DIGITISATION AND ARTIFICIAL INTELLIGENCE IN THE ISLAMIC FINANCE INDUSTRY: INDUSTRY INNOVATION AND SHARIAH COMPLIANCE AUTOMATION

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Abstract**:** *Islamic finance has gained significant traction globally, with Malaysia emerging as one of its most sophisticated hubs. The integration of digitisation and artificial intelligence (AI) into this sector presents both opportunities and challenges. This paper explores how FinTech solutions, including blockchain, big data analytics, and AI, are revolutionising operations within Islamic financial institutions while ensuring adherence to Shariah principles. The study critically examines Malaysia's regulatory frameworks, institutional capacity, and innovation landscape, offering insights into the automation of Shariah compliance and system governance. The article also identifies emerging risks, such as Shariah non-compliance in algorithmic models, and proposes a governance-based audit framework aligned with Islamic jurisprudence. Through a combination of ecosystem analysis, case studies, and strategic foresight, this paper aims to contribute to the discourse on sustainable, ethical digitisation in Islamic finance.*

Keywords: Islamic finance, artificial intelligence, FinTech, Shariah audit

1. Introduction

Islamic finance, characterised by the ethical and jurisprudential guidelines of Shariah, is undergoing a digital transformation driven by the Fourth Industrial Revolution. As global financial systems leverage AI and automation, Islamic financial institutions must navigate the tension between innovation and faith-based compliance (Adznan et al., 2024; Sahabuddin et al., 2023). Unlike conventional finance, Islamic finance prohibits interest (*riba*), excessive uncertainty (*gharar*), and unethical investments. Hence, digitisation in this context is not merely about technological adoption but also about safeguarding Shariah objectives (*maqasid al-Shariah*).

Malaysia stands out globally due to its well-developed Islamic finance ecosystem and government-endorsed FinTech innovation policies. With over MYR2.5 trillion in Islamic financial assets and an expanding network of digital Islamic institutions (Shafii, 2025), Malaysia provides a critical case study in harmonising regulatory innovation and religious accountability. This article explores the role of AI, blockchain, and big data in enhancing Islamic financial services while automating Shariah governance.

The Malaysian Islamic finance ecosystem encompasses banking, insurance (takaful), capital markets, and socio-religious institutions such as zakat and waqf. Regulatory bodies, including Bank Negara Malaysia (BNM) and the Securities Commission Malaysia (SC), play a central role in setting frameworks that accommodate digital innovation without compromising Shariah principles (BNM, 2024; SC, 2024). According to Shafii (2025), Malaysia currently supports 16 Islamic banks, 17 takaful operators, 14,417 cooperatives with over 6 million members, 14 State Islamic Religious Councils and Waqf Institutions, and a growing list of Islamic capital market products, including exchange-traded fund (ETF) and Real Estate Investment Trust (REIT).

This diversity ensures resilience and offers a dynamic platform for digital transformation. The ecosystem's openness to innovation, combined with strict Shariah compliance oversight, positions Malaysia at the forefront of Islamic FinTech. Islamic FinTech is reshaping how Islamic finance products are conceptualised, delivered, and regulated.

The aim of the study is to identify Shariah compliance automation that could be adopted to the applications of Islamic fintech, closing the gap between Shariah integrity and technological efficiency, making sure that fintech innovations stay inside the bounds of Islamic finance.

2. Literature Review

The intersection of Islamic finance and digital technology has attracted considerable academic attention. Alam et al. (2019) provided foundational insights into the relationship between FinTech and Islamic finance, highlighting the potential for technological solutions to enhance Shariah compliance mechanisms. Ali et al. (2019) examined the impact of FinTech on Islamic banking in Southeast Asia, particularly focusing on Brunei Darussalam and Malaysia, demonstrating the regional leadership in Islamic FinTech adoption.

Islamic FinTech; financial technology compliant with Shariah principles offers innovations in domains like crowdfunding, peer-to-peer (P2P) lending, mobile payments, robo-advisory, and compliance tools. Its growth reflects strong demand among Muslim consumers and evolving regulatory ecosystems globally.

