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Integrating *Al-'Urf* into Smart Contracts: Addressing Regulatory Challenges in Blockchain-Based Waqf Governance

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Abstract

The integration of blockchain technology into waqf system opens opportunities for transforming digital waqf governance by increasing transparency, efficiency, and accountability. Despite the potential, its implementation still faces Sharia compliance issues and regulatory challenges. Therefore, this study aims to examine the feasibility of implementing smart contracts, identify the regulatory challenges of smart contracts in blockchain-based waqf governance, and propose integrating *Al-'Urf* as a model to support adaptive and sustainable governance. The study procedures were carried out using a normative juridical method with a statutory and conceptual approach. Legal materials, such as regulations, *fiqh* documents, fatwas, literature, and whitepapers on blockchain-based waqf, were then analyzed. The results showed that smart contracts had the technical potential to strengthen the transparency and efficiency of waqf management. However, its effectiveness depended on protocol security, code quality, and verification mechanisms to ensure compliance with the principles of justice (*'adl),* the prohibition of *gharar*, and usury. Regulatory challenges were primarily from the lack of regulations on the status of digital assets, the validity of blockchain-based contracts, and the dispute-resolution mechanism for digital waqf, creating legal uncertainty. *Al-'Urf* integration through *taqnin* and *siyasah syar'iyyah* could form the basis for developing more adaptive and sustainable digital waqf regulations. These results are expected to contribute to the development of a digital waqf governance model based on 4 components, including normative foundation, governance architecture, sustainable investment, and policy coherence. The model integrates Sharia principles, blockchain governance, and adaptive regulation as a new paradigm in the digital economy era.

KEYWORDS: *Al-'Urf*; Blockchain; Digital Waqf; Sharia Compliance; Smart Contract

Abstrak

Integrasi teknologi blockchain dalam sistem wakaf membuka peluang bagi transformasi tata Kelola wakaf digital melalui peningkatan transparansi, efisiensi, dan akuntabilitas. Namun, implementasinya masih menghadapi persoalan kepatuhan Syariah dan tantangan regulasi. Studi ini menguji kelayakan implementasi smart contract, mengidentifikasi tantangan regulasi smart contract dalam tata kelola wakaf berbasis blockchain, dan menawarkan integrasi al-'urf sebagai model untuk mengatasi tantangan regulasi guna mendukung tata kelola wakaf digital yang adaptif dan berkelanjutan. Penelitian ini mengadopsi metode yuridis normatif dengan pendekatan perundang-undangan dan konseptual melalui analisis terhadap sumber-sumber bahan hukum, yang meliputi regulasi, dokumen fikih, fatwa, literatur akademik, serta whitepaper wakaf berbasis blockchain. Temuan menunjukkan bahwa smart contract layak secara teknis untuk memperkuat transparansi dan efisiensi pengelolaan wakaf, tetapi efektivitasnya bergantung pada keamanan protokol, kualitas kode, dan mekanisme verifikasi untuk memastikan kepatuhan pada prinsip keadilan ('adl), larangan gharar dan riba. Tantangan regulasi muncul akibat belum adanya pengaturan mengenai status aset digital, validitas kontrak berbasis blockchain, dan *mekanisme penyelesaian sengketa wakaf digital, sehingga menimbulkan ketidakpastian hukum dalam tata kelola wakaf digital. Studi ini menyimpulkan bahwa integrasi al-'urf melalui taqnin dan siyasah syar'iyyah dapat menjadi dasar pengembangan regulasi wakaf digital yang lebih adaptif dan berkelanjutan. Kontribusi dan kebaruan penelitian ini terletak pada pengembangan model tata kelola wakaf digital berbasis empat komponen—fondasi normatif, arsitektur tata kelola, investasi berkelanjutan, dan koherensi kebijakan—yang mengintegrasikan prinsip Syariah, blockchain governance, dan adaptive regulation sebagai paradigma baru pengelolaan wakaf digital berkelanjutan di era ekonomi digital.*

KATA KUNCI: *Al-'Urf; Blockchain; Kepatuan syariah; Smart contract; Waqf digital*

Introduction

Waqf management often requires strict adherence to Islamic law to ensure its alignment with Sharia principles and effective resource management [1]. Several studies have shown that blockchain technology and smart contracts offer significant potential to increase transparency, efficiency, and trust in waqf governance, particularly through the integration of local customs (*Urf*),[2] which can enhance contract adaptability. However, the implementation of smart contracts poses a threat to Sharia compliance because their automated nature can bypass manual verification by Islamic jurists and reduce flexibility in responding to changes in Sharia interpretation.[3] It is also prone to technical vulnerabilities, such

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[1] Tharaka Hewa, Mika Ylianttila, and Madhusanka Liyanage, "Survey on Blockchain-Based Smart Contracts: Applications, Opportunities and Challenges," *Journal of Network and Computer Applications* 177 (2021): 102857, https://doi.org/10.1016/j.jnca.2020.102857.

[2] Ghassan Adhab Atiyah, Nazura Abdul Manap, Ahmed Ismael Ibrahim, and Abdur Rahman. "Legitimacy of smart contracts from the perspective of Islamic law: A case study of blockchain transactions." *Al-Istinbath: Jurnal Hukum Islam* 9, no. 1 (2024): 155-192.https://doi.org/10.29240/jhi.v9i1.8726

[3] Miftahul Huda, Lia Noviana, and Lukman Santoso, "Pengembangan Tata Kelola Wakaf Berbasis Korporasi Di Asia Tenggara/Development of the Governance of Corporate-Based Waqf in South East Asia," *De Jure Jurnal Hukum dan Syariah* 12, no. 2 (2020): 120–39, https://doi.org/10.18860/j-fsh.v12i2.3908.

as coding errors that can potentially lead to transactions containing *gharar* (uncertainty) or usury (*riba*), both of which are prohibited in Islam[4].

The concept of waqf has historically evolved from the classical period, which emphasized the principle of eternity (*al-ta'bid*) and sincere intentions,[5] to the modern era, adapted through regulations such as Law No. 41 of 2004 in Indonesia to optimize governance, transparency, and accountability[6]. The development of corporate-based waqf and multi-stakeholder collaboration (government, religious institutions, and the private sector) demonstrates an interplay between classical values and modern demands[7]. Therefore, studies on the integration of *Al-'Urf* into smart contracts are important to address regulatory and Sharia compliance challenges. This is expected to help facilitate the use of blockchain technology innovation without sacrificing the ethical and legal essence of Islam, which is the foundation of waqf.

