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Tokenization in Islamic Finance: Evolution, Sukuk Innovations, and Shariah-Compliant Block chain Frameworks

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Abstract

The accelerating digital transformation of global finance is reshaping the mechanisms through which value is issued, transferred, and governed. Islamic finance, grounded in ethical constraints and asset-backed transactions, faces a distinctive challenge in this transition: how to adopt emerging financial technologies without compromising Shariah principles. Although Sukuk markets have expanded significantly over the past two decades, they continue to face structural limitations related to liquidity, issuance costs, governance transparency, and restricted investor access. This article examines digital tokenization as an infrastructural evolution within Islamic finance rather than a speculative financial innovation. By representing ownership rights and contractual obligations on distributed ledgers, tokenization offers a framework for enhancing transparency, automating Shariah compliance, reducing transactional friction, and enabling broader market participation. The analysis positions blockchain-enabled Sukuk as a mechanism capable of restoring substantive asset-backing and ethical accountability while aligning Islamic capital markets with contemporary financial infrastructure.

Keywords: Riba (interest), risk, Sukuk, tokenization, Islamic finance.

Introduction

Islamic finance has emerged as a distinct global financial system, characterized by its normative commitment to ethical conduct, shared risk, and real economic activity. Its foundational prohibitions, most notably Riba (interest), Gharar (excessive uncertainty), and Maysir (speculation), are not merely technical rules but expressions of a moral economy

aimed at justice, transparency, and social balance¹. Within this framework, Sukuk serve as the principal capital market instrument, structured to represent proportional ownership in tangible assets or productive ventures rather than interest-bearing debt.

Despite this conceptual clarity, the institutional development of Sukuk has exposed growing tension between legal form and economic substance. Many contemporary Sukuk structures rely on complex contractual layering, special purpose vehicles, and purchase undertakings that replicate the cash-flow certainty of conventional bonds. While such structures often satisfy formal Shariah approval, they weaken the link between financial returns and underlying asset performance, thereby diluting the risk-sharing ethos that Sukuk are meant to embody². This evolution has contributed to persistent critiques that Sukuk increasingly resemble debt instruments in function, even when framed as asset-based in law.

Concurrently, global financial systems are undergoing a foundational transformation driven by digitalization. Settlement cycles are compressing, intermediaries are being disintermediated, and transparency is becoming a regulatory and market expectation rather than an optional feature. Financial instruments dependent on slow, opaque, and manually verified processes are increasingly misaligned with this environment. For Islamic finance, this moment represents a structural crossroads. Continued reliance on legacy infrastructure risks undermining both market competitiveness and ethical credibility, while uncritical adoption of financial technology risks subordinating Shariah objectives to efficiency alone. The challenge, therefore, lies in integrating technological innovation in a manner that reinforces, rather than replaces, the normative foundations of Islamic finance³.

1. Blockchain as Ethical Financial Infrastructure

Blockchain technology, more precisely described as Distributed Ledger Technology (DLT), represents a fundamental shift in how financial records are created, validated, and maintained. Unlike centralized databases controlled by a single authority, a distributed ledger is shared across multiple participants, with each transaction validated through cryptographic consensus. Once recorded, data cannot be altered retroactively without collective agreement, making the ledger effectively immutable⁴. From a purely technical perspective, blockchain offers efficiency and security. From an Islamic finance perspective, however, its significance runs deeper. Islamic commercial law places strong emphasis on transparency (*wuḍūḥ*), certainty (*yaqīn*), and accountability (*amānah*) in contractual relationships. Transactions must be clearly defined, verifiable, and free from hidden manipulation. Traditional financial systems attempt to achieve these goals through regulation and intermediaries. Blockchain embeds them directly into infrastructure.

Transparency is one of the most ethically relevant features of DLT. Every authorized participant in a blockchain network has access to the same transaction history, eliminating asymmetric information between issuers, investors, and oversight bodies. This shared visibility directly addresses concerns related to information opacity in Sukuk markets, where investors often rely on periodic disclosures rather than continuous verification.

