed by enabling near real-time transaction validation and finality. Unlike traditional banking systems that rely on

multiple intermediaries and clearing cycles, blockchain-based systems reduce settlement time by allowing direct peer-to-peer validation (Lombardi et al., 2021b).

Empirical mappings of distributed ledger applications in banking show that post-trade settlement processes become faster and more efficient, reducing counterparty risk and increasing liquidity efficiency.

Comparative Efficiency Analysis

Comparative studies between traditional financial systems and blockchain-based systems show that while blockchain improves transparency and speed, efficiency gains depend heavily on interoperability, regulatory clarity, and technological maturity (Ariyibi et al., 2024).

In Islamic financial applications, efficiency gains are more pronounced in digital Sukuk issuance and peer-to-peer financing platforms. However, implementation costs and regulatory compliance requirements may offset short-term efficiency benefits (Septiana & Sanjayawati, 2021).

Financial Inclusion Through Blockchain in Islamic Finance Expanding Access to Financial Services

The literature indicates that blockchain technology enhances financial inclusion by lowering entry barriers to financial services. Through decentralized digital platforms, unbanked populations can access financial products without requiring traditional banking infrastructure.

In Islamic finance, blockchain-enabled fintech platforms support inclusion by offering Shariah-compliant digital banking, microfinance, and crowdfunding services to underserved populations (Qudah et al., 2023).

These systems reduce onboarding costs and improve accessibility for rural and low-income populations by enabling mobile-based financial participation.

MSME Financing and Microfinance Systems

Blockchain plays a significant role in improving access to capital for micro, small, and medium enterprises (MSMEs) through tokenized financing, peer-to-peer lending, and Islamic crowdfunding platforms.

Smart contract-based financing models such as micro-Musharakah and micro-Mudharabah allow automated profit-sharing and transparent fund distribution, improving trust between investors and entrepreneurs (Ahmed, 2024).

Additionally, blockchain-based Sukuk micro-issuance enables fractional investment opportunities, allowing small investors to participate in Islamic capital markets.

Fintech and Financial Inclusion in Developing Economies

Empirical findings suggest that fintech adoption significantly improves financial inclusion in developing Muslim-majority countries, particularly when combined with regulatory support and strong Shariah governance frameworks (Berakon et al., 2022).

Indonesia and other Southeast Asian economies demonstrate that digital financial platforms can expand access to banking and investment services, particularly for unbanked and underbanked populations.

However, inclusion outcomes depend on digital literacy, infrastructure readiness, and trust in financial technology systems (Lubis et al., 2023).

Challenges in Rural Financial Inclusion

Despite its potential, blockchain-based financial inclusion faces several barriers in rural contexts. These include limited digital literacy, inadequate infrastructure, cybersecurity risks, and lack of awareness of Shariah-compliant fintech solutions.

Furthermore, regulatory fragmentation and absence of standardized Shariah frameworks hinder scalable

implementation in rural financial ecosystems.

Studies emphasize that trust-building and localized product design are essential for achieving meaningful inclusion outcomes in underserved populations (Oladapo et al., 2023).

This discussion synthesizes evidence on blockchain adoption in Islamic finance by integrating findings on transparency, regulatory structures, Shariah governance, efficiency gains, and socio-technical barriers. Across the literature, a consistent narrative emerges: blockchain technology offers strong theoretical alignment with Islamic financial principles, particularly in terms of transparency, accountability, and trust enhancement, yet its real-world adoption is constrained by regulatory fragmentation, governance limitations, and socio-technical readiness gaps (Septiana & Sanjayawati, 2021; Qudah et al., 2023).

A key insight from the literature is that blockchain's transparency and immutability directly support core maqasid al-shariah objectives, particularly the protection of wealth (al-mal) and the reduction of uncertainty (gharar). By providing shared, tamper-evident ledgers, blockchain enables all stakeholders in a financial system to access consistent transaction histories, thereby reducing information asymmetry and strengthening trust between participants (Ayu & Wati, 2022; Mohamed et al., 2023). This characteristic is particularly significant in Islamic finance instruments such as smart Sukuk, where traceability of asset-backed flows is essential for Shariah compliance. However, transparency alone is not sufficient to guarantee compliance; governance structures remain essential to ensure that digital financial instruments adhere to prohibitions on *riba*, *gharar*, and *maysir* (Septiana & Sanjayawati, 2021).

Beyond transparency, blockchain is also widely discussed as a mechanism for enhancing justice and risk-sharing in Islamic financial contracts. Smart contracts allow pre-defined Shariah conditions to be encoded and automatically executed, reducing the likelihood of moral hazard and contract manipulation. This automation aligns with the principles of *mudharabah* and *musharakah* by strengthening enforceability and reducing discretionary intervention once contractual terms are established (Aysan & Bergigui, 2021). Nevertheless, the literature also highlights that such automation requires careful Shariah validation at the design stage, as improper encoding of financial logic may inadvertently introduce non-compliant features or structural inequities.

Regulatory fragmentation remains one of the most persistent barriers identified across studies. Islamic finance operates within multiple overlapping jurisdictions, including national regulatory bodies and Shariah advisory councils, such as DSN-MUI in Indonesia and equivalent institutions in Malaysia. These differences lead to inconsistencies in the approval of fintech products, particularly blockchain-based innovations such as tokenized assets and decentralized finance applications (Rahman et al., 2023; Supriadi et al., 2023). The absence of harmonized standards contributes to regulatory uncertainty, increases compliance costs, and limits cross-border scalability. As a result, the literature strongly emphasizes the need for regulatory harmonization and coordinated Shariah governance frameworks to enable sustainable adoption of blockchain-based Islamic financial systems.

Closely linked to regulatory challenges are governance-related limitations within Shariah supervisory boards. Many studies indicate that Shariah boards may lack sufficient technical expertise to evaluate complex blockchain architectures, smart contracts, and tokenized financial instruments. This creates a gap between technological innovation and religious-legal evaluation, potentially slowing

down product approval and innovation cycles (Berakon et al., 2022; Haridan et al., 2020). Consequently, several scholars advocate for capacity-building programs that integrate technical training with Shariah jurisprudence to enable more informed decision-making within governance bodies.

From a socio-technical perspective, consumer literacy and trust emerge as equally important determinants of blockchain adoption in Islamic finance. Even when regulatory and governance frameworks are in place, adoption may remain limited if users lack understanding of digital financial products or harbor concerns about their religious compliance. Empirical studies across Indonesia and Malaysia demonstrate that financial literacy, perceived trust, and religiosity significantly influence adoption intentions for Islamic fintech platforms (Darmansyah et al., 2020; Majid, 2024). This suggests that technological readiness alone is insufficient; socio-cultural alignment is necessary to achieve meaningful inclusion outcomes.

Efficiency gains from blockchain adoption are widely acknowledged in the literature, particularly in relation to transaction cost reduction, automation, and settlement speed improvements. Smart contracts eliminate intermediaries in financial transactions, reducing reconciliation costs and enabling near real-time execution of financial agreements. In cross-border payments and Sukuk issuance, blockchain systems can significantly reduce delays and operational overhead compared to traditional financial infrastructures (Karunamurthy et al., 2023; Natarajan et al., 2017). However, these gains are not guaranteed and depend heavily on interoperability, scalability, and regulatory acceptance. Some studies caution that implementation costs and technological complexity may offset efficiency benefits in the short term.

Financial inclusion is another major theme where blockchain is seen as a transformative enabler, particularly for unbanked populations and small and medium-sized enterprises (MSMEs). By lowering entry barriers, reducing documentation requirements, and enabling decentralized access to financial services, blockchain-based Islamic fintech platforms can extend financial inclusion to underserved communities. Tokenized microfinance, crowdfunding platforms, and blockchain-enabled Sukuk are frequently cited as instruments that can democratize access to capital (Qudah et al., 2023). Nonetheless, inclusion outcomes are highly dependent on infrastructure availability, regulatory support, and digital literacy levels, especially in rural areas where technological access remains uneven.

A key tension identified across the literature concerns the pace of innovation versus the need for standardization. While some studies advocate for rapid experimentation through regulatory sandboxes to accelerate innovation, others emphasize that premature deployment without standardized Shariah frameworks may lead to inconsistencies and erosion of trust. This tension reflects a broader governance dilemma in Islamic fintech: balancing innovation with doctrinal consistency and institutional legitimacy (Ayu & Wati, 2022; Baber & Billah, 2022).

Overall, the literature converges on a central conclusion: blockchain has strong potential to enhance transparency, efficiency, and inclusion in Islamic finance, but its successful implementation depends on the alignment of three critical dimensions. First, robust and harmonized Shariah governance is required to ensure compliance with Islamic legal principles. Second, regulatory frameworks must evolve to accommodate decentralized technologies while maintaining financial

stability and consumer protection. Third, socio-technical readiness, including literacy, trust, and institutional capacity, must be strengthened to support widespread adoption. Where these three dimensions align, blockchain adoption in Islamic finance is more likely to deliver meaningful and sustainable benefits (Haridan et al., 2023; Mohamed et al., 2023; Qudah et al., 2023).

Conclusion

This study synthesizes literature on blockchain adoption in Islamic finance, with a focus on transparency, efficiency, financial inclusion, regulatory structures, Shariah governance, and socio-technical barriers. The findings demonstrate that blockchain technology offers significant theoretical and practical advantages for Islamic financial systems, particularly through its ability to enhance transparency, automate financial processes, and expand access to financial services.

First, the literature consistently shows that blockchain improves transparency and accountability in financial transactions. Its distributed ledger structure, immutability, and traceability support the objectives of *maqasid al-shariah* by reducing uncertainty (*gharar*) and strengthening trust in financial reporting and contract execution. These features are particularly relevant for Islamic financial instruments such as Sukuk and digital Islamic contracts, where asset traceability and compliance verification are essential.

Second, blockchain contributes to operational efficiency by reducing transaction costs, minimizing intermediaries, and enabling smart contract automation. These improvements are most evident in settlement systems, cross-border payments, and Islamic capital market instruments. However, the literature also highlights that these efficiency gains are contingent on technological maturity, interoperability, and supportive regulatory frameworks. Without these conditions, efficiency benefits may be limited or unevenly distributed.

Third, blockchain holds strong potential for enhancing financial inclusion, particularly among unbanked populations and small and medium-sized enterprises. By lowering entry barriers and enabling decentralized access to financial services, blockchain-based Islamic fintech platforms can expand financial participation in Muslim-majority countries. Nevertheless, inclusion outcomes depend heavily on digital literacy, infrastructure readiness, and trust in both technology and Shariah compliance mechanisms.

Fourth, regulatory and governance frameworks emerge as the most critical determinants of successful blockchain adoption in Islamic finance. The literature emphasizes the need for harmonized Shariah standards, clear regulatory guidelines, and coordinated oversight between financial regulators and Shariah supervisory boards. Fragmented regulatory environments and inconsistent Shariah interpretations remain major barriers to scalable implementation across jurisdictions.

Finally, socio-technical factors—including user literacy, institutional capacity, cybersecurity readiness, and cultural acceptance—play a decisive role in shaping adoption outcomes. Even when technological and regulatory conditions are favorable, weak user understanding and limited institutional preparedness can significantly slow down implementation.

In conclusion, blockchain technology presents a transformative opportunity for Islamic finance by improving

transparency, efficiency, and inclusion. However, its successful adoption requires an integrated approach that combines robust Shariah governance, regulatory harmonization, and socio-technical readiness. Future

research should focus on empirical validation of blockchain implementations in Islamic finance ecosystems, particularly in Southeast Asia, to better understand long-term impacts and adoption dynamics.

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