Malaysia is widely recognized as the most competitive country in Islamic FinTech, scoring highest in traditional Islamic financial institution capability and ethics, though Information and communication technology (ICT) infrastructure remains comparatively less mature. The Islamic Financial Services Act 2013 provides a legal backbone for supervising Islamic financial institutions and digital payment systems, enforcing Shariah compliance across fintech offerings. The Malaysian Islamic finance ecosystem encompasses a

comprehensive range of financial services, including banking, insurance (takaful), capital markets, and socio-religious institutions such as zakat and waqf. Regulatory bodies, including Bank Negara Malaysia (BNM) and the Securities Commission Malaysia (SC), play a central role in setting frameworks that accommodate digital innovation without compromising Shariah principles (BNM, 2024; SC, 2024).

Malaysia features mature applications in zakat collection and digital platforms. For instance, Zakat Kedah launched apps such as Zakat on Touch (ZoT), Jom Zakat, and Asnaf Care, enabling real-time donation tracking, digital distribution, and increased efficiency leading to a rise in zakat collection from MYR 183m (2018) to MYR 207m (2019), and strong user ratings.

Micro-entrepreneurs (MEs) in Malaysia adopting Shariah-compliant FinTech (like P2P lending, crowdfunding, e-wallets) experience improved income sustainability. Performance expectancy and facilitating conditions significantly boost usage intentions among Muslim MEs.

Research shows Shariah compliance, perceived ease of use, usefulness, and trust are critical to customers' intention, satisfaction, and retention when using Islamic FinTech platforms in Malaysia. Regulatory clarity and active Shariah advisory boards further support credibility and uptake. Challenges remain, including gaps in legal frameworks, data security, and uneven digital infrastructure adoption across regions. Comparatively weak ICT systems limit scalability despite policy support.

A global systematic review highlights regulation and governance as dominant challenges, especially in crowdfunding and horizontal business models (e.g. insurance/takaful, digital asset investing). Trust remains a key determinant across markets, along with cultural factors, religiosity, usability, and digital literacy. Smart contracts and blockchain introduce concerns about *gharar* (ambiguity) and need standardized Shariah reviewed frameworks to ensure compliance.

Cross-country indicators rank Malaysia first for Islamic FinTech readiness due to institutional depth and regulatory support while other countries (e.g. UAE, Saudi, Indonesia) are advancing but face gaps in harmonized regulation and infrastructure. Countries like UAE invest heavily in sandboxes and digital economy initiatives to become Islamic FinTech hubs.

Globally, markets are expanding in robo-advisory, blockchain, and ethical crypto. But standardized cross jurisdiction regulation, trust-building mechanisms, user education and interoperability need further development. Globally, Islamic FinTech covers:

i. Crowdfunding and peer-to-peer lending platforms such as Malaysia's pitchIN and initiatives like Shekra Asia are enabling Shariah-compliant financing for entrepreneurs in Southeast Asia and the Middle East and North Africa (MENA) region. These platforms support financial inclusion, wealth circulation, and uphold Shariah principles through mandatory compliance screening, transparency policies, and Shariah advisory oversight (pitchIN, n.d.; Shekra, n.d.; IFSB, 2023).
ii. Robo-advisory/WealthTech, Islamic investment platforms like Wahed Invest and Ethis provide halal investment options using robo-advisory models, democratizing access to Shariah-compliant investment opportunities (DinarStandard, 2024) with

Shariah-compliant ETFs, sukuk, stocks, and real estate products.

iii. Blockchain applications for transparency and Shariah oversight (e.g. Adl Advisory's NFT-based Shariah rulings) and blockchain technology has found particular application in waqf management, with platforms like Finterra's Waqf Chain using distributed ledger technology to enhance transparency and traceability in charitable asset management.

iv. Ethical cryptocurrency platforms, such as Islamic Coin or CAIZ, offering halal digital currencies, wallets, stablecoins, and tokenized profit and loss sharing aligned with Islamic finance values.

This institutional diversity ensures resilience and offers a dynamic platform for digital transformation. The ecosystem's openness to innovation, combined with strict Shariah compliance oversight, positions Malaysia at the forefront of Islamic FinTech development.

Islamic FinTech is reshaping how Islamic finance products are conceptualised, delivered, and regulated. Key innovations include digital Islamic banking platforms such as AEON Digital Bank and Boost Bank, which integrate AI and mobile technology to deliver Shariah-compliant services efficiently. These innovations reflect a fundamental shift from institutional to community-based finance, democratising access while requiring more sophisticated compliance measures.