In a distributed ledger environment, ownership transfers, cash flows, and contractual triggers are observable in real time, strengthening trust without requiring blind reliance on intermediaries. Immutability further reinforces contractual integrity. Once a transaction is recorded on the ledger, it cannot be modified unilaterally. This characteristic aligns closely with the Islamic legal principle that contracts, once validly concluded, carry binding moral and legal force (*luzūm al-‘aqd*). The inability to retroactively alter records reduces the risk of post hoc manipulation, selective disclosure, or opportunistic behavior, concerns that have historically undermined confidence in complex financial instruments.

Decentralization also has normative implications. In conventional finance, centralized intermediaries act as gatekeepers of trust, settlement, and verification. While functional, these structures concentrate power and introduce agency problems. Blockchain redistributes verification across a network, reducing dependence on single points of control. For Islamic finance, which emphasizes justice and balance in economic relationships, this redistribution supports a more equitable governance model without eliminating regulatory oversight.

Importantly, blockchain should not be understood as a substitute for ethical judgment or legal reasoning. It is an enabling infrastructure, not a normative authority. Its value lies in its ability to operationalize ethical constraints consistently and transparently. When applied to Sukuk markets, DLT does not redefine Shariah principles; it provides a technical medium through which those principles can be enforced with greater precision and reliability. In this sense, blockchain functions less as a disruptive innovation and more as an infrastructural correction, realigning financial practice with ethical intent.

2. Smart Contracts and the Reconfiguration of Shariah Compliance

Smart contracts represent one of the most structurally significant applications of blockchain technology for Islamic finance. Unlike traditional legal contracts, which require interpretation and enforcement by external institutions, smart contracts are self-executing programs embedded within a blockchain. Once predefined conditions are met, execution occurs automatically, without discretionary intervention⁵. From a Shariah perspective, this automation carries important implications.

Islamic commercial law places strong emphasis on certainty (qaṭ'iyah) and enforceability in contracts. Rights and obligations must be clearly defined, and outcomes must depend on real economic events rather than speculative assumptions. In conventional Sukuk structures, compliance is often verified through documentation and periodic audits. Smart contracts, by contrast, allow compliance conditions to be embedded directly into the operational logic of the instrument itself.

In a smart Sukuk framework, profit distributions can be programmatically linked to verified asset performance rather than fixed schedules. Returns are triggered only when the underlying asset generates revenue, reinforcing the principle that profit must be accompanied by exposure to risk (al-ghunm bi al-ghurm). This structural linkage reduces the tendency toward debt-like behavior and strengthens the connection between financial returns and real economic activity⁶.

Automation also minimizes the role of intermediaries whose functions are primarily administrative rather than value-creating. Functions such as payment distribution, compliance checks, and record reconciliation can be executed automatically once contractual parameters are met. This reduction in manual intervention lowers operational costs and limits the scope for human error or opportunistic behavior.

More importantly, it shifts Shariah compliance from a procedural obligation into a functional requirement: if the rules are not satisfied, the transaction simply does not execute. Another critical implication concerns the treatment of non-compliance events. In traditional structures, breaches may be detected retrospectively and addressed through discretionary remedies. Smart contracts allow predefined responses to non-compliance, such as suspending distributions or redirecting impermissible income to charitable accounts, in accordance with established Shariah principles. This predictability strengthens governance and aligns contractual enforcement with ethical intent⁷.

It is important, however, to recognize the limits of automation. Smart contracts execute code, not moral judgment. They must therefore be designed with careful juristic input to ensure that encoded rules accurately reflect Shariah requirements. Poorly designed code can rigidly enforce flawed assumptions. As such, smart contracts do not replace Shariah scholars; they require deeper collaboration between jurists, financial engineers, and technologists. When designed correctly, they offer a mechanism through which Shariah compliance becomes continuous, transparent, and operational rather than symbolic.

3. Tokenization and the Transformation of Ownership

Tokenization refers to the representation of ownership rights in real assets through digital tokens recorded on a blockchain. Each token corresponds to a defined share of an underlying asset, revenue stream, or usufruct, enabling ownership to be divided, transferred, and recorded with high precision. Within Islamic finance, this mechanism reflects established principles of divisible ownership and shared entitlement that underpin contracts such as *mushārah*, *ijārah*, and *wakālah*⁸.

Rather than introducing a new legal concept, tokenization provides a technologically efficient means of expressing ownership relationships that Islamic law has long recognized. Classical jurists emphasized that ownership must be clearly specified, transferable, and protected from ambiguity in order to ensure transactional justice. Unclear entitlement (*jahālah*) and uncertainty regarding asset control have historically been central concerns in Islamic commercial jurisprudence. By digitally encoding ownership claims and transfer conditions, tokenization reduces ambiguity at both contractual and operational levels, addressing governance weaknesses that often emerge in complex Sukuk structures⁹.

A defining feature of tokenization is its capacity to facilitate fractional ownership. Traditional Sukuk issuances frequently impose high minimum investment thresholds due to administrative complexity, settlement inefficiencies, and custodial constraints. Tokenization lowers these barriers by allowing assets to be divided into standardized units that can be independently acquired and transferred. This structural shift directly supports the Islamic finance objective of financial inclusion, expanding access to productive investment opportunities while preserving asset-backing and risk-sharing requirements¹⁰.

Tokenization also contributes to improved market liquidity without encouraging speculative behavior. Because tokens represent direct ownership interests rather than derivative claims, secondary trading remains anchored to real assets. Efficient digital transfer reduces settlement delays and transaction costs, while blockchain-based recordkeeping enhances price transparency.

These features align with Islamic prohibitions against excessive speculation by maintaining a clear link between market activity and underlying economic value and from a Shariah governance perspective, tokenization strengthens traceability and auditability¹¹. Ownership histories are permanently recorded on distributed ledgers, allowing scholars and regulators to verify asset continuity and transfer legitimacy at any point in time. This continuous visibility mitigates concerns related to hidden ownership changes, improper asset substitution, or impermissible revenue mixing ,issues that have historically complicated Sukuk oversight¹².

Taken together, these characteristics position tokenization as a structural enhancement rather than a conceptual departure. It reinforces core Islamic finance principles ,clarity, shared risk, and real asset linkage ,by embedding them into ownership infrastructure. As Islamic capital markets confront the limitations of legacy systems, tokenization emerges as a practical mechanism for restoring both functional efficiency and normative integrity.

4. Efficiency, Transparency, and Economic Impact

The tokenization of Sukuk, combined with blockchain infrastructure and smart contracts, generates measurable efficiencies across issuance, settlement, and governance processes. Traditional Sukuk markets rely on multilayered documentation, multiple intermediaries, and lengthy verification procedures, resulting in high administrative costs and delayed settlement. Tokenized instruments, by contrast, embed contractual obligations and ownership rights directly into a distributed ledger, allowing transactions to execute automatically and reducing operational frictions¹³.

Efficiency gains are evident in multiple dimensions. First, issuance costs decline because the need for repeated legal review and intermediary verification diminishes. Blockchain-enabled Sukuk can standardize contract logic and automate compliance checks, reducing both time and expenditure associated with manual processes¹⁴. Second, settlement speed improves markedly. Whereas conventional Sukuk transfers may require days to reconcile through clearinghouses, blockchain-based transactions are near-instantaneous, with ownership and entitlements recorded in real time. This accelerates capital circulation, enabling faster deployment of funds into productive projects and enhancing market liquidity¹⁵.

Transparency is equally enhanced. All tokenized transactions are visible to authorized participants, producing a continuous audit trail. Unlike traditional structures, which rely on periodic disclosures and reporting, tokenization provides persistent, real-time verification of ownership and revenue flows. This reduces information asymmetry, strengthens investor confidence, and supports Shariah oversight by ensuring that all transactions comply with ethical and legal requirements¹⁶.

From an economic perspective, these efficiency and transparency improvements have broader systemic implications. Reduced costs and faster settlement encourage wider participation, particularly by smaller investors, which aligns with the Shariah principle of equitable access to wealth-building opportunities. At the same time, automated compliance lowers operational risk, reducing the likelihood of disputes, errors, or accidental engagement in prohibited financial activities¹⁷.