Previous studies over the past 5 years have shown that digital transformation in waqf management is increasingly developing through the use of blockchain, smart contracts, crowdfunding, and collaborative governance models. Anwar et al. (2024) reported that a polycentric collaborative governance model in CSR-based waqf could improve transparency, accountability, and benefit distribution through multi-

[4] Hilma Rohmatul Ummah, Adang Sonjaya, and Jujun Jamaludin, "Sharia Fintech: Crowdfunding as MSMEs Financing," *Al-Muamalat: Jurnal Ekonomi Syariah* 11, no. 1 (2024): 115–36, https://doi.org/10.15575/am.v11i1.28808.

[5] Muhammad Shulthoni and Norma Md Saad, "Waqf Fundraising Management: A Conceptual Comparison between Traditional and Modern Methods in the Waqf Institutions," *Indonesian Journal of Islam and Muslim Societies* 8, no. 1 (2018): 57–86.https://doi.org/10.18326/ijims.v8i1.57-86

[6] Abdurrohman Kasdi, Abdul Karim, Umma Farida and Miftahul Huda, "The Development of Waqf in the Middle East and Its Role in Pioneering Contemporary Islamic Civilization: A Historical Approach," *Journal of Islamic Thought and Civilization* 12, no. 1 (2022): 186–98, https://doi.org/10.32350/jitc.121.10.

[7] Trianah Sofiani, Shofian bin Ahmad, Bunga Desyana Pratimi, and Heris Suhendar, "Mosques as Catalysts for Islamic Financial Inclusion: Evidence from Branchless Banking Implementations," *Asy-Syari'ah* 27, no. 2 (2025): 143–70, https://doi.org/10.15575/as.v27i2.48309.

stakeholder engagement.[8] Meanwhile, Megat et al. (2024) emphasized that the implementation of blockchain-based Waqftech and smart contracts could increase efficiency and donor trust through a transparent and decentralized digital system.[9] From a governance perspective, Setiawan and Nurzaman (2022)[10] and Mohaiyadin et al. (2022)[11] stated that the integration improved transparency, accountability, and data integrity between Nadzir, Waqif, and regulators, while minimizing the risk of information manipulation. A study by Hapsari et al. (2021) on institutional innovations, such as waqf crowdfunding[12], and Yusgiantoro et al. (2023) on Micro Waqf Banks[13] reported that integrating Islamic financial principles with digital technology strengthened the sustainability, transparency, and performance of waqf institutions.

Despite the potential, studies on regulatory aspects and Islamic legal approaches are still limited. For example, Mustagfiroh and Nadya's (2025) focused more on the regulatory challenges and legal certainty of blockchain use in digital waqf management, [14] while Wijaya et al. (2025) examined this

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[8] Intan Fatimah Anwar, Syarifah Bahiyah Rahayu, Yuslina Faizah Mohd Lajin, and Atika Atan "The Sustainability of Cash Waqf Using Blockchain Technology: A Conceptual Study," *International Journal of Trends In Accounting Research* 5, no. 2 (2024): 70–82.https://doi.org/10.54951/ijtar.v5i2.664

[9] Puteri Aina Megat, Fahd Al-Shaghdari, Besar Bin Ngah, and Sami Samir Abdelfattah. "Assessing the predictive benefits of Waqftech smart contracts on corporate waqf crowdfunding among Malaysian enterprises." *Journal of Islamic Marketing* 15, no. 5 (2024): 1303-1325.https://doi.org/10.1108/JIMA-08-2023-0262

[10] Agus Setiawan, and M. Sholeh Nurjaman. "Application of blockchain and smart-contract on waqf asset management: is it necessary?." *EL DINAR: Jurnal Keuangan dan Perbankan Syariah* 10, no. 2 (2022): 85-101.https://doi.org/10.18860/ed.v10i2.15529

[11] Norlaila Mazura Hj Mohaiyadin,, Aini Aman, Mohd Rizal Palil, and Suzana Muhamad Said. "Addressing accountability and transparency challenges in waqf management using blockchain technology." *Journal of Islamic Monetary Economics and Finance* 8 (2022): 53-80.https://doi.org/10.21098/jimf.v8i0.1413

[12] Meri I Hapsari, Mohamed Asmy Bin Mohd Thas Thaker, Mustafa Omar Mohammed, and Jarita Duasa, "A Qualitative Investigation Into Crowdfunding Framework as a Source of Financing for Waqf Land Development," *Journal of Islamic Accounting and Business Research* 13, no. 3 (2021): 425–43, https://doi.org/10.1108/jiabr-10-2020-0311.

[13] Inka Yusgiantoro, Putra Pamungkas, and Irwan Trinugroho, "The Sustainability and Performance of *Bank Wakaf Mikro*: Waqf-Based Microfinance in Indonesia," *International Journal of Islamic and Middle Eastern Finance and Management* 17, no. 1 (2023): 86–101, https://doi.org/10.1108/imefm-06-2022-0233.

[14] Siti Mustagfiroh, and Nadya Nafiisah Khoirina. "Legal and Regulatory Challenges in the Implementation of Blockchain-Based Waqf in Indonesia." *WiShEL: Walisongo*

through a *maslahah mursalah* approach from an Islamic legal perspective.[15] These studies are generally still partial and have not comprehensively integrated national waqf regulations, muamalah jurisprudence, Islamic legal principles, and blockchain technology architecture into a single, coherent analytical framework.

Although previous studies have shown significant progress in the digitization of waqf through blockchain, smart contracts, crowdfunding, and collaborative governance models, the results remain fragmented. First, the existing literature focuses primarily on technical aspects, efficiency, and institutional governance, while the integration of blockchain technology with the Islamic legal framework and national waqf regulations remains limited. Second, studies on smart contracts in waqf context have not specifically addressed the translation of waqf contract principles into digital mechanisms that comply with Islamic law and the Indonesian legal system. Third, the Islamic legal approach still predominantly relies on the concept of *maslahah mursalah*, failing to deeply explore other, more contextual concepts, such as *Al-'Urf,* in adapting digital economic practices. Consequently, there is no analytical framework capable of fully integrating the regulatory dimensions, *muamalah* jurisprudence, and blockchain technology architecture in digital waqf governance.