Current regulations in Malaysia and Indonesia are insufficient for overseeing modern Islamic fintech activities. The Islamic Financial Services Act 2013 (IFSA) in Malaysia focuses mainly on traditional Islamic banking. It does not clearly address technologies like blockchain, robo-advisors, or smart contracts (Ilyas et al., 2020). Likewise, Indonesia's POJK No. 77/2016 does not mandate Islamic P2P platforms to follow a certified Shariah governance process (Trisadini et al., 2023). This legal gap creates ambiguity and inconsistency in fintech operations. Without proper regulation, Islamic fintech firms operate without clear guidance on Shariah auditing standards, which may lead to non-compliance with core Islamic principles.

Fintech platforms often target underserved populations, including Muslims who avoid conventional finance due to religious concerns. However, the lack of proper Shariah audits and regulatory oversight can result in mistrust, fraud, or participation in impermissible contracts unknowingly (Fatimah & Dewi, 2020). To build trust, scholars emphasize proactive Shariah assurance mechanisms, such as automated compliance monitoring systems, user-facing dashboards that detail Shariah status, and transparency tools that explain how contractual terms align with Islamic principles the core components of robust Shariah governance frameworks and trust-building in Islamic fintech platforms (AlMelaih et al., 2024; Sharif, 2024; IADI, 2022).

A key issue is the lack of technical expertise among Shariah auditors. SAC members and Shariah Supervisory Boards often have strong backgrounds in Islamic law but are unfamiliar with digital systems. As a result, they may overlook critical technological elements such as algorithm transparency, data flows, and automated contract execution (Ilyas et al., 2020). Moreover, in Indonesia, many Islamic fintech platforms do not even have a designated Shariah board and rely only on fatwa references without a structured review process (Fatimah & Dewi, 2020). This situation undermines consumer trust and leaves digital

transactions open to hidden *riba* or *gharar*.

3. Information System Governance and Shariah Compliance Automation: A Foundation to Shariah Assurance for Fintech Applications

Information system governance plays a pivotal role in sustaining the credibility, transparency, and ethical soundness of Islamic FinTech. As financial institutions pivot to digitised models, governance frameworks must evolve to ensure that innovation aligns with both operational goals and Shariah imperatives. Malaysia, as a global leader in Islamic finance, has adopted international IT governance standards such as Control Objectives for Information and Related Technologies 2019 (COBIT) and Committee of Sponsoring Organizations (COSO) to structure information systems, establish risk protocols, and audit digital infrastructures (ISACA, 2023). Strong governance within Islamic financial institutions involves the following key areas:

- Defining IT roles according to the three lines of defense (operations, compliance, and audit).
- Implementing Shariah-compliant risk management protocols, particularly addressing both financial and cyber risks.
- Conducting user acceptance testing (UAT) to ensure that systems accommodate Shariah guidelines during product rollout.
- Utilising exception reports and AI-based analytics to proactively detect Shariah non-compliance risks.

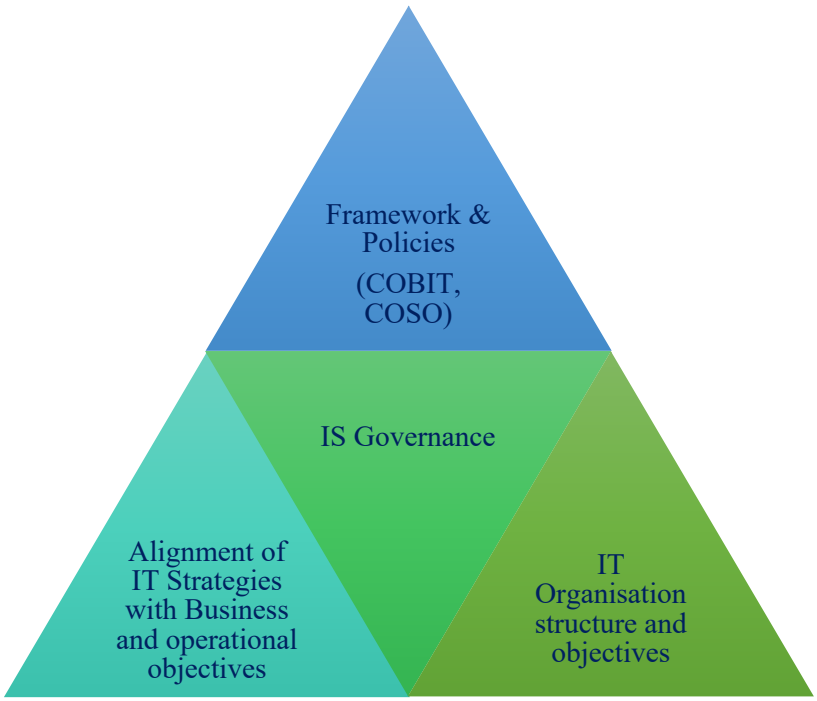

Diagram 1: The Components of Information System Governance

Effective Information System Governance is crucial to ensuring that IT resources are used responsibly, efficiently, and in alignment with organizational goals. This governance encompasses aligning IT strategies with business objectives, establishing a clear organizational structure, and adhering to recognized frameworks and standards.

A robust governance model ensures that IT initiatives directly support the broader strategic direction of the organization. Key elements include, firstly the alignment of IT Strategies with Business Objectives. IT must act as a strategic enabler, ensuring that its initiatives are tightly aligned with the business's strategic goals. This includes leveraging technology to drive innovation, efficiency, and competitiveness. Secondly, the adoption of frameworks, Standards & Policies by recognized governance frameworks such as COSO and COBIT. The frameworks provide structured guidance for risk management, internal control, and value delivery. These frameworks ensure consistent policy enforcement, compliance, and strategic IT alignment. The third component is IT Organizational Structure and Responsibilities that clearly defined roles and responsibilities within the IT function. This structure supports accountability, efficient decision-making, and the successful execution of IT initiatives.

Furthermore, aligning IT with business strategy ensures that technology investments yield maximum value. This involves:

i. Product Development and Features: IT plays a critical role in product development by incorporating features that meet user needs, improve customer experience, and align with market demands.
ii. Risk Management and Internal Control: Integration of risk assessment and internal control mechanisms within IT systems helps mitigate operational, compliance, and cybersecurity risks. These controls must align with enterprise risk management frameworks and support regulatory compliance.
iii. User Acceptance Testing (UAT): UAT is a key phase in the implementation lifecycle, ensuring that systems and applications meet business requirements. Involving end-users during this stage validates the functionality and usability of the final product.

In term of IT responsibilities, it holds a variety of responsibilities that support ongoing business operations and continuous improvement through system adoption. IT must facilitate the adoption of systems by ensuring they are user-friendly, well-documented, and supported with training and change management. System adoption too need to be able to monitor through Exception Reports. Ongoing system monitoring is conducted through exception reports, which identify anomalies and performance deviations. This enables proactive issue resolution and supports operational efficiency. The adopted system should incorporate iterative improvements through feedback loops driven by feedback collected from various lines of defense, including operations, compliance and audit. This feedback is vital for identifying system gaps, prioritizing enhancements, and maintaining alignment with evolving business needs.

A fundamental challenge lies in ensuring that digital applications and systems are designed with Shariah compliance embedded at the infrastructure level. This includes real-time oversight mechanisms that provide Shariah advisors with visibility over system logic, workflow templates, and contractual automation.

Recent studies have examined the role of artificial intelligence (AI) and machine learning (ML) in enhancing Shariah compliance and improving decision-making within Islamic financial institutions. Shalhoob and Babiker (2025) provide a theoretical analysis of how AI technologies, particularly automated compliance monitoring, predictive analytics, and natural language processing (NLP) can support auditing and accounting practices aligned with Shariah principles. Complementing this, Dey et al. (2025) offer a comprehensive review of machine learning applications in Islamic finance, highlighting their potential in areas such as credit risk assessment, fraud detection, investment optimization, and regulatory compliance. Together, these studies underscore the transformative potential of AI and ML in advancing operational efficiency and ensuring adherence to ethical and religious standards in Islamic finance. Islamic FinTech services ranging from zakat apps to robo-advisors and blockchain-based contracts must adhere to Shariah principles such as prohibition of *riba, gharar, maysir*, and the promotion of ethical and socially beneficial financing.

The literature emphasises that Shariah compliance is a core determinant of customer adoption (especially in Malaysia). However, FinTech innovations are fast-moving and complex, often involving smart contracts, algorithmic investment, or new cryptocurrencies. These tools introduce new forms of risk, including *gharar* (ambiguity in smart contracts), improper zakat calculation logic in apps, lack of transparency in crypto investments and automated contracts that may bypass Shariah filters.

This highlights the growing need for robust and dynamic Shariah auditing mechanisms. The literature identifies that Shariah governance frameworks in Malaysia are well established (via the IFSA 2013, BNM's Shariah Governance Policy Document 2019, and regulatory sandboxes). Yet, specific Shariah audit practices for FinTech products are not always embedded or clearly defined. Many FinTech startups lack in-house Shariah advisors or real-time audit protocols. Shariah compliance has traditionally relied on manual processes and periodic reviews by scholars. However, digitisation allows for the automation of these processes, increasing efficiency and reducing human error. AI-based tools can now screen products for Shariah compliance at three stages:

i. Pre-Product Development
   AI algorithms can automatically exclude haram (prohibited) elements based on dynamic screening criteria. For example, a robo-advisor may filter stocks based on revenue derived from alcohol or gambling.

ii. Transaction Execution
   Smart contracts enforce Shariah-based contractual logic, such as *wakalah* (agency) or *murabahah* (cost-plus sale), ensuring transactions follow stipulated terms.

iii. Post-Transaction Audit
   AI and big data analytics enable real-time monitoring of transaction trails, leveraging machine learning to detect anomalies and enforce compliance protocols (Khanvilkar & Kommuru, 2025). Moreover, natural language processing (NLP) tools facilitate automated review of legal and regulatory documents, identifying and interpreting compliance clauses to support contract oversight and audit accuracy (UnitedLex, 2025).

4. Proposed Shariah Audit Scopes and Tools for Islamic Fintech applications

In Shariah-based institutions, information system (IS) must not only support operational efficiency and financial accuracy but also comply with rigorous Shariah audit requirements. These requirements ensure that all IT systems align with Islamic principles and are capable of supporting Shariah-compliant financial operations. The IS must be designed with embedded controls, monitoring mechanisms, and governance structures that uphold the integrity of Shariah principles throughout the system's lifecycle from contract creation to transaction execution and audit.

One of the key requirements in such systems is contract authentication. All financial contracts executed through the system must reflect valid and approved Shariah structures, such as *Murabahah, Ijarah, or Mudarabah*. The system should also include functionality for digital *ijab-qabul* (offer and acceptance), which serves as the core of a valid Islamic contract. Ensuring the digital execution of *ijab-qabul* helps validate the Shariah authenticity of the transaction and preserves the audit trail for compliance reviews.

Additionally, IS should facilitate automated transaction monitoring to detect potential instances of Shariah non-compliance. For instance, the system must be able to flag transactions that involve interest-like penalties (*riba*), ambiguous pricing (*gharar*), or speculative elements (*maysir*). By incorporating real-time alerts and automated checks, institutions can proactively identify and rectify non-compliant activities before they are finalized, thereby reducing operational and reputational risks.

To further support Shariah oversight, the system must emphasize data transparency. This involves designing auditor-friendly dashboards that provide clear access to transaction histories, contract versions, approval workflows, and compliance indicators. Shariah auditors should be able to independently verify that processes and outcomes align with approved Shariah rulings, without depending solely on manual reports or intervention from system administrators.

Lastly, effective governance integration is essential. The IS should be designed to provide real-time access to Shariah Committee, enabling them to review contract templates, approve system workflow logic and ensure that updates to Shariah guidelines are promptly reflected in the operational system. This integrated governance framework ensures that Shariah compliance is embedded at the systemic level and continuously upheld across all business functions. Moving forward, Shariah audit must evolve in three keyways to keep pace with FinTech innovations:

i. Real-time Digital Shariah Audit (RTSA)
   Shariah audit should shift from periodic manual reviews to continuous real-time audits embedded within FinTech applications. For example, by integrating Shariah rules directly into smart contract code, using AI/ML algorithms to auto-flag *riba* or *gharar* elements and adopt blockchain-based traceability to ensure zakat is distributed to rightful *asnaf* categories.

ii. Shariah Compliance-as-a-Service (SCaaS)
A new model where third-party Shariah audit platforms offer plug-and-play audit APIs to startups and platforms. This would lower entry barriers for small FinTech firms lacking in-house expertise.

iii. Self-Regulating Shariah Tech Tools
Emerging Islamic FinTech apps like Wahed Invest and Islamic Coin claim Shariah compliance but rely on advisory boards. Future models could include auditable smart contracts or open-source Shariah compliance engines governed by licensed Shariah auditors.

In the planning phase of a Shariah audit, Artificial Intelligence (AI) has the potential to significantly enhance the scope, precision, and efficiency of audit activities. Traditionally, Shariah auditors relied on sampling methods to test compliance due to resource and time constraints. However, with AI, auditors can now perform a universe audit by analysing the entire population of transactions instead of relying on limited samples. This shift reduces the risk of overlooking non-compliant transactions and enhances the overall assurance level, particularly important in Shariah-based institutions where even minor deviations can carry significant reputational and regulatory consequences.

Further refinement in audit planning comes from the use of exception reports powered by AI and data analytics. Instead of manual or random sampling, AI enables data-driven sampling, allowing Shariah auditors with data analytics capabilities to focus on high-risk or unusual transactions flagged by the system. This approach blends the efficiency of exception-based auditing with a risk-focused lens, enabling auditors to allocate their efforts where it matters most that is on transactions with potential Shariah non-compliance indicators, such as profit miscalculations or contract structure inconsistencies.

During the execution stage of a Shariah audit, AI continues to play a critical role in enhancing audit quality and credibility. By leveraging risk-based approaches informed by exception reports, auditors can prioritize high-risk areas and conduct deeper reviews where anomalies are detected. This ensures a more targeted and effective audit process, reinforcing confidence in the audit outcomes.

Moreover, AI supports the system walkthrough process by automating the tracing of transactional flows within the system. Shariah auditors can use intelligent tools to map how contracts are initiated, executed, and closed by validating that all steps align with Shariah principles and approved contract logic. This reduces manual efforts and enhances the accuracy of system understanding, particularly in complex financial products.

Lastly, AI enables audit automation through the use of Computer-Assisted Audit Techniques (CAATs). These tools allow Shariah auditors to run scripts and queries on large datasets, automatically test controls, identify exceptions, and even simulate Shariah rulings against real transactional data. By incorporating CAATs into the audit lifecycle, institutions can conduct more comprehensive and frequent audits, while maintaining consistent adherence to Shariah requirements.

In the nutshell, the transformation of Shariah audit in the digital era should be guided by both *fiqh*-oriented principles and technology-neutral innovation. This means updating Shariah governance policies to cover algorithmic logic, tokenisation, and decentralised decision-making, training Shariah scholars in digital literacy, AI ethics, and blockchain fundamentals and embedding compliance standards like AAOIFI's Shariah Governance Standards into digital platforms through regulatory sandboxes and supervised pilots. Ultimately, robust Shariah assurance in Islamic FinTech must not merely keep pace with innovation as it must shape it through principles of transparency, justice, and risk-sharing.

To enable the effective conduct of Shariah audits, it is essential to promote training and the enhancement of technical expertise among Shariah auditors. Existing training programs focus on equipping auditors with Shariah knowledge, Shariah governance, and audit-specific skills, including planning, execution, and reporting (IBFIM, 2025). However, with the rise of fintech applications, there is a growing need to introduce specialized training in data analytics for Shariah audits. Current practices in some Islamic banks that utilize AI in their Shariah audit processes can serve as benchmarks for developing such training and continuous professional development programs for the existing pool of Shariah auditors.

5. Conclusion

The digital transformation of Islamic finance is not merely a technological evolution. It is a profound recalibration of how faith-based financial services engage with innovation, ethics, and governance. Malaysia's experience demonstrates that with the right ecosystem comprising regulatory support, institutional capacity, and Shariah oversight. Digitisation and artificial intelligence can significantly enhance financial inclusion, operational efficiency, and ethical integrity in the Islamic financial system.

However, the integration of advanced technologies such as AI, blockchain, and big data introduces new complexities, including algorithmic opacity, compliance ambiguities, and emerging risks like digital *gharar* or unethical smart contracts. These challenges require Islamic financial institutions to move beyond traditional compliance mechanisms toward embedded, real-time Shariah assurance frameworks.

This paper advocates for a future-oriented Shariah governance paradigm that incorporates Real-Time Shariah Audit (RTSA), Shariah Compliance-as-a-Service (SCaaS), and self-regulating Shariah tech tools. These innovations must be supported by enhanced digital literacy among Shariah scholars, interdisciplinary collaboration, and updated legal frameworks that address the specific dynamics of FinTech.

Ultimately, for Islamic finance to maintain its distinct identity while thriving in the era of the Fourth Industrial Revolution, it must embed the *maqasid al-Shariah* not only in financial products but also in the algorithms and platforms that power them. A dynamic, ethical, and digitally mature Shariah audit system is not just an operational necessity as it is a spiritual imperative that ensures Islamic finance continues to offer equitable, transparent, and socially responsible financial solutions in a rapidly evolving world.

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