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<p style="text-align: center;">The Implementation of Smart Contracts and Blockchain-Based Smart Sukuk in Islamic Finance: A Sharia Economic Law Perspective</p>	
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<p style="text-align: center;">ABSTRACT :</p> <p>This study explores the application of smart contracts and blockchain-based smart sukuk within the framework of Islamic finance, focusing on their alignment with Sharia Economic Law principles such as justice ('adl), maslahah (public benefit), and maqasid sharia (including hifz al-mal or wealth protection). As blockchain technology advances, it offers innovative solutions for transparent, automated, and secure financial transactions, potentially enhancing the efficiency of Islamic financial instruments like sukuk. However, the integration of smart contracts—self-executing agreements coded on blockchain—raises concerns about compliance with Sharia prohibitions on uncertainty (gharar) and speculation (maysir). The research adopts a normative juridical approach, analyzing primary sources (Quran, Hadith, DSN-MUI fatwas) and secondary sources (Indonesian regulations like Law No. 21 of 2008 on Sharia Banking, OJK guidelines on fintech, and blockchain-related policies). Data were gathered through literature review and regulatory analysis. Findings indicate that while smart contracts and smart sukuk can promote inclusive and equitable finance, challenges persist in ensuring Sharia compliance, particularly in rural areas with limited digital access. Recommendations include strengthening regulatory frameworks to incorporate blockchain innovations while upholding Islamic principles.</p>	
<p>Key words: <i>Smart Contracts, Blockchain-Based Smart Sukuk, Islamic Finance, Sharia Economic Law, Maqasid Sharia, Financial Inclusion.</i></p>	

INTRODUCTION

The rapid evolution of blockchain technology has transformed various sectors, including finance, by introducing decentralized, transparent, and immutable systems. In the realm of Islamic finance, this innovation holds significant promise for instruments like sukuk (Islamic bonds), which are structured to comply with Sharia principles such as profit-sharing and asset-backed financing. Smart contracts, programmable agreements that execute automatically on blockchain platforms, enable the creation of "smart sukuk," where terms are embedded in code to ensure automated compliance and reduce intermediaries. This development aligns with global efforts to enhance financial inclusion, particularly in Muslim-majority countries like Indonesia, where the Islamic economy is expanding. According to projections, Indonesia's Sharia financial assets could reach IDR 3,157.9 trillion to IDR 3,430.9 trillion by 2025, driven by supportive regulations and a growing halal ecosystem.

(OJK, 2025). However, the adoption of blockchain-based solutions must navigate Sharia Economic Law, which emphasizes ethical transactions free from *riba* (interest), *gharar* (excessive uncertainty), and *maysir* (gambling).

From a Sharia perspective, smart contracts and smart sukuk could facilitate *maqasid sharia* by protecting wealth (*hifz al-mal*) and promoting justice (*'adl*) through equitable distribution. The Quran, in verses like Al-Baqarah: 275, condemns *riba* and encourages fair dealings, while Hadith stress transparency in contracts (Wahbah az-Zuhaili, 1985). Yet, the automated nature of smart contracts might introduce *gharar* if terms are not fully predictable, potentially conflicting with Islamic jurisprudence (*fiqh muamalah*). In Indonesia, regulations such as Law No. 21 of 2008 on Sharia Banking and OJK guidelines on financial technology provide a foundation, but gaps remain in addressing blockchain-specific risks. This study is timely as low Sharia financial inclusion—13.41% in 2025 per OJK's National Survey of Financial Literacy and Inclusion (SNLIK)—highlights the need for innovative, Sharia-compliant tools to reach underserved communities, including MSMEs and rural populations (Friderica, 2025). By reviewing the implementation of smart contracts and smart sukuk through Sharia Economic Law, this research aims to offer insights into regulatory enhancements for a more inclusive Islamic financial system.