The current study offers the development of an integrative framework that connects national waqf regulations, Islamic legal principles (particularly *fiqh muamalah* and *Al-'Urf*), and blockchain technology architecture in smart contract-based digital waqf governance. It introduces an adaptive approach by using *Al-'Urf* as an Islamic legal instrument to bridge the flexibility of contemporary socio-economic practices with smart contract design. The study not only examines the legal and technological

Journal of Sharia Economic Law 1, no. 1 (2025).https://doi.org/10.21580/wishel.2025.1.1.29407

[15] Muhammad Widyarta Wijaya, Irfan Ramis, Nurwinsyah Rohmaningtyas, and M. Lathoif Ghozali. "Blockchain-Based Waqf and Maslahah Mursalah: A Sharia Analysis in Light of MUI Fatwas." *El-kahfi| Journal of Islamic Economics* 6, no. 02 (2025): 363-380.

aspects separately but also develops a conceptual model of Sharia-compliant blockchain waqf governance that is more comprehensive, contextual, and in line with regulatory needs in Indonesia. Therefore, this study aims to (1) analyze the feasibility of implementing smart contracts in digital waqf to increase transparency, efficiency, and accountability in accordance with Islamic law, (2) identify regulatory challenges during implementation, and (3) formulate the integration of *Al-'Urf* to achieve adaptive and sustainable digital waqf governance. The results are expected to contribute to a contemporary Islamic theoretical and empirical framework that integrates technical dimensions of smart contracts with modern interpretations of Islamic principles (*fiqh al-mu'aṣir*), laying the foundation for an efficient, transparent, and Sharia-compliant (*mūwafaq li al-shariʿa*) digital waqf management model. The study also offers actionable insights for policymakers, technology developers, and religious authorities (*ahl al-hall wa al-ʿaqd*) to design adaptive regulatory standards (*miʿyarat tanẓimiyya murūna*) and ethical frameworks rooted in multi-stakeholder synergy (*al-takamul al-shariʿi*).

Methods

This study was carried out using a normative juridical method with statutory and conceptual approaches. The statutory approach was used to examine and analyze positive legal norms related to waqf and the use of blockchain technology, particularly in assessing smart contract regulations and legal protection for *mauqūf 'alayh* in Law Number 41 of 2004 concerning waqf and its implementing regulations. Meanwhile, the conceptual approach was used to understand and construct key concepts, such as waqf contracts, *Al-'Urf,* smart contracts, and the principles of *fiqh muamalah* to build an integrative analytical framework between Islamic law and positive law. The sources of legal materials included primary legal materials, namely the Waqf Law and its implementing regulations, regulations related to electronic transactions, and fatwas of DSN-MUI.

Secondary legal materials included waqf *fiqh* literature, scientific journals, white papers, blockchain policy reports, and other related literature. Data collection was conducted through a documentary study, which involved tracing, inventorying, and reviewing various regulations, academic literature, and policy documents from both printed and digital sources. The data obtained was analyzed using prescriptive analysis, through legal interpretation and legal reasoning. The analysis was carried out to assess the conformity and gaps in norms as well as formulate an integrated construction of *Al-'Urf* principles in the design of blockchain-based waqf smart contracts in accordance with Islamic law and positive law.

Discussion

Feasibility of Smart Contracts in Digital Waqf Governance

Implementing smart contracts for Digital Waqf Governance became viable when addressed alongside governance, regulatory, and technical barriers evidenced in related domains[16]. The implementation increased the potential for transparency, automation, and efficiency of waqf asset management. However, this must be balanced with rigorous technical verification and Sharia regulatory adjustments.[17] Smart contract technology enabled the automatic execution of agreements on the blockchain, providing immutable, decentralized transaction records.[18] It also reduced third-party intervention and enhanced trust in waqf management. Through these features, the allocation and distribution of waqf funds could be

[16] Kaharuddin, Asep Saepudin Jahar, and Arta Amaliah Nur Afifah. "Integrating blockchain technology into waqf governance: Enhancing transparency and accountability in Sharia finance for achieving SDGs." In *Towards Resilient Societies: The Synergy of Religion, Education, Health, Science, and Technology*, pp. 501-506. CRC Press, 2026.

[17] Noor Leena Haniffah, Mohammed Sharaf Shaiban, and Pervaiz Ahmed, "Development and Validation of a Performance Measurement System Based on Islamic Principles," *Heliyon* 9, no. 5 (2023), https://doi.org/10.1016/j.heliyon.2023.e16095.

[18] Zibin Zheng, Shaoan Xie, Hong-Ning Dai, Weili Chen, Xiangping Chen, Jian Weng, and Muhammad Imran. "An Overview on Smart Contracts: Challenges, Advances and Platforms." *Future Generation Computer Systems* 105 (2020): 475–91. https://doi.org/10.1016/j.future.2019.12.019.

automated based on predetermined criteria, thereby minimizing the risk of misuse and ensuring the accurate implementation of waqf policies.

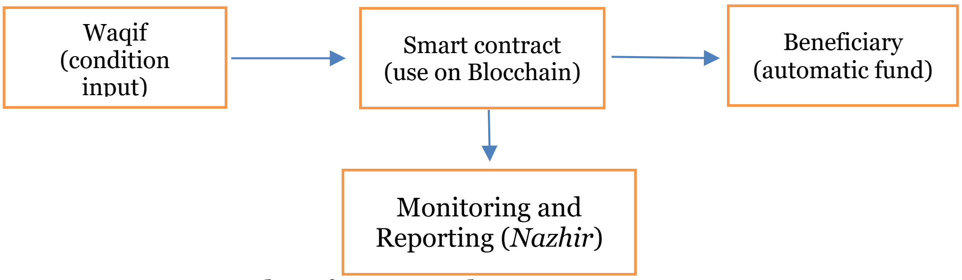
The technical feasibility of smart contracts in waqf systems largely depended on the quality and security of the underlying code. Formal verification methods, such as those discussed by Almakhour et al., could help reduce the risk of bugs and logical errors.[19] This verification was crucial to ensure that all contract terms accurately reflected the agreed-upon waqf management provisions, preventing exploitative loopholes or violations of Sharia principles. However, factors such as reliance on external data sources and potential performance issues (e.g., out-of-gas conditions) still required further studies to ensure optimal operational stability during implementation.

Apart from technical challenges, integrating smart contracts into waqf systems required careful consideration of compliance with Sharia regulatory frameworks and ethical principles. For instance, the traditional waqf management system governed by Law No. 41 of 2004 required adjustments to accommodate intelligent contract automation while preserving the foundational values of social justice and sustainability inherent in waqf.[20] Crucial collaboration between technology experts, regulators, and Sharia authorities was needed to develop standardized code verification methodologies that properly implemented Sharia principles into smart contracts. This was to ensure that the system remained technologically advanced while being legally and ethically valid.

Figure 1: *Smart Contract Flow for Waqf*

[19] Mouhamad Almakhour, Layth Sliman, Abed Ellatif Samhat, and Abdelhamid Mellouk. "Verification of smart contracts: A survey." *Pervasive and Mobile Computing* 67 (2020): 101227. https://doi.org/10.1016/j.pmcj.2020.101227

[20] Imron Choeri, "Optimalisasi Undang-Undang Nomor 41 Tahun 2004 Tentang Wakaf Di Kabupaten Jepara," *El-Usrah Jurnal Hukum Keluarga* 5, no. 1 (2022): 23, https://doi.org/10.22373/ujhk.v5i1.12221.



***Source**: author framework*

Figure 1 shows the basic flow of smart contract implementation in blockchain-based waqf management. The process began with waqif entering the terms, conditions, and objectives of waqf (condition input) into the digital system. This data was then processed by a smart contract running on blockchain to automate the execution of the waqf agreement in accordance with the established provisions. After the contractual requirements were met, the system automatically distributed waqf funds or benefits to the beneficiary (*mauquf 'alayh*) without requiring manual intervention. This scheme demonstrated that the use of smart contracts could improve the efficiency, transparency, accountability, and certainty of digital waqf implementation through automated mechanisms and permanent blockchain transaction recording.

The feasibility of smart contracts was in their ability to enhance transparency and asset management efficiency, provided that formal verification processes and Sharia regulatory compliance were prioritized. Previous studies demonstrated that well-integrated smart contract implementation in existing legal frameworks could serve as an innovation to support community economic empowerment through more structured and trustworthy waqf management.[21] Therefore, the next strategic step was to develop prototypes and conduct empirical studies to evaluate the

[21] Mujahidin, Muhammad Imran, Nasrullah Bin Sapa, Fasiha Fasiha, Sitti Aisya, and Trimulato Trimulato. "Challenge of Waqf to the Social and Economic Welfare of Muslim Communities: A Comparative Analysis Between Countries." *Jurnal Ilmiah Mizani: Wacana Hukum, Ekonomi Dan Keagamaan* 12, no. 1 (2025): 168-184. http://dx.doi.org/10.29300/mzn.v12i1.7765

implementation process while engaging diverse stakeholders to ensure alignment between technological solutions and Islamic values.

In Islamic jurisprudence, contracts held a central role as instruments that upheld principles of justice (*'adl*), transparency, and legal certainty. Consequently, when integrating smart contract technology into digital transaction ecosystems, a thorough review was essential to ensure automated contract implementation does not compromise fundamental Islamic values, such as prohibitions against excessive uncertainty (*gharar*) and exploitation (e.g., *riba*).[22] While smart contracts automatically executed on blockchain offered significant potential to optimize transaction efficiency and transparency, their immutable nature substantially reduced opportunities for contextual adjustments typically made through human intervention in Islamic legal frameworks. This characteristic necessitated careful design considerations to preserve flexibility while maintaining compliance with Sharia principles.

From a technical perspective, the formal verification methodology provided a rigorous approach to ensure that automated contract logic was meticulously formulated and free from vulnerabilities leading to execution errors. This verification process significantly mitigated the risk of conditions deviating from Sharia principles, such as emergencies requiring the reinterpretation of agreed contract terms. Moreover, the formal verification framework enabled the explicit encoding of Sharia norms into operational parameters, allowing smart contracts to function with computational efficiency and consistently align with the justice (*'adl*) and precautionary measures (*ihtiyat*) mandated by Islamic law. The methodology created a technical safeguard that embedded ethical and legal

[22] Mohammad Alhejaili, "Harmonising Derivatives with Shari'ah: Ethical Practices and Regulatory Insights," *International Journal of Islamic and Middle Eastern Finance and Management*, 2025, https://doi.org/10.1108/IMEFM-03-2024-0163.

compliance at the protocol level while maintaining the operational benefits of blockchain automation.[23]

Sharia review of smart contracts showed the importance of synergy between technological innovation and traditional Islamic legal principles.[24] Formal verification testing could strengthen technical assurances that smart contracts operated as intended.[25] However, implementation challenges remained in preserving mediation roles and contextual adaptability, as well as in ensuring that digital contract execution aligned with the underlying Sharia values governing contractual relationships.[26] This integrative approach was expected to pave the way for smart contract applications that were both technologically efficient, Sharia-compliant, and ethically valid from an Islamic perspective.

Challenges of Smart Contract Regulation in Blockchain-Based Waqf

The compliance of smart contracts with Indonesian Waqf Law No. 41/2004 and its implementing regulations must be assessed through 2 key aspects, namely the application of waqf legal principles and the technical implementation ensuring transparency, accountability, and legal certainty[27]. The law mandated that waqf assets be irrevocable and managed

[23] Meixun Qu,, Xin Huang, Xu Chen, Yi Wang, Xiaofeng Ma, and Dawei Liu. "Formal verification of smart contracts from the perspective of concurrency." In *International Conference on Smart Blockchain*, Cham: Springer International Publishing, 2018. pp. 32-43. https://doi.org/10.1007/978-3-030-05764-0_4

[24] Lukman Raimi, Ibrahim Adeniyi Abdur-Rauf, and Basirat Olaide Raimi, "Interdependence of Halal Entrepreneurship and Islamic Finance for Creating a Strong Halal Ecosystem," *Journal of Islamic Marketing* 16, no. 3 (2025): 929–54, https://doi.org/10.1108/JIMA-05-2023-0162.

[25] Amritraj Singh, Reza M. Parizi, Qi Zhang, Kim-Kwang Raymond Choo, and Ali Dehghantanha. "Blockchain smart contracts formalization: Approaches and challenges to address vulnerabilities." *Computers & Security* 88 (2020): 101654. https://doi.org/10.1016/j.cose.2019.101654

[26] Fatima Retno Ningrum, Adang Sonjaya, Siti Puryandari, Dian Anggraenu Rahim, "Sharia Compliance Dalam Pelaksanaan Eksekusi Jaminan Gadai Rahn," *Jurnal Asy-Syari'ah* 25, no. 1 (2023), https://doi.org/10.15575/as.v25i1.28809.

[27] Raditya Sukmana. "Critical assessment of Islamic endowment funds (Waqf) literature: lesson for government and future directions." *Heliyon* 6, no. 10 (2020).e05074. https://doi.org/10.1016/j.heliyon.2020.e05074

professionally for social benefit, requiring any smart contract implementation to preserve the waqif's original legal intent and the permanent nature of assets. An adequately designed waqf smart contract must explicitly incorporate conservative management principles, including clear asset identification, legal certainty, and participatory oversight mechanisms. This was expected to provide a legal basis for authorized intervention in case of disputes while maintaining blockchain's immutable transaction records, thereby balancing technological innovation with Sharia-compliant governance requirements.

From a technical perspective, smart contracts as self-executing computer programs could significantly enhance transaction efficiency and security.[28] Applying formal verification methods, as recommended by Almakhour et al.,[29] ensured that the contract code accurately implemented the agreed terms in the legal framework of waqf. This formal verification process minimized execution errors that could conflict with waqf regulations, thereby increasing trust in smart contracts' ability to perform automated functions without deviating from the legal principles established under Law No. 41/2004.

Integrating smart contracts into waqf systems required flexible mechanisms to address unforeseen circumstances and accommodate potential reinterpretations by Sharia authorities or supervisory institutions. This necessity stemmed from the requirement that the implementation must consistently align with Islamic law's philosophical and normative values governing waqf management. Consequently, innovative contract applications must not rely solely on automated execution but also incorporate auditing mechanisms and adjustment protocols based on

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[28] Nazanin Moosavi, Hamed Taherdoost, Nachaat Mohamed, Mitra Madanchian, Yousef Farhaoui, and Inam Ullah Khan. "Blockchain technology, structure, and applications: a survey." *Procedia Computer Science* 237 (2024): 645-658.https://doi.org/10.1016/j.procs.2024.05.150

[29] Mouhamad Almakhour, Layth Sliman, Abed Ellatif Samhat, and Abdelhamid Mellouk. "A formal verification approach for composite smart contracts security using FSM." *Journal of King Saud University-Computer and Information Sciences* 35, no. 1 (2023): 70-86.https://doi.org/10.1016/j.jksuci.2022.08.029

principles of justice and prevailing legal provisions. A collaborative effort among technologists, regulators, and Islamic scholars was essential to develop technical standards and validation frameworks that ensured smart contracts were not only operationally efficient and innovative but also legally sound and ethically consistent in managing waqf assets.

By addressing both aspects comprehensively, smart contracts could enhance transparency, efficiency, and accountability in waqf systems, provided their implementation was carefully adapted to comply with Law No. 41/2004 and its implementing regulations. This required developing formally verified smart contracts equipped with robust oversight mechanisms to ensure alignment with both technical requirements and Islamic legal principles.

The absence of specific regulations for blockchain technology in the Indonesian waqf legal framework presented significant challenges that must be addressed to effectively integrate technological innovation without compromising fundamental principles. Historically, waqf governance in Indonesia had been regulated by Law No. 41 of 2004 and its implementing regulations, formulated before the emergence of digital technologies, such as blockchain. This had created a normative gap, leading to legal uncertainties in the management of digital waqf assets, particularly regarding transaction recording, identity verification, and transparent accountability mechanisms. The current regulatory vacuum indicated the urgent need for legal reforms to reconcile distributed ledger technology with established Islamic endowment principles while maintaining the sacred nature of waqf assets[30].

From a governance perspective, blockchain implementation held significant potential to enhance transparency and operational efficiency

[30] Nurizal Ismail and Siti Aisyah, "Islamic Social Finance: A Bibliometric Analysis," *Global Review of Islamic Economics and Business* 9, no. 2 (March 2022): 019–028, https://doi.org/10.14421/grieb.2021.092-02.

through smart contracts and immutable ledgers.[31] However, the absence of a specific and adaptive regulatory framework created substantial risks, including inconsistencies between digital practices and the fundamental Sharia principles underlying waqf systems, as well as legal conflicts in dispute resolution.[32] The lack of explicit regulations further complicates law enforcement efforts to address potential misconduct or abuse on blockchain-based platforms, hindering technological innovation and the widespread adoption of these solutions. This regulatory gap showed the critical need for comprehensive legal frameworks that simultaneously accommodated technological advancement while safeguarding Islamic ethical and legal standards[33].

These regulatory limitations necessitated close collaboration between policymakers, waqf stakeholders, and technology experts to develop comprehensive policies and technical standards that bridge traditional practices with technological innovation. Such efforts must adapt legal frameworks to accommodate blockchain's unique characteristics, including decentralization, cryptographic security, and smart contract automation, while preserving the core principles of perpetual social benefit and sustainability. Consequently, legislative reforms and tailored implementing regulations were imperative to enable legally sound, ethically grounded, and fully aligned blockchain applications.

Integrating blockchain technology promised enhanced transparency and operational efficiency, but faced significant challenges due to the

[31] Bedjo Santoso, and Moch Zulfa. "Blockchain Model to Support Waqf Management." In *International Conference on Intelligent Networking and Collaborative Systems*, pp. 328-338. Cham: Springer International Publishing, 2022.https://doi.org/10.1007/978-3-031-14627-5_33

[32] Al-Hakim, S, A Sonjaya, S Adityawati, A Z Rahmayanti, and O Rozikin. "Mosque-Based Economic Transformation: Ecosystem Model Analysis Using ANP." *International Journal of Sustainable Development and Planning* 20, no. 2 (2025): 623–33. https://doi.org/10.18280/ijsdp.200213.

[33] Azwar Iskandar, Bayu Taufiq Possumah, Khaerul Aqbar, and Akhmad Hanafi Dain Yunta. "Islamic Philanthropy and Poverty Reduction in Indonesia: The Role of Integrated Islamic Social and Commercial Finance Institutions." *AL-IHKAM: Jurnal Hukum & Pranata Sosial* 16, no. 2 (December 2021): 274–301. https://doi.org/10.19105/al-lhkam.v16i2.5026

absence of specific regulations accommodating this innovation in existing legal frameworks. Traditional regulations were established without explicit provisions for blockchain-based asset digitization and transactions, creating legal gaps that generated uncertainty for digital waqf operations. These uncertainties included smart contract implementation and distributed ledger systems, potentially stifling technological innovation in the sector.[34]

The absence of specific regulations had led to several legal issues. First, under the existing legal framework, blockchain-recorded digital assets lacked a clear legal status in waqf (Islamic endowments), creating the potential for legal disputes among involved parties in the event of conflicts. In addition, while smart contracts, which automatically executed agreements, offered efficiency advantages, their implementation remains challenging due to the lack of specific guidelines ensuring compliance with Sharia principles governing waqf. This regulatory gap created tension between the rapid execution enabled by digital systems and the need for contextual evaluation, as often required by religious authorities.

Studies in Indonesia indicated that efforts to digitize waqf had encouraged the adoption of technologies, such as blockchain. However, existing regulations remained unresponsive to such advancements. A study by Choirunnisak and Jihad revealed that low digital literacy and inadequate regulations were the primary obstacles to optimising waqf innovation in digital era.[35] An analysis of blockchain regulations in Indonesia by Dinata et al. demonstrated that while legal frameworks such as the Electronic Information and Transactions Law (UU ITE) and Financial Services Authority (OJK) regulations existed, the frameworks were not designed to

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[34] I Kadek Dwiki Trisna Dinata, I Ketut Kasta Arya Wijaya, and Ni Made Puspa Sutari Ujianti, "Legal Regulations on the Use of Blockchain Technology in Indonesia," *International Journal of Social Science and Human Research* 08, no. 02 (2025), https://doi.org/10.47191/ijsshr/v8-i2-41.

[35] Choirunnisak and Azka Amalia Jihad, "Optimalisasi Inovasi Wakaf Di Indonesia Era Digital Dalam Menjawab Tantangan Dan Peluang," *Jurnal I-Philanthropy a Research Journal on Management of Zakat and Waqf* 4, no. 2 (2024): 117–28, https://doi.org/10.19109/iphi.v4i2.25847.

comprehensively accommodate the unique features of blockchain, particularly in the context of waqf management.

Al-'Urf Integration in Smart Contracts for Adaptive and Sustainable Digital Waqf Governance

Based on Indonesian regulatory landscape for waqf, the evolving role of nadzir, the 4.0 digital economy, and comparative insights from other Muslim-majority or Muslim-minority contexts, this study argued that *Al-'Urf* could be harmonized with Sharia and national law through codified mechanisms (*taqnin*),[36] siyasah shari'yyah-informed policy, and robust governance structures. The proposed model emphasized adaptive compliance, accountable governance, and sustainable cash waqf management that leveraged digital channels while respecting local customary practices. Potential tensions between *Urf* and formal statutory rules were acknowledged, with pathways for constructive reconciliation illustrated through cross-jurisdictional examples and empirical studies.[37]

Al-'Urf (local customs) could harmonize Sharia with national regulations when integrated through codification (taqnin) and Sharia policy (*siyasah shari'yyah*), serving as a cultural complement rather than substitute for formal law. [38] Indonesian legal harmonization efforts provided pathways to formalise *Al-'Urf* in waqf regulation. Comparative

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[36] H Y Sonafist, Yasni Efyanti, Ramlah Ramlah, Ali Hamzah, and Faizin Faizin "Ibn Al-Muqaffa's Proposal for Taqnīn and Its Synchronization With Islamic Law Codification in Indonesia," *Samarah Jurnal Hukum Keluarga Dan Hukum Islam* 4, no. 2 (2020): 504, https://doi.org/10.22373/sjhk.v4i2.7864.

[37] Haris M Putra, Hisam Ahyani, Nanang Naisabur, Muharir Muharir, "Reconstruction of the Practice of Siyasa Syar'iyyah During the Islamic Empire's Relevance to the Practice of Sharia Financing CWLS Retail in Indonesia," *Al-Istinbath Jurnal Hukum Islam* 8, no. 2 November (2023): 347, https://doi.org/10.29240/jhi.v8i2.8057.

[38] Muhammad Abdulloh, Athi' Hidayati, Moh Nurul Qomar, Abdurrohman Kasdi, Agung Slamet Sukardi, "Land Waqf Practices Based on Local Wisdom of Tribes in Dosay Village, Papua," *Inferensi Jurnal Penelitian Sosial Keagamaan* 16, no. 2 (2023): 241–56, https://doi.org/10.18326/infsl3.v16i2.241-256.

insights from Nigeria[39] and Malaysia[40] confirmed that productive waqf development required frameworks with religious principles, local practices, and state policy. This integration was increasingly urgent as Indonesian digital waqf governance faced challenges in accountability and transparency. The current study proposed a 4-component framework for Sharia-compliant digital waqf governance (Table 1) that synergized codified law with locally informed practices.

Table 1: *Four Component Model Framework*

Components	Explanatory
Normative Foundation	*Al-'Urf* was formally recognized in legislation when it aligned with Sharia principles and the public interest. Sharia policy served as a guideline for determining when adaptations based on local customs were permissible in waqf governance.
Governance Architecture	Nadzir must have clear standards of transparency and accountability under regulatory oversight. Digital waqf platforms must be equipped with data security controls, transparency over funds, and dispute-resolution mechanisms. Customary leadership structures could be involved, provided there was compliance with national and Sharia law.
Sustainable Investment	Cash waqf management required flexibility, tailored to local customs, for investment in productive Islamic financial instruments. The goal was to optimize community welfare without compromising Sharia compliance and accountability.
Policy Coherence	Synchronization between Islamic law and national law through codification was essential. Customary practices, such as customary land ownership, needed to be formalized through appropriate administrative procedures (waqf deeds, certifications) to remain valid under national law without losing local legitimacy.

Source: *author framework*

[39] Abdulqadir Ibrahim Abikan, and Abdullahi Saliu Ishola. "Waqf development in Nigeria: Issues and challenges." *Waqf Development and Innovation, Routledge.* (2021): 238-255. https://doi.org/10.4324/9781003158073

[40] Mohamad Akram Laldin, Sharifah Zubaidah Syed Abdul-Kader, and Fares Djafri. "Waqf development in Malaysia." In *Waqf Development and Innovation*, pp. 207-225. Routledge, 2021. https://doi.org/10.4324/9781003158073

Table 1 shows that the integration of *Al-'Urf* into waqf governance positioned local customs and social practices as elements that could be accommodated when in line with Sharia principles and the public interest. From a normative perspective, *Al-'Urf* was positioned as the legitimate basis for adapting waqf practices to the social context of society, allowing Sharia policy to serve as a parameter for determining the limits of acceptance of local traditions. From a governance architecture perspective, nadzir were required to have clear standards of transparency and accountability under regulatory oversight, while digital waqf platforms needed to be supported by data security systems, open fund management, and adequate dispute resolution mechanisms. The involvement of customary leadership structures was also possible when there was no conflict with national law or Sharia principles. In the sustainable investment dimension, cash waqf management required flexibility that considered local customary characteristics to support productive investment in Sharia financial instruments, with a primary orientation toward optimizing community welfare without neglecting Sharia compliance and accountability principles. For policy coherence, synchronization between Islamic law and national law through the codification process was an important factor, specifically in the formalization of customary practices, such as customary land ownership through legitimate administrative procedures. For example, waqf pledge deeds and certification were important to maintain national legal legitimacy without eliminating social and cultural validity at the local level.

The integration of *Al-'Urf* in waqf governance was implemented with the following 3 scenarios.

Table 2: *Implementation Scenario*

Scenarios	Illustration
Digital Cash Waqf	Waqf crowdfunding platform applied flexibility, based on local customs, in distributing funds (e.g., for education or micro-businesses), while still adhering to transparency standards and applicable regulatory provisions.

Customary Land Waqf	In customary areas such as Papua, the land waqf process involved the approval of customary leaders, which was then formalized through a waqf pledge deed and land certification in accordance with national law.
Modern Waqf Financing	Sharia principles were used to formulate rules that allowed waqf to invest in modern financial instruments or collaborate across regions, provided there was compliance with Sharia principles.

***Source**: Author framework*

Table 2 showed the implementation of *Al-'Urf* integration in 3 contemporary waqf management scenarios that maintained a balance between social flexibility, Sharia compliance, and national legal legitimacy. In the first scenario of digital cash waqf, waqf crowdfunding platforms implemented fund distribution mechanisms tailored to local community needs and customs, such as financing education or micro-enterprise development, while upholding transparency, accountability, and applicable regulations. The second scenario involved customary land waqf, particularly in customary areas such as Papua. Waqf process involved not only formal administrative procedures but also required the approval of customary leaders as a form of recognition of local social authority, which was then legalized through a waqf pledge deed and land certification in accordance with national law. The third scenario was modern waqf financing. Sharia principles were used as the basis for formulating regulations that enabled the development of waqf investments in modern financial instruments and cross-regional cooperation, as long as all activities complied with Sharia principles and the objectives of public welfare. These 3 scenarios demonstrated the integration of *Al-'Urf* as an adaptive strategy that strengthened the legitimacy, accountability, and social impact of waqf.

The primary challenge in integrating *Al-'Urf* into waqf governance was the risk of deviation from formal law when local customary practices were not bound by clear codified standards. The solution required clear *taqnin* guidelines on when and how *Al-'Urf* could be applied, along with strict standards of transparency and accountability for nadzir.[41] Second, there was the potential for conflict between customary practices and legal certainty, as in the case of customary waqf land that had not been officially registered. The solution was to formalize local customary practices through official administration and registration, such as waqf pledge deeds and land certification. This was to help ensure the presence of legal force without diminishing customary legitimacy. [42] Third, the integration of *Al-'Urf* had the potential to conflict with the national secular legal framework when not properly harmonized.[43] The solution was for waqf management to refer to national law in general, as exemplified by harmonization in Nigeria, which aligned religious endowments with secular non-profit law to avoid jurisdictional disputes and ensure broad legitimacy.[44] With this approach, *Al-'Urf* could function as a strengthener, rather than a weakener of the national waqf governance system.

Table 3: *Challenges and Middle Way*

Challenges	**Solution**
Risk of deviation from formal law	Clear codification was needed regarding when and how *Al-'Urf* could be applied, as well as strict transparency standards for *nadzir* (managers).
Conflict with legal certainty	Local customary practices must be formalized through official

[41] Achmad Yani, "Reconstruction of the Waqf Pledge as a Juridical Acronym for Expert Waqf Dispute Resolution," *Management of Zakat and Waqf Journal (Mazawa)* 5, no. 1 (2023): 105–21, https://doi.org/10.15642/mzw.2023.5.1.105-121.

[42] Rahman A Masse and Andi Aderus, "The Model Investment Management of Cash Waqf," *Diktum Jurnal Syariah Dan Hukum* 20, no. 2 (2022): 204–27, https://doi.org/10.35905/diktum.v20i2.3327.

[43] Adang Sonjaya, Ragimun, Edwin Basma, TutiErmawati, Anggi Putri Kurniadi, Helena Dasilva, Kanetasya Sabilla, Hasan, Muhamad Takhim, Ratih Pratiwi, Mutaqin, Sri Yanthi Yosepha, "How the Integration of Payment Systems Through QRIS Accelerates Economic and Financial Cooperation in the ASEAN Region," *International Journal of Sustainable Development and Planning* 20, no. 3 (March 2025), https://doi.org/10.18280/ijsdp.200305.

[44] Oluwaseun Sulaiman Saidu, Murat Çızakça, and Rodney Wilson, "Harmonization Is the Only 'Game' in Town; Actualizing the Functionality of Vital Islamic Financial Institutions: A Case of Waqfs in Nigeria," *Jurnal Syariah* 29, no. 2 (2021): 175–94, https://doi.org/10.22452/js.vol29no2.1.

	administration and registration rather than left as mere informal practices.
Conflict with legal frameworks	Waqf management must be consistent with general national legal provisions to ensure broad legitimacy and avoid jurisdictional disputes.

Source: *Author framework*

Table 3 showed the various challenges in integrating *Al-'Urf* into waqf governance along with normative solutions that could be implemented to maintain a balance between social flexibility, legal certainty, and Sharia compliance. The risk of deviation from formal law could arise when the application of *Al-'Urf* lacked clear boundaries, requiring a firm codification of the scope and mechanisms for implementing customary law in waqf management, accompanied by strict standards of transparency and accountability for nadzir. In addition, conflicts with legal certainty could arise when customary practices were carried out only informally without administrative recognition, requiring local practices to be formalized through official procedures, such as recording and registration to gain legal force. The potential for conflict with the national legal framework demonstrated the importance of aligning waqf governance with national legal provisions in general. This was to ensure that waqf management gained broader legitimacy and could minimize authority disputes and jurisdictional conflicts between customary law, Islamic law, and state law.

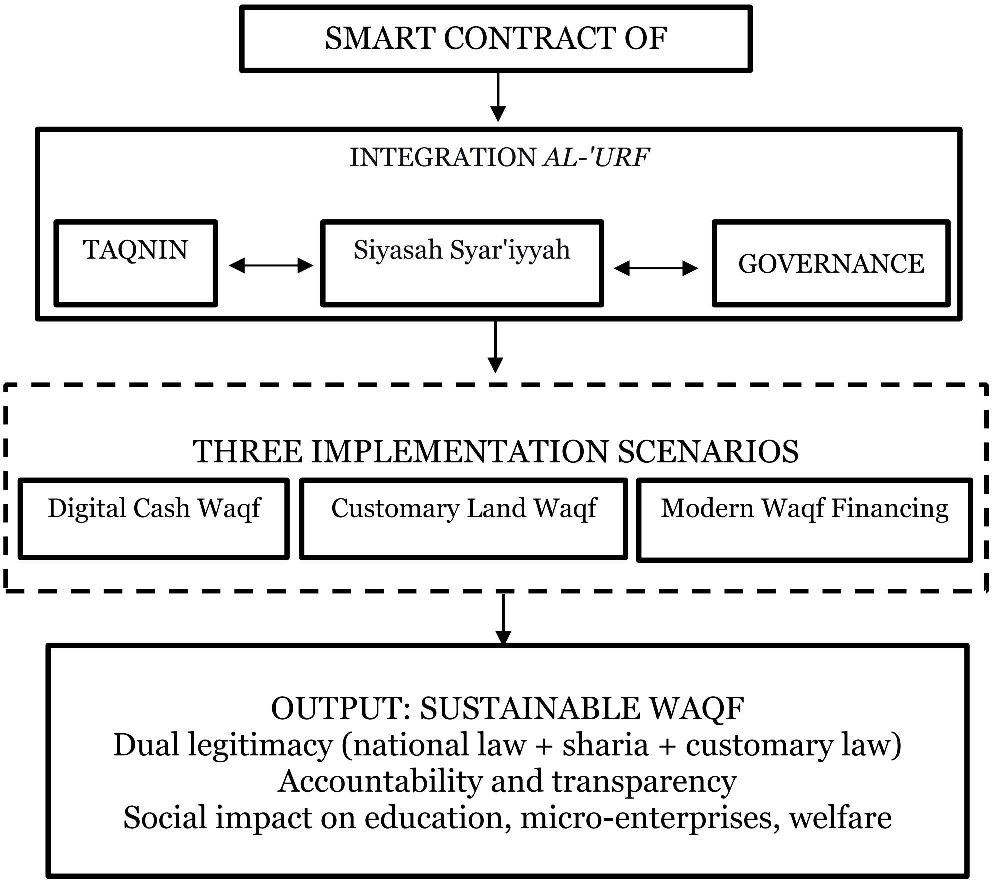
Al-'Urf integration offered a viable path to address regulatory challenges while preserving Sharia compliance in digital waqf governance. By anchoring '*Urf* in formal *taqnin* and *siyasah shari'yyah*, leveraging robust nadzir governance and digital platforms, and aligning cash waqf investments with credible Islamic financial instruments and welfare objectives, waqf governance became more legitimate, adaptive, and sustainable[45]. Indonesian experience reflected in regulatory reform, 4.0-

[45] Zainuddin Sahban, and Wahida Wahida. "Between Innovation and Prohibition: A Contextualised Islamic Legal Analysis of Cryptocurrency Compliance with Sharīʿah Principles in the Indonesian Context." *Jurnal Ilmiah Mizani: Wacana Hukum, Ekonomi Dan Keagamaan* 13, no. 1 (2026): 151-168. http://dx.doi.org/10.29300/mzn.v13i1.10673

digitization, and local customary practices provided an enabling environment for implementing *'Urf*-informed governance that harmonized national law, Islamic law, and local customary norms[46]. However, these efforts must be carefully calibrated to avoid regulatory fragmentation and must be grounded in codified standards and transparent governance. The results presented concrete pathways for researchers, policymakers, and practitioners to advance *Al-'Urf*–driven regulatory design in waqf governance, with potential applicability in other Muslim-majority and Muslim-minority contexts.

[46] Nafi Mubarok, Suqiyah Musafa'ah, and Yoga Irama. "Epistemological Transformation of'Urf in the DSN-MUI Fatwa on E-Commerce: A Maqāṣid al-Sharī'ah Based Analysis." *Al-Manahij: Jurnal Kajian Hukum Islam* 19, no. 2 (2025): 167.https://doi.org/10.24090/mnh.v19i2.13145

Figure 2: *'Urf Integrated Smart Contract Solution*



Source: *Author framework*

Figure 2 clearly demonstrated that *Al-'Urf* was not a disruptive variable, but rather a reinforcing variable in the digital waqf governance system. Whether in Indonesia, a Muslim-majority country with a high degree of cultural diversity, or in Muslim-minority countries facing challenges regarding legal recognition, this model offered a concrete middle ground. Integrating *'Urf* into smart contracts did not weaken legal certainty, but strengthened it by adding a layer of cultural legitimacy on formal legitimacy. With this approach, digital waqf could transcend jurisdictional boundaries, becoming a truly inclusive, sustainable, and locally rooted Islamic social finance instrument.

Conclusion

Implementing smart contracts in digital waqf management offered significant improvements in transparency, operational efficiency, and asset traceability. However, its technical feasibility depended largely on code quality, protocol security, and the implementation of formal verification to ensure Sharia compliance. From an Islamic legal perspective, smart contracts must meet the principles of justice (*'adl*), transparency, and legal certainty, and be free from *gharar* and *riba* (usury). Contract automation could reduce the flexibility for contextual adjustments, making formal verification a crucial tool for explicitly incorporating Sharia values into the program code. Regulatory challenges arose because Law No. 41 of 2004 concerning Waqf did not yet accommodate blockchain technology, creating legal uncertainty regarding the status of digital assets, identity verification, and dispute resolution. This showed the urgency of legal reform that bridged technological innovation with the principles of enduring and professional waqf. The integration of *Al-'Urf* through a codification mechanism (*taqnin*) and *siyasah syar'iyyah*-based policies offered an adaptive solution to bridge the gap between Sharia compliance and national regulations. The developed 4-component model framework, normative foundation, governance architecture, sustainable investment, and policy coherence provided integrative guidance for adaptive and accountable digital waqf governance. This study emphasized the need for multi-stakeholder collaboration between technology developers, religious scholars, regulators, and academics in formulating technical standards and a regulatory framework that ensured smart contract implementation was not only operationally efficient but also legally and ethically valid from an Islamic perspective. This was expected to help realize a Sharia-compliant (*mūwafaq li al-shariʿa*) digital waqf governance model that was transparent and sustainable in the digital era.

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