العقود الذكية في الأنظمة المالية الإسلامية: قابلية التنفيذ والتحديات القانونية في دول مجلس التعاون الخليجي

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Smart Contracts in Islamic Financial Systems: Enforceability and Legal Challenges in GCC Jurisdictions

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Abstract

The study examines the enforceability and legal challenges of smart contracts in Sharia-compliant finance with a focused case study of Gulf Cooperation Council (GCC) jurisdictions, including Saudi Arabia, the United Arab Emirates, Bahrain, Kuwait, Oman, and Qatar. The study adopts qualitative, doctrinal, and comparative as the main methods. Furthermore, the study examines national laws of selected countries on contracts, fintech regulation, Sharia regulations, and specific guidance, beside comparative perceptions from Malaysia and the United Kingdom. Regarding the findings of this study, it determines that while GCC countries have made distinguished development through electronic transaction laws and digital asset frameworks, significant legal ambiguity

remains concerning contract establishment, liability allocation, jurisdiction, and dispute resolution for self-executing code. Thus, from a Sharia viewpoint, the study identifies main challenges resulting from the tension between automated implementation and principles such as the prohibition of illegal transactions, the requirement of contractual intent, equitable risk allocation, and the need for human interpretation through Sharia supervisory oversight. The study explores how fragmented regulatory approaches and lack of unified standards, particularly from AAOIFI, exacerbate cross-border enforceability risks for Islamic fintech products. Finally, the study concludes by recommending a hybrid governance model that integrates early Sharia review, legally binding off-chain documentation, and human-in-the-loop safeguards. It also emphasizes the need for specialized dispute resolution mechanisms and greater regional harmonization. Such modifications are vital to ensure that smart contracts can be effectively enforced within GCC Islamic financial systems while preserving Sharia compliance, legal certainty, and market confidence.

الملخص

تتناول هذه الدراسة إمكانية إنفاذ العقود الذكية والتحديات القانونية التي تواجهها في التمويل المتوافق مع الشريعة الإسلامية، مع التركيز على دراسة حالة لدول مجلس التعاون الخليجي، وهي: المملكة العربية السعودية، والإمارات العربية المتحدة، والبحرين، والكويت، وسلطنة عمان، وقطر. وتعتمد الدراسة المنهج النوعي والفقهي والمقارن كمنهج رئيسي. كما تتناول الدراسة القوانين الوطنية للدول المختارة فيما يتعلق بالعقود، وتنظيم التكنولوجيا المالية، والأحكام الشرعية، والتوجيهات الخاصة، بالإضافة إلى مقارنة النتائج مع ماليزيا والمملكة المتحدة. وخلصت الدراسة إلى أنه على الرغم من التطور الملحوظ الذي حققته دول مجلس التعاون الخليجي من خلال قوانين المعاملات الإلكترونية وأطر الأصول الرقمية، إلا أن هناك غموضًا قانونيًا كبيرًا لا يزال قائمًا فيما يتعلق بإنشاء العقود، وتوزيع المسؤولية، والاختصاص القضائي، وتسوية المنازعات المتعلقة بالبرمجيات ذاتية التنفيذ. ومن منظور الشريعة الإسلامية، تحدد الدراسة التحديات الرئيسية الناجمة عن التناقض بين التنفيذ الآلي ومبادئ مثل حظر المعاملات غير المشروعة، وضرورة وجود النية التعاقدية، والتوزيع العادل للمخاطر، والحاجة إلى التفسير البشري من خلال الرقابة الشرعية. تستكشف هذه الدراسة كيف يؤدي تشتت المناهج التنظيمية وغياب المعايير الموحدة، لا سيما من هيئة المحاسبة والمراجعة للمؤسسات المالية الإسلامية إلى تفاقم مخاطر إنفاذ العقود الذكية عبر الحدود في منتجات التكنولوجيا المالية الإسلامية. وتختتم الدراسة بتوصية نموذج حوكمة مختلط يدمج المراجعة الشرعية المبكرة، والوثائق الملزمة قانونًا خارج سلسلة الكتل، وضمانات التدخل البشري. كما تؤكد على ضرورة وجود آليات متخصصة لحل النزاعات، وتعزيز التنسيق الإقليمي. وتُعد هذه التعديلات ضرورية لضمان إنفاذ العقود الذكية بفعالية ضمن الأنظمة المالية الإسلامية في دول مجلس التعاون الخليجي، مع الحفاظ على الامتثال للشريعة الإسلامية، واليقين القانوني، وثقة السوق.

1- Introduction

The financial sector is experiencing a major transformation driven by digital innovation. Modern developed technologies affect how transactions are designed and enforced. Blockchain, artificial intelligence (AI), and decentralized finance are restructuring efficiency, security, and customer experiences in international markets. In this context, one of the most significant inventions is the smart contract, which is important for today's global transactions. Thus, smart contracts systematize transactions and reduce the need for intermediaries and agents. In addition, they assist in reducing classic conflicts between parties when they enter an agreement. Hence, the main strengths of smart contracts are transparency, enforcement, and building trust between parties. As a result, smart contracts have grown very fast in some important areas, such as securities trading, cross-border payments, and asset tokenization.