Moreover, the integration of tokenization and blockchain can facilitate the development of secondary markets with higher liquidity. Tokens representing asset-backed Sukuk can be traded on regulated digital platforms, creating more responsive pricing and better capital allocation. Importantly, these benefits are achieved without sacrificing the asset-based nature of the instrument or undermining risk-sharing principles, preserving the normative integrity of Islamic finance while enhancing its functional efficiency¹⁸.

In sum, tokenization represents both a structural and ethical enhancement. By reducing transaction costs, improving transparency, and facilitating real-time compliance, it addresses long-standing inefficiencies in Sukuk markets while remaining fully consistent with Shariah objectives. The result is a more accessible, accountable, and economically effective financial system capable of supporting sustainable growth and broader financial inclusion.

5. Overcoming Barriers to Adoption

Despite the structural and ethical advantages of tokenization and blockchain, the practical adoption of these technologies in Islamic finance faces several interrelated challenges. Recognizing and addressing these barriers is essential to ensure that innovation complements, rather than undermines, Shariah compliance and market stability.

1. **Regulatory Uncertainty** is a primary concern. Jurisdictions differ in how digital assets are legally defined, which complicates recognition of tokenized Sukuk as legitimate financial instruments. Without clear legal status, investors may be reluctant to participate, and institutions may be exposed to compliance risks. Harmonization of regulatory frameworks across key markets is necessary to enable cross-border transactions and enforce investor protections while preserving the integrity of Islamic financial principles¹⁹.
2. **Shariah Governance** and Expertise constitute another critical barrier. While block chain and smart contracts automate compliance, they do not replace the need for informed oversight. Shariah boards must adapt to understand the technological mechanisms underpinning these instruments, ensuring that encoded rules faithfully represent the jurisprudential intent. Training programs and collaboration between technologists and Islamic jurists are essential to bridge the knowledge gap²⁰.
3. **Technical and Operational**, Challenges also pose significant obstacles. Deploying blockchain infrastructure requires substantial investment in technical expertise, cybersecurity protocols, and operational integration. Financial institutions must acquire capabilities not only in distributed ledger technologies but also in the secure design of smart contracts and digital wallets. Without robust technological architecture, tokenized Sukuk risk operational failure, security breaches, or mismanagement of investor funds²¹.
4. **Market Adoption** and Investor Confidence further influence the pace of integration. Investors accustomed to traditional Sukuk may require education and assurance regarding both the digital process and adherence to Shariah norms. Clear communication of governance mechanisms, risk management procedures, and auditability features is necessary to build trust in this evolving financial environment²².

Addressing these barriers requires a multi-pronged approach: regulatory clarity, Shariah-literate technological design, operational robustness, and investor education. When effectively managed, these measures ensure that tokenization and blockchain do not merely replicate existing inefficiencies but enhance the ethical, economic, and structural quality of Islamic capital markets.

6. *The Future: A Global Shariah-Compliant Network*

The long-term vision for tokenized Islamic finance is the establishment of a borderless, Shariah-compliant financial ecosystem, where investors and issuers interact seamlessly across geographies while remaining fully aligned with ethical and legal principles. Blockchain and tokenization are central to this vision, enabling real-time transparency, automated compliance, and standardized contractual enforcement at a global scale²³.

A global network of this nature would allow a Sukuk issued in one jurisdiction to be purchased, traded, or redeemed by investors anywhere in the world. Digital wallets and interoperable blockchain platforms would replace slow cross-border processes and reduce

reliance on multiple clearinghouses. This not only accelerates capital deployment but also democratizes access, enabling smaller investors and institutions in emerging markets to participate meaningfully in asset-backed projects²⁴.

Unified Shariah Governance is another critical feature of a global network. Blockchain enables continuous monitoring and auditing of transactions by Shariah scholars without interfering in market operations. Each transaction can be coded with compliance rules, and governance decisions can be recorded immutably on the ledger, ensuring that ethical oversight is both visible and enforceable across jurisdictions.

This mitigates conflicts of interest, enhances investor confidence, and creates a shared standard of compliance across diverse markets²⁵. In addition, the adoption of global standards for tokenized Sukuk could facilitate harmonization of accounting, reporting, and disclosure practices.

Organizations like the International Islamic Financial Market (IIFM) are developing model contracts, benchmark structures, and standard protocols that can be integrated into blockchain platforms, enabling regulatory alignment and market interoperability²⁶. Standardization further reduces transaction costs, simplifies settlement, and strengthens systemic stability, while maintaining fidelity to Shariah objectives.

Finally, a global Shariah-compliant network supports the broader ethical mission of Islamic finance: mobilizing resources for productive economic activity, promoting equitable participation, and ensuring transparency and accountability. By integrating tokenization and blockchain at scale, Islamic finance can offer a modern, technologically robust alternative to conventional financial networks, without compromising its core values of justice, risk-sharing, and asset-backing²⁷.

This vision is not merely aspirational. Pilot projects and collaborative frameworks are already being explored in Asia, the Middle East, and Europe, indicating a practical pathway toward global deployment. The ongoing challenge is ensuring that technological innovation, regulatory adaptation, and Shariah compliance advance in tandem, preserving both efficiency and ethical integrity.

7. Final Thoughts

Tokenization and blockchain represent the next evolutionary step in Islamic finance, offering a transformative framework that reconciles efficiency, transparency, and Shariah compliance. By embedding ownership rights, profit distribution, and governance mechanisms into digital infrastructures, these technologies allow Islamic capital markets to overcome historical limitations related to cost, access, and operational complexity²⁸.

The adoption of tokenized Sukuk does more than streamline processes, it restores alignment between financial practice and ethical intent. Fractional ownership, automated compliance, and real-time auditing reinforce the principles of risk-sharing, asset-backing, and equitable participation that define Islamic finance. Investors gain broader access, regulators gain greater oversight, and the global community benefits from a more transparent and efficient financial ecosystem²⁹.

Importantly, these innovations do not replace the normative role of Shariah governance; they complement it. Smart contracts and distributed ledgers operationalize ethical and legal requirements, reducing reliance on manual checks and lowering the risk of human error or intentional misrepresentation. The result is a system in which compliance is continuous, transparent, and auditable, enabling Islamic finance to scale globally without compromising its moral foundations³⁰.

Looking forward, the full potential of a global, Shariah-compliant network depends on coordinated efforts among regulators, financial institutions, technology providers, and Shariah scholars. Harmonized legal frameworks, technical infrastructure, investor education, and standardization are critical enablers. When these elements converge, tokenization can redefine not only Islamic capital markets but also broader notions of ethical and asset-backed finance, establishing a model of financial integrity and inclusion for the 21st century³¹.

Conclusion

Tokenization and blockchain are redefining the landscape of Islamic finance by offering a structural framework that combines efficiency, transparency, and Shariah compliance. Through fractional ownership, automated smart contracts, and real-time verification, tokenized Sukuk eliminate many of the operational and accessibility barriers inherent in traditional structures.

These innovations enhance market liquidity, reduce issuance and settlement costs, and enable broader participation, aligning closely with the ethical and economic objectives of Islamic finance. Importantly, the adoption of these technologies does not compromise the normative foundations of Islamic finance. Instead, it operationalizes principles such as risk-sharing, asset-backing, and equitable participation in a way that is verifiable, auditable, and scalable.

Shariah governance, integrated with blockchain, ensures that compliance is continuous and transparent, transforming ethical oversight from a procedural task into a functional mechanism embedded within financial operations. Looking ahead, the potential to establish a global Shariah-compliant network represents a profound shift in the accessibility and efficiency of Islamic capital markets. By harmonizing regulatory frameworks, technological standards, and Shariah principles, Islamic finance can achieve a truly borderless ecosystem where investors across the world can participate in ethical, asset-backed financial instruments with confidence. In conclusion, blockchain-enabled tokenization is not merely an innovation, it is a structural evolution that strengthens the integrity, inclusivity, and resilience of Islamic finance. By embracing this approach, the sector can meet the demands of a digital, interconnected global economy while staying true to its ethical and jurisprudential foundations, setting a model for sustainable and inclusive finance in the 21st century.

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