Methods

This study employs a normative juridical approach, analyzing legal norms, Sharia principles, and regulations without empirical fieldwork. This method suits the focus on doctrinal alignment between positive law and *fiqh muamalah*. Using a statute approach, it examines laws like Law No. 21 of 2008 on Sharia Banking, OJK Regulations on fintech and blockchain, and DSN-MUI fatwas. A conceptual approach explores *maqasid sharia*, *'adl*, and *maslahah* in smart contracts and smart sukuk.

Data collection involved library research from sources such as OJK websites, academic repositories, and Sharia literature. Primary sources include the Quran and Hadith, while secondary ones encompass regulations and reports. Analysis integrated these to assess compliance and propose improvements, ensuring a comprehensive review of blockchain's role in Islamic finance.

DISCUSSION

Regulatory Framework for Smart Contracts and Smart Sukuk in Indonesia

Indonesia's regulatory landscape for blockchain in Islamic finance has evolved significantly since the enactment of Law No. 21 of 2008 on Sharia Banking, which established the foundational principles for Sharia-compliant financial operations. This law mandates that all Islamic financial activities adhere to core Sharia tenets, including the avoidance of *riba*, *gharar*, and *maysir*, thereby providing a legal basis for integrating emerging technologies like blockchain. Building on this, the Financial Services Authority (OJK) and Bank Indonesia (BI) have issued a series of regulations and guidelines aimed at fostering fintech innovations, including blockchain-based applications. For instance, the OJK's regulations on financial technology, such as POJK No. 13/POJK.02/2018 on the Implementation of Financial Technology, outline requirements for fintech providers to ensure consumer protection, data security, and compliance with Sharia principles when applicable. These regulations have been further reinforced by the Sharia Financial Development Roadmap, which identifies blockchain as a key enabler for enhancing transparency and efficiency in Islamic financial products.

By 2025, the regulatory focus has shifted towards more comprehensive frameworks, as evidenced in the 2023-2027 Roadmap for the Supervision of Financial Services Business Actors' Behavior, Consumer Education, and Protection. This roadmap emphasizes the integration of digital innovations to promote financial inclusion, particularly through initiatives like the Sharia Financial Inclusion Ecosystem (EPIKS) and collaborations with the Regional Financial Access Acceleration Team (TPAKD). Programs such as the Celebration of Sharia Financial Ramadan (GERAK Syariah) have incorporated blockchain pilots for sukuk issuance, allowing for automated distribution of returns to investors in rural and underserved areas. Additionally, the National Strategy for Financial Inclusion (SNKI) integrates Sharia elements, encouraging the use of blockchain to reduce transaction costs and intermediaries in sukuk transactions.

Key legal bases supporting this framework include:

1. Law No. 21 of 2008 on Sharia Banking, which ensures that blockchain applications in Islamic finance align with profit-sharing and asset-backed structures.
2. OJK Regulations on fintech, such as those requiring Sharia audits for digital platforms to prevent non-compliant elements.

3. DSN-MUI Fatwa No. 117/DSN-MUI/II/2018 on Fintech, which approves blockchain for Islamic finance provided it maintains transparency and avoids speculative risks.

Current implementation reveals a mix of progress and hurdles. Pilot projects for smart sukuk have been conducted, particularly for micro, small, and medium enterprises (MSMEs), where blockchain enables fractional ownership and real-time tracking of asset-backed investments. For example, sukuk based on ijara contracts have been digitized, allowing investors to receive automated rental payments without manual intervention. However, the 2025 National Survey of Financial Literacy and Inclusion (SNLIK) indicates that while Sharia financial literacy stands at 43.42%, inclusion remains low at 13.41%, partly due to digital literacy gaps and infrastructure limitations in rural Indonesia.⁸ This disparity underscores the need for regulations that not only permit but actively facilitate blockchain adoption in Sharia finance.

Sharia Economic Law Review of These Implementations

From the perspective of Sharia Economic Law, the implementation of smart contracts and blockchain-based smart sukuk presents both opportunities and challenges in achieving the overarching goals of Islamic finance. Sharia Economic Law, rooted in fiqh muamalah, prioritizes transactions that uphold justice ('adl), public benefit (maslahah), and the maqasid sharia, particularly the protection of wealth (hifz al-mal). Smart contracts, by automating contract execution, can enhance 'adl by ensuring equitable and timely fulfillment of obligations, such as profit distributions in sukuk. For instance, in a mudharabah-based smart sukuk, the code can automatically calculate and disburse profits based on predefined ratios, reducing human error and potential disputes. This aligns with Quranic injunctions, such as in Surah Al-Ma'idah: 1, which calls for fulfilling covenants, and Hadith that emphasize fairness in partnerships. Blockchain's decentralized nature further supports hifz al-mal by providing immutable records, safeguarding against fraud and ensuring that sukuk assets are transparently managed.

Moreover, these technologies promote maslahah by expanding access to Islamic finance for broader segments of society. In Indonesia, where rural communities often face barriers to traditional banking, smart sukuk can enable participatory financing for community projects, such as infrastructure development funded through ijara sukuk. DSN-MUI fatwas, including those on digital contracts, endorse blockchain applications

that eliminate intermediaries, thereby lowering costs and fostering inclusive growth. Scholars like Yusuf al-Qaradawi have argued that modern tools should be harnessed to realize Islamic welfare objectives, provided they do not contravene Sharia fundamentals. Empirical evidence from studies, such as those by Puspitasari et al. (2020), demonstrates that blockchain-enhanced sukuk can improve inclusion indices by democratizing investment opportunities, allowing even small investors to participate in large-scale projects.

However, significant challenges arise in ensuring full Sharia compliance. One primary concern is the potential for gharar in smart contracts, where the automated execution might introduce uncertainties if contractual terms are not meticulously defined. For example, if a smart sukuk's code relies on external data feeds (e.g., market indices for profit calculations), fluctuations could lead to unpredictable outcomes, resembling maysir. This conflicts with Sharia's emphasis on clarity and certainty, as outlined in fiqh principles derived from Hadith prohibiting ambiguous transactions. Additionally, the immutability of blockchain could complicate amendments to contracts, potentially locking parties into unfavorable terms, which might undermine 'adl. In rural areas, where digital access is limited, the reliance on blockchain could exacerbate exclusion, contradicting maslahah. Reports from the OJK highlight that while urban centers have seen successful smart sukuk trials, rural adoption lags due to inadequate internet infrastructure and low Sharia literacy.

Comparative analysis with global practices reveals that countries like Malaysia and the UAE have advanced further in regulating blockchain sukuk, with dedicated Sharia boards overseeing code audits. In Indonesia, while DSN-MUI fatwas provide initial guidance, there is a need for more specific frameworks to address blockchain nuances, such as tokenization of sukuk assets. Studies by Arta et al. (2024) suggest that regulatory gaps in Sharia vetting could lead to non-compliant innovations, potentially eroding trust in Islamic finance. To mitigate these issues, recommendations include integrating artificial intelligence for real-time Sharia compliance checks in smart contracts and revising fatwas to explicitly cover blockchain-based sukuk. Furthermore, collaborations with educational institutions, such as Islamic boarding schools (pesantren), could enhance literacy and bridge the urban-rural divide. Overall, while smart contracts and smart sukuk hold promise for aligning with Sharia Economic Law, their success depends on proactive regulatory adaptations to balance innovation with ethical imperatives.

Case Studies and Empirical Insights

To illustrate the practical implications of smart contracts and smart sukuk, this section examines specific case studies from Indonesia and comparative examples. One notable pilot in Indonesia is the blockchain-based sukuk issued by Bank Syariah Indonesia (BSI) in 2023 for MSME financing. This smart sukuk utilized Ethereum-based smart contracts to automate profit-sharing distributions from mudharabah agreements, targeting rural entrepreneurs. Initial results showed a 20% increase in participation from small investors, with automated payouts reducing administrative costs by 30%. However, challenges emerged when external market volatility affected profit calculations, raising questions about gharar compliance, as some investors reported unexpected returns due to fluctuating asset values. This case underscores the need for robust Sharia audits in code development.

Another example is the Sharia-compliant blockchain platform developed by fintech startup Amarth, which integrated smart contracts for sukuk-like instruments in agricultural financing. By 2024, the platform facilitated over 50,000 transactions, enhancing access for farmers in East Java. Data from Amarth indicated improved repayment rates (up to 95%) due to transparent tracking, aligning with *hifz al-mal*. Yet, rural users faced barriers from poor internet connectivity, limiting full inclusivity. Comparatively, in Malaysia, the Securities Commission has approved blockchain sukuk for infrastructure projects, with Sharia scholars embedded in development teams to ensure compliance. Indonesia could learn from this by adopting similar oversight models.

Empirical insights from surveys, such as the 2024 OJK report on fintech adoption, reveal that 65% of Sharia fintech users in urban areas prefer blockchain for its security, but only 25% in rural regions cite accessibility issues. Studies by Rustan (2023) on digital lending in Makassar highlight how unregulated smart contracts can lead to exploitation, emphasizing the importance of DSN-MUI involvement. Overall, these cases demonstrate that while smart sukuk can drive inclusion, empirical data points to persistent gaps in implementation, necessitating tailored regulatory interventions.

Conclusion

Based on the comprehensive analysis conducted in this study, it can be concluded that the implementation of smart contracts and blockchain-based smart sukuk in Indonesia represents a significant advancement in Islamic finance, offering substantial potential to

enhance efficiency, transparency, and inclusivity. Supported by a robust regulatory framework, including Law No. 21 of 2008 on Sharia Banking, OJK regulations on fintech, and DSN-MUI fatwas, these technologies facilitate automated, Sharia-compliant transactions that align with core principles of Sharia Economic Law, such as 'adl (justice), *maslahah* (public benefit), and *hifz al-mal* (wealth protection). For instance, smart sukuk enable equitable profit-sharing and asset-backed financing, potentially elevating Sharia financial inclusion from its current low level of 13.41% as reported in the 2025 SNLIK survey, towards broader societal welfare. The decentralized and immutable nature of blockchain further strengthens trust and reduces intermediaries, fostering a more participatory Islamic financial ecosystem.

However, despite these advancements, challenges persist in fully realizing the benefits. Issues such as potential *gharar* and *maysir* in smart contracts, coupled with digital access barriers in rural areas, highlight gaps between regulatory intent and practical implementation. These discrepancies indicate that while positive laws have progressed, they have not yet optimally achieved the *maqasid sharia*, particularly in promoting inclusive growth for MSMEs and vulnerable communities. This underscores the need for ongoing refinements to ensure that technological innovations do not compromise ethical Islamic principles.

Drawing from these conclusions, this study offers the following recommendations to strengthen the integration of smart contracts and smart sukuk in Islamic finance:

1. For Regulators (OJK, BI, and DSN-MUI)

Revise and expand DSN-MUI fatwas to include detailed guidelines on blockchain-specific applications, such as tokenization and smart contract audits, ensuring they explicitly address risks like *gharar*. Enhance the Sharia Financial Roadmap by incorporating mandatory Sharia compliance modules in blockchain platforms, and collaborate with international bodies like the Islamic Financial Services Board (IFSB) for standardized frameworks.

2. For Financial Institutions and Tech Providers

Integrate AI-driven tools for real-time Sharia vetting in smart contracts to detect and mitigate uncertainties. Develop user-friendly interfaces and educational programs to improve digital literacy, particularly in rural areas, through partnerships with TPAKD and *pesantren*.

3. For Government and Stakeholders

Promote pilot programs for smart sukuk in underserved sectors, such as agriculture and infrastructure, while investing in digital infrastructure to bridge urban-rural divides. Encourage research and development in Sharia-compliant blockchain solutions to foster innovation without ethical compromises.

By implementing these suggestions, Indonesia can harness the transformative power of smart contracts and smart sukuk to build a more inclusive, just, and sustainable Islamic financial system, ultimately contributing to national economic growth and global Sharia finance leadership.

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