In addition, smart contracts have gone further than traditional finance, which is based on papers. Thus, smart contracts emerge in digital asset management, supply chain finance, and regulatory technology. In this context, countries like the United States, the European Union, and Singapore have started recognizing these agreements in law. However, regardless of their effectiveness, smart contracts face challenges about legal recognition, enforceability in courts, and compatibility with current rules and regulations in the world, which are affected by the modern technology. Thus, these challenges are significantly affecting Islamic finance, where compliance with Sharia principles is necessary.

However, smart contracts make Islamic finance more transparent, organized, and efficient. Hence, Islamic principles such as the prohibitions of illegal transactions can be coded straight into the contract. In this context, this could help reduce human error, limit compliance disputes, and speed up Sharia board approvals. Nevertheless, coding leaves minimum scope for interpretation, which is important according to the Sharia principles.

In this regard, this study examines these challenges in the Gulf Cooperation Council (GCC), Saudi Arabia, the UAE, Bahrain, Kuwait, Oman, and Qatar. These countries have advanced fintech programs, such as Bahrain's Open Banking Framework, Saudi Arabia's Vision 2030, and the UAE's blockchain initiatives. However, consistent legal frameworks

for smart contracts are still considered an issue. In addition, jurisdictional conflicts, lack of specific statutes, and uncertainty over how courts handle blockchain evidence are major challenges. Furthermore, the lack of standardized guidance from international organizations such as the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) makes it more complex to combine modern technology with Sharia principles regarding smart contracts.

The scope of this study is limited to the GCC region, which is a central focusing point for this study. Hence, the region is a leading hub for Islamic finance and includes major financial centers such as Dubai, Manama, and Riyadh. Furthermore, GCC jurisdictions share similar legal environments rooted in civil law traditions influenced by Islamic law, while rapidly following determined national fintech plans. Hence, this dual dynamic of following Sharia principles and pursuing technological development makes the region a model case study for examining the enforceability and compliance challenges of smart contracts.

The methodology of this study is a qualitative approach that is suitable for this type of study. Thus, the study adopts a qualitative methodology based on doctrinal legal analysis and a comparative review of different countries' regulatory frameworks. In addition, examination of case studies of some countries is also part of the research methodology for this study. Furthermore, content analysis of policy documents, regulatory guidelines, and Sharia governance standards issued by institutions such as AAOIFI and national central banks will be conducted.

2- Legal Framework for Smart Contracts in the GCC

Smart contracts are defined as a set of promises, specified in digital form, including protocols within which the parties make these promises. (Yusof et al., 2024). The legal identification and regulation of smart contracts in the GCC is proceeding rapidly but stays variable and, to some extent, uncertain. Thus, smart contracts present legal challenges in relation to contract arrangement, enforceability, jurisdiction, liability, and alignment with the current civil, commercial, and electronic transaction laws. Hence, within the GCC, there have been attempts to adjust or interpret existing legal systems to adapt smart contracts, even as limited legislation remains limited in many jurisdictions. (Bantekas and Al-Hosseini, 2025).

In this context, in the UAE, significant steps have been taken in establishing a legal circumstance contributing to smart contract implementation. Therefore, Federal Decree Law No. 46 of 2021 on Electronic Transactions and Trust Services of the UAE provides a

legislative basis that allows automated electronic systems to conclude contracts without human physical involvement. This is permitted if specific legal requirements are met, as it states in Article 11 (1):

> 'Contracting may be made between Automated Electronic Agents, including one or more Electronic Information Systems pre-set and pre-programmed to do so. Such a contract shall be valid, enforceable, and legally effective even if no natural person was personally or directly involved in the conclusion of the contract within said systems.

In Dubai, the Smart Contracts on Dubai Blockchain Policy requires smart contracts to be readable and accessible in both Arabic and English. Furthermore, it states that all parties must have a clear view of the contract's logic. (Dubai Future Council for Blockchain, 2019) Similarly, in free zones such as the Dubai International Financial Centre (DIFC), fully "coded contracts" composed entirely of coded terms are increasingly recognized under local contract law frameworks (Dubai International Financial Centre, 2024). Furthermore, Limited Liability Companies (LLCs) operating in the virtual asset sector are subject to regulations issued by the Virtual Assets Regulatory Authority (VARA), mainly under Dubai Law No. 4 of 2022 Regulating Virtual Assets in the Emirate of Dubai. These regulations establish licensing, supervisory requirements, and compliance obligations for virtual asset service providers, including those offering smart contract services.

Despite these advances, issues and uncertainties remain as the main point. In this perspective, onshore UAE law still does not include explicit legal definitions of "smart contract," and judicial decisions remain restricted and limited. Therefore, enforceability often depends on whether smart contracts meet traditional contract law principles that include offer, acceptance, intention, and capacity under civil law. (Bantekas & Al-Hosseini, 2025).

Like the UAE, Saudi Arabia faces challenges in combining smart contracts into its legal system. Smart contracts can improve competence, legal certainty, and transparency in contractual transactions. However, they also raise difficulties due to the current development in the financial system. These include aligning mutual consent, parties' legal capacity, and established contract law principles under the Civil Transactions Law

with the automatic and self-executing nature of smart contracts (Alhejaili, 2025). Further description of smart contracts under the Saudi legal framework shows that although the Saudi Civil Transactions System includes general contract law principles, they were not primarily drafted with blockchain or smart contracts in mind. Therefore, it could be said that legal reform in the Saudi financial system is needed, particularly around liability, defects, and dispute resolution (Khuli, 2024).

At a general regional level, the AMF published a Guidance Note under the title of "Adopting Smart Contracts and Their Legal Enforceability in Arab Countries," which consists of GCC states. The note shows main issues such as consumer protection, market integrity, data protection, identity verification, and regulating decentralized and pseudonymous participants in smart contract-based systems. The AMF instruction recommends that legislative interventions are required to illuminate the status of smart contracts, create accountability for decentralized protocols, ensure risk management practices, and align current laws in the areas of civil, commercial, and electronic transactions with the functionalities of smart contracts (Arab Monetary Fund, 2022).

Hence, one of the fundamental legal challenges in the GCC perspective is attribution of liability. Classic contract law assumes human agency, fault, or misrepresentation; smart contracts introduce technical risk, code interpretability, and inadequate capacity for human intervention post-deployment. An additional challenge is jurisdiction and choice of law, assuming that smart contracts are by nature distributed, sometimes international or cross-border. Hence, it can be unclear which legal system has authority to enforce or interpret the contract. (Bantekas & Al-Hosseini, 2025).

Moreover, the process of identity verification under the legal system is vital. Thus, it is important for contracts to be enforceable in many GCC states that the parties can figure out their legal competence, which includes their legal ability and the ability to sign digitally. Hence, reliable trust methods, such as electronic signatures and geometric identification, have a crucial function in proving enforceability in blockchain-based structures.

Furthermore, data protection and confidentiality are necessary, as smart contract functionality often involves personal data. Several GCC jurisdictions have introduced or are in the process of introducing data protection laws, such as the UAE's Federal Data Protection Law and the

Abu Dhabi Global Market (ADGM) data protection framework, which may directly affect designated smart contracts (ADGM, 2018).

It can be said that while GCC countries are adopting smart contract technology and are increasingly modifying existing legal frameworks to provide legal recognition, enforceability, and regulatory clarity, much remains to be achieved. Therefore, specific legislation that defines smart contracts, addresses lifecycle issues, allocates liability in cases of malfunction, specifies dispute resolution mechanisms, and harmonizes applicable contract, electronic transaction, and data protection laws will be important. Therefore, without this judicial amendment, parties applying smart contracts in the GCC countries will continue to rely on interpretation of existing rules and regulations, which leads to possible uncertainty. Consequently, for legislators and businesses engaging with smart contracts in the GCC, clear legal drafting and reliable auditing of code auditing are necessary preliminary measures. In addition, effective dispute resolution mechanisms and strict compliance with identity, data protection, and regulatory requirements comprise crucial provisional strategies.

3- Legal Challenges of Smart Contracts in Islamic Financial Systems

The rapid digitalization of financial transactions has set smart contracts as required tools in contemporary finance. These contracts, implemented through blockchain technology, improve efficiency, transparency, and security in financial transactions. The implementation of smart contracts within Islamic finance introduces distinct legal frameworks and Sharia-compliance considerations. Islamic financial systems are governed by principles that require accurate evaluation of automated contractual frameworks. This issue is particularly significant in the GCC countries, where hybrid legal frameworks integrate elements of civil law, Sharia law, and developing digital legislation. (Rafaheh, 2024).

Despite the advanced methods of fintech legislation in GCC states, the enforceability of smart contracts within Sharia-compliant frameworks remains unclear. Therefore, the main legal issues in operating smart contracts in the Islamic finance industry through the GCC region will be analyzed. Thus, it presents issues of Sharia compliance, jurisdictional ambiguity, dispute settlement and contract interpretation, and the regulatory gaps and standardization.

3-1- Sharia Compliance Issues

In Islamic finance, the validity of a contract depends on the prohibition of forbidden aspects like riba, gharar, and maysir. Thus, classical jurists emphasized the significance of justice in contracts, mutual consent, and fair risk distribution. Smart contracts, on the other hand, are based on contemporary technology systems ,which have recently been developed to include AI. It means that a smart contract automatically carries out their terms when certain coded conditions are met. Hence, these certain digital codes may not always be suitable for Sharia principles, which need special interpretation that operates under Islamic laws and regulations. In this context, the prohibition of gharar, for example, means that both parties must clearly specify the terms of the contract to avoid uncertainty. However, smart contracts rely on outside sources that could cause confusion if they fail or give wrong information or incomplete data about the contract. (El-Gamal, 2006). Additionally, Islamic finance contracts like Murabaha (cost-plus sale), ijara (leasing), and mudaraba (profit-sharing) have their specific rules. Thus, in a Murabaha, for example, the Islamic financial institution must take ownership of the goods before they can be sold again. In the ijara transaction, the Islamic financial institution only leases the right to use the goods, not the goods themselves. Therefore, it is hard to put these rules into a smart contract because blockchain code can move assets without checking that the underlying Sharia-compliant asset flows are correct. In this context, if smart contracts don't follow these rules, they are considered unacceptable under Sharia law. (Desky and Mahbubul Hye, 2025)

Another challenge related to Sharia compliance is accomplishing balance between automation and human interpretation. In this regard, Sharia law uses ijtihad (juridical reasoning) and fatwa (juridical opinion) to frame contracts in context. Thus, once it is set up, a smart contract cannot be changed, and its logic must be followed without any space for interpretation. For instance, if a smart sukuk contract automatically divides profits but the market conditions make that division illegal, a Sharia board, which consists of scholars and members ,may need to step in. Nevertheless, once a smart contract is in place, it cannot usually be cancelled. (Zulkepli, Mohamad, and Azzuhri, 2023). Islamic financial institutions need to have Sharia supervisory boards to supervise transactions, make decisions, and make sure that all transactions are followed by the Sharia rules. (Salh and Hyland, 2021). The establishment of smart contracts may consist of this governance framework by circumventing the oversight of Sharia supervisory boards

once the contract is constructed. Accordingly, promoting hybrid models that integrate human override clauses and manual dispute resolution mechanisms alongside code is essential. (Al Janabi, 2020). Thus, this form of combination operates under the Sharia justice, which puts fairness above strict enforcement.

3-2- Jurisdictional Ambiguities

The GCC countries have a combined legal system, which includes civil law, which is codified according to the countries' legal system, uncodified Sharia regulations, and electronic laws of commerce. In this regard, in the UAE legal system, UAE Federal Law No. 1 of 2006 on Electronic Commerce and Transactions recognizes digital signatures and contracts, but it doesn't clearly govern self-executing smart contracts (UAE Federal Law, 2006). In addition, in Saudi Arabia Sharia law is always followed, although it has lately written down business and digital rules to assist with the Vision 2030 changes (Middle East Briefing, 2024). Looking at Bahrain, it has made itself a center for fintech by creating a clear set of rules for crypto assets, as it is stated in the Crypto Guide of Bahrain: "CBB has been providing regulations to oversee and manage the 'regulated crypto-asset services' in Bahrain with a view to becoming the region's premier FinTech center." (Charltons Quantum, 2024).

Since both legal systems work in parallel, jurisdiction becomes uncertain. In this sense, a sukuk smart contract issued in Bahrain's sandbox but traded on a UAE exchange may fall under multiple rules, which consist of Bahraini fintech laws, UAE electronic transactions law, and AAOIFI Sharia standards. (White & Case LLP, 2025). Likewise, free zones like ADGM and DIFC follow the English common law system, while the rest of the UAE operates under civil and Sharia law. (Mondaq, 2025). Hence, this separation makes enforcement problematic since a smart contract used across jurisdictions may be valid in one forum and invalid in another.

In addition, digital-asset regulation in the GCC remains ambiguous. The UAE and Bahrain issue clear virtual-asset service provider licenses. In contrast, Oman and Kuwait take a more cautious approach. Thus, without a unified GCC legal framework, jurisdictional arbitrage becomes possible, making cross-border operations harder for Sharia-compliant institutions.

3-3- Dispute Resolution and Contract Interpretation

3-3-1- Limitations of Traditional Courts in Handling Code-Based Contracts

Courts in the GCC may not have sufficient knowledge about technological systems, as these courts are based on a traditional legal system that was established before the development of AI. Thus, understanding contracts that are based on blockchain is not easy for these courts. In addition, judges in the GCC countries learn about civil or Sharia law, but they don't have sufficient information about how to build smart contracts, which is part of the modern technology. Therefore, in cases of dispute, judges may have to decide if a code problem is a breach, a mistake, or an act of God. (Yusuf & Martinez, 2025). Thus, for instance, if a prediction incorrectly reflects commodity prices, resulting in unwanted payments, courts must assess whether the inaccuracy invalidates permission according to Sharia law. Nevertheless, the laws of evidence in numerous GCC countries do not clearly state that blockchain records can be used as evidence or prove themselves. (Alshhadat, 2023). The DIFC Courts in the UAE have started a Digital Economy Court to deal with technology-related issues, including blockchain and AI. (Dubai International Financial Centre Courts, 2021). However, these forms of specialist courts are not the standard, as they are uncommon and unrecognized in most countries in the world. In Saudi Arabia and Qatar, established Sharia courts are the most common, and smart contracts have not yet been tested as binding agreements. (Bantekas & Al-Hosseini, 2025). As a result, this gap in the law leads the investors to lose confidence in Islamic technology solutions.

3-3-2- Arbitration and Specialized Fintech Courts

Due to these problems, arbitration might be a suitable method to settle disputes. Hence, arbitration assists the conflict parties in choosing arbitrators who have skill in both technical and Sharia law, which facilitates resolving the gap between code and law. In this sense, many GCC countries adopted the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards, which makes it possible for arbitral awards to be enforced across borders. (Association of Corporate Counsel, n.d.). Therefore, putting arbitration clauses into smart contracts can ensure that conflicts are settled by Sharia-compliant arbitrators who specialize in Distributed Ledger Technology (DLT). Furthermore, GCC countries should consider consulting specialized fintech courts such as the DIFC Digital Economy Court for guidance. These courts shall comprise technological specialists and Sharia scholars

to review fulfillment and interpret the implications of smart contracts. Moreover, regulatory sandboxes can function similarly to tribunals, enabling regulators to resolve disputes during the trial phase. These developments indicate that the legal system is gradually shifting toward composite decisions, integrating arbitration, specialized tribunals, and Sharia law.

3-4- Regulatory Gaps and Standardization

3-4-1- Lack of Unified Approach Across GCC States

Lack of a unified regulatory framework for smart contracts in the GCC countries is one of the present issues. (Bantekas & Al-Hosseini, 2025). The UAE has adopted a forward-thinking method, with ADGM and DIFC implementing extensive digital asset frameworks. Bahrain has led in licensing crypto-asset enterprises, (Arabian Business, 2024). whereas Saudi Arabia fosters innovation inside its regulatory sandbox but does not possess a specific statute for smart contracts. Oman, Qatar, and Kuwait maintain a traditional approach, prioritizing consumer protection and financial stability. (Carnegie Endowment for International Peace, 2025). Thus, this difference shows significant issues for Islamic financial institutions. Tokenized sukuk issued in one jurisdiction may face enforceability challenges in another jurisdiction due to differences in Sharia compliance or digital legal standards. Therefore, in the absence of standardization, cross-border Islamic fintech solutions will continue to experience fragmentation, deteriorating compliance expenses, and hindered innovation.

3-4-2- Compliance with International Financial Standards

International regulatory bodies, such as the Financial Action Task Force (FATF) and the International Organization of Securities Commissions (IOSCO), require following rules and regulations of anti-money laundering and counter-terrorism financing for digital assets. Therefore, Sharia-compliant institutions must integrate KYC/AML inspections into smart contracts. However, automation may breach Sharia rules if it leads to inequitable treatment of counterparties, and the contract will be invalid according to the Sharia regulations. (Financial Action Task Force, 2021). The automated freezing of assets triggered by AML flags may violate fairness in the event of errors.

Additionally, AAOIFI standards have been highly compromised throughout GCC countries; nevertheless, their implementation concerning

smart contracts remains uncertain. The absence of AAOIFI standards on blockchain and tokenization requires institutions to organize compliance procedures independently. (AlSalih, 2025). Therefore, the incorporation with international financial standards is needed, as Islamic finance should meet the requirements of Sharia boards, GCC regulatory authorities, and international committees like the Basel Committee on Banking Supervision. Combining these models into self-executing code imposes accurate governance, technological ability, and synchronized policymaking.

Therefore, smart contracts preserve major potential for improving efficiency, transparency, and innovation within GCC Islamic financial institutions. They face major legal barriers while struggling to operate under Sharia principles. They shall also govern jurisdictional conflicts among civil law, Sharia law, and current digital regulations. Furthermore, they struggle with judicial and evidentiary limitations in dispute resolution and must address regulatory gaps while meeting international compliance requirements. A multifaceted strategy is required to address these challenges. This strategy includes hybrid smart contract models with human oversight, specialized fintech courts and arbitration mechanisms, GCC-wide harmonization of digital legislation, and AAOIFI-led standardization for Sharia-compliant digital products. Hence, in the absence of these reforms, the potential of smart contracts in Sharia-compliant finance will continue to be limited by legal ambiguity.

4- Comparative Analysis

Smart contracts are self-executing, code-based mechanisms that automatically perform contractual obligations once predefined conditions are met. Their automation, auditability, and resistance to unilateral alteration provide efficiency, cost reduction, and transparency advantages for contemporary financial markets. However, when adopted in Sharia-compliant finance, these technical benefits intersect with doctrinal concerns relating to contractual intent, gharar, riba, enforceability, and the role of human oversight. As a result, smart contracts present both significant opportunities for innovation and complex governance challenges.

In the GCC, financial regulators and Islamic finance shareholders are actively assessing distributed ledger technology, tokenization, and smart contracts. These assessments cover their operation through banking, capital markets, and financial frameworks. Regardless of this experimentation, the legal and Sharia structures that will eventually

determine whether such arrangements are enforceable, compliant, and widely acceptable remain in a state of evolution. In this context, a comparative analysis explains how the GCC's approach differs from other developed jurisdictions and identifies lessons that can be drawn from Malaysia and the United Kingdom.

The GCC regulatory environment is characterized by legal variety and institutional decentralization. National legal structures collaborate with specialized financial free zones, mainly in the UAE, such as ADGM and DIFC, which operate within specific legal structures and apply the common law system. (Chambers and Partners, 2025). Rather than enacting a single, comprehensive smart contract or digital asset statute at the regional level, GCC regulators have adopted an incremental and layered approach. This includes the application of electronic transactions legislation, indicated free zone rulebooks, sector-specific licensing regimes, and market-conduct regulations. Supervised innovation frameworks are commonly applied to investigate new financial technologies in managed environments, assisting authorities to detect risks and market behavior before confirming rules. This system offers flexibility and sensitivity, allowing free zones to apply forward-looking regulatory modes while central regulators keep supervising systemic stability, consumer protection, anti-money laundering compliance, and prudential licensing.

At the same time, this fragmented structure creates legal and Sharia-related uncertainty for cross-border Islamic finance transactions. Tokenized Sharia-labelled instruments, such as sukuk issued or settled on distributed ledgers, may be subject to overlapping and sometimes inconsistent requirements. Differences between AAOIFI standards, national Sharia supervisory boards, and free zone evidentiary or documentation rules can affect how contractual intent, ownership, and compliance are assessed. (Sharairi, 2021). This divergency complicates cross-jurisdictional offerings and increases legal, compliance, and transaction costs, even as innovation accelerates. The GCC approach therefore prioritizes experimentation and market-led development, but at the cost of reduced uniformity and predictability for regional and cross-border Islamic finance activity.

Looking at Malaysia, which is a developed country regarding Islamic finance. Malaysia does not have a specific regulation for the smart contracts; the Contracts Act 1950, which is in effect in Malaysia,

regulates the creation, performance, and enforceability of contracts. Hence, Malaysia still depends on the outdated Electronic Commerce Act 2006 (ECA) and the Contract Act 1950, which was enacted before the independence of Malaysia. (Yusof et al., 2024). However, Malaysia offers a more centralized and integrated model for managing the intersection of fintech innovation and Islamic finance compared to other countries' Islamic finance sectors. Hence, Malaysia has purposely established a comprehensive legal and institutional framework in which digital asset regulation and Sharia authority are aligned. Regulatory ability is assigned between Bank Negara Malaysia, which supervises Islamic banks and the takaful industry, and the Securities Commission Malaysia, which supervises capital markets, including digital assets and tokenization. These bodies operate within a coordinated system that inserts Sharia governance into regulatory decision-making through a centralized Sharia advisory council. Regulatory guidance on digital assets is accompanied by formal Sharia resolutions that clarify the permissibility of specific activities and structures when they satisfy established Sharia criteria. Hence, the role of the Sharia Advisory Committee in Malaysia is important regarding the regulatory and supervisory approach. (Arifin et al., 2025).

Thus, this integrated arrangement facilitates proposed tokenized Islamic products to be assessed under regulatory and Sharia requirements prior to implementation. Smart contracts and DLT-based instruments are assessed not only for technical and legal compliance but also for their conformity with recognized Sharia contract systems and principles. From an operational viewpoint, Malaysia emphasizes clear licensing requirements for market participants, strict conduct obligations, and formalized Sharia supervision of on-chain processes. Thus, applying hybrid documentation is proposed, confirming that practical code is supported by legally binding contractual texts and Sharia explanations that articulate economic substance and risk allocation. This reduces interpretive uncertainty for courts, regulators, and Sharia consultants, lowers the likelihood of post-issuance disputes, and provides issuers and investors with a high level of regulatory and Sharia certainty.

Another comparable country in the context of smart contracts is the United Kingdom. The UK presents a comparative analysis based on its common law system and principles-based regulatory framework. As an alternative to embedding fintech innovation within a distinct legal framework, the UK has emphasized explaining the application of current

legal principles to evolving technologies. Consequently, the UK Jurisdiction Taskforce's legal statement on crypto assets and smart contracts has played a pivotal role by affirming that English private law recognizes crypto assets as property and considers smart contracts capable of establishing legally binding obligations when the requisite legal conditions are satisfied. This approach emphasizes doctrinal stability and judicial interpretation, allowing courts to adapt longstanding legal tests to innovative technological circumstances. (UK Jurisdiction Taskforce, 2019).

Regulatory oversight in the UK complements this doctrinal clarity. Bodies such as the Financial Conduct Authority supervise fintech and crypto-related activities via targeted rules on market conduct, consumer protection, and AML compliance. This combination of legal adaptability and focused regulation has been attractive to innovators looking for predictable legal outcomes without broad statutory reform. Though the UK legal structure does not consist of a centralized Sharia authority as exists in Malaysia. (IBS Intelligence, 2025). Therefore, Sharia compliance in Islamic finance operations is usually managed via private advisory procedures and contractual design rather than public supervisory systems. As a result, while English law can successfully enhance the enforceability of smart contracts and digital asset transactions, it does not resolve internal Sharia interpretive questions, which remain dependent on advisory opinions and market practice.

Taken together, the comparison positions the GCC between Malaysia's highly integrated Sharia-regulatory model and the UK's regulatory system adaptive common law approach. Thus, GCC free zones resemble the UK in their pragmatic, project-specific regulatory clarity and willingness to accommodate innovation without wholesale legal reform. At the same time, national-level Sharia governance requirements across the GCC align more closely with Malaysia's emphasis on Sharia oversight for Islamic financial products. Therefore, the comparative experience recommends that the GCC could benefit from greater coordination between regulatory experimentation and Sharia governance, as well as clearer supervision on the legal effects and evidentiary status of smart contracts. Such developments could help reconcile flexibility with certainty and strengthen the region's ability to integrate smart contracts into Sharia-compliant finance at both domestic and cross-border levels.

5- Lessons for GCC Jurisdictions

The comparative review of Malaysia and the UK could be practical lessons that GCC jurisdictions should consider when designing legal and Sharia-compliant frameworks for smart contracts.

5-1- Combine doctrinal clarity with regulatory pathways

The UK model shows how a well-argued doctrinal statement can notably reduce legal uncertainty. GCC free zones and national authorities shall announce authoritative guidance explaining when existing contract law and electronic transaction statutes will treat smart contract outputs as legally effective. In this sense, the ADGM and DIFC created an important part of this framework for certain financial tools (Bird & Bird, 2024), and GCC national regulators can follow by issuing interpretive management and targeted rule changes to avoid leaving market participants guessing about contractual formation and attribution.

5-2- Integrate Sharia governance early and centrally

The Malaysian Islamic finance system has enhanced the Sharia supervisory approach. Malaysia's combined model illustrates that it's better to make Sharia compliance a part of the regulatory system instead of just adding it when it is just necessary (Hassan & Hussain, 2013). For Sharia-labelled smart contracts, such as tokenized sukuk or automated mudaraba profit-sharing, GCC jurisdictions should consider mechanisms that require Sharia advisory review at the licensing or approval stage and provide clear documentation standards showing how the on-chain operations map to accepted Sharia contract forms (AAOIFI standards may serve as a reference point where adopted). Early Sharia engagement reduces the risk of later disputes and increases investor confidence. Thus, this model verifies smart contracts with the Sharia governance system that assist these contracts to be reliable according to the Sharia rules.

5-3- Require hybrid documentation and operational fallbacks

Both Malaysian and UK regulatory guidance emphasize the value of hybrid approaches in the use of smart contracts. These approaches align machine-readable code with human-readable legal agreements and clearly articulated governance rules. The aim is to confirm that automated execution reflects the parties' legal intentions and remains subject to recognized legal standards. In both jurisdictions, code is not treated as a substitute for law but as a technical instrument that runs within a broader legal framework.

Thus, this comparative guidance implies an important regulatory lesson for the GCC. Regulators shall demand that any smart contract with legal or financial implications be supported by comprehensive off-chain legal documentation. Hence, such documentation should clearly define contractual rights, obligations, and risk allocation. Furthermore, the document shall contain dispute resolution provisions that assist parties to request alternatives through courts or arbitration if automated outcomes are challenged. In addition, alternative mechanisms should be constructed into contractual arrangements to address oracle failures, coding errors, or unforeseen events that intervene in performance.

These protections are particularly important in Sharia-compliant finance. Permanent code may strictly execute outcomes that conflict with Sharia principles if circumstances change or if uncertainty arises. Without human oversight, principles such as equitable treatment, avoidance of excessive uncertainty, and substantive fairness may be undermined. Hence, hybrid structures permit Sharia responsibilities to be preserved by ensuring that automated implementation remains subject to legal interpretation, Sharia review, and corrective intervention when required.

5-4- Use sandboxes to align technical risk management with Sharia compliance.

GCC regulators have actively adopted experimental regulatory settings as a central tool for fintech experimentation. In this context, establishments such as the Saudi Central Bank, the Bahraini Central Bank, and the Abu Dhabi Global Market use these regulatory trial mechanisms to allow supervised direct projects. These situations authorize financial institutions to investigate smart contracts and other digital solutions under close regulatory supervision. Hence, technical protections can be assessed along with legal and Sharia authority requirements. This approach permits regulators to monitor how automated systems operate in practice before wider market implementation.

In this context, access to these sandboxes is typically conditional rather than automatic. Hence, regulators require participants to submit comprehensive Sharia documentation and clearly defined risk amendment proposals. Awareness is given to Sharia-sensitive issues within automated actions. These include transparency in profit-and-loss sharing, allocation of risk, and the treatment of contingencies embedded in code. Through enforcing these conditions, regulators seek to ensure that technological flexibility does not undermine Sharia principles. In this way, sandbox

frameworks balance innovation with doctrinal acceptability and support the responsible integration of smart contracts into Islamic finance.

5-5- Harmonize cross-jurisdictional standards where possible.

One of the primary challenges at present facing the GCC is fragmentation across different jurisdictions. Thus, various regulatory frameworks are applicable within national legal systems and financial free zones. These differences get worse when people have different ideas about Sharia and how to supervise things. As a result, it will be harder and less certain to issue Sharia-compliant, tokenized securities around the world. Nevertheless, when issuers operate in different GCC jurisdictions, they might have to deal with different legal systems and Sharia review procedures.

Hence, supportive regional organizations possibly will assist in resolving these challenges. Proposals directed by the AMF, along with structured negotiation among GCC regulators, have the potential to strengthen compromise on fundamental regulatory principles. Furthermore, establishing consensus on minimum standards for documentation, auditability, and Sharia review would mitigate legal and compliance conflicts. Such coordination would facilitate the expansion of Islamic fintech initiatives across borders while maintaining regulatory oversight and adherence to Sharia principles.

Furthermore, additional interpretation is required in all cases where AAOIFI standards are applied. Regulators should elucidate how these standards pertain to tokenized assets and the structuring of smart contracts. Consequently, clarification is necessary regarding whether distributed ledger records can fulfill the traditional requirements for auditing, ownership, and asset transfer. Clear and authoritative perspectives on these issues would enhance legal certainty, strengthen compliance with Sharia principles, and confirm the broader adoption of tokenized Islamic financial tools across the GCC.

5-6- Clarify evidentiary rules and liability for oracles and intermediaries.

Both the UK and Malaysian frameworks clarify that legal enforceability depends on evidentiary standards and on the explicit assignment of responsibility for external data sources (oracles) and intermediaries. GCC legislatures and regulatory authorities shall consider introducing legislative amendments or regulatory guidance to clarify how distributed ledger records may be recognized and relied upon as legal evidence. In

addition, such measures should specify the circumstances in which off-chain declarations prevail over on-chain execution. Such guidance should also delineate the allocation of liability among programmers, platform administrators, and Sharia advisers when automated processes lead to contested outcomes.

Smart contracts provide substantial operational advantages for Sharia-compliant financial systems. These advantages consist of automated mechanisms for profit and loss sharing, enhanced transparency, and more effective organizing of tools such as sukuk and Sharia-compliant digital fundraising platforms. Nevertheless, their effective deployment in the GCC is contingent upon establishing an appropriate balance between regulatory oversight and governance frameworks. This demands doctrinal clarity that gives legal significance to ledger-based records, like the UK's approach, alongside integrated Sharia governance and regulatory certainty comparable to the Malaysian model. It also calls for practical experimentation through regulatory sandboxes and the constant use of hybrid documentation that combines practicable code with traditional legal and Sharia texts, as already practiced in jurisdictions such as ADGM, DIFC, and national sandbox initiatives.

Thus, GCC jurisdictions can further enhance their policy by adopting a coordinated, multi-faceted scheme. This includes issuing clear legal instructions for electronic transactions and the enforceability of smart contracts, as well as mandating both ex ante and ongoing Sharia compliance assessments for tokenized Islamic financial products. Therefore, authorities should encourage the consistent use of combined on-chain and off-chain documentation, introduce appropriate risk-mitigation and contingency mechanisms, and enhance regional cooperation to address cross-border regulatory and Sharia inconsistencies. It is noted that these processes can clarify the full potential of smart contracts in Islamic finance while preserving legal enforceability and regulatory certainty within Sharia rules.

6- Results and Discussion

The results of this paper show the complex cooperation between modern technology, Sharia principles, and legal frameworks in the implementation of smart contracts of the Islamic financial system in the GCC region. Hence, the results indicate that blockchain-based automation offers important operational benefits, including efficiency, transparency, and reduced dependence on intermediaries. Nevertheless, these benefits do not guarantee full enforceability. Therefore, smart contracts still

depend on legal recognition, Sharia compliance, and harmonized regulatory supervision. As a result, this discussion explains these findings and discovers their implications for regulators and financial institutions operating in GCC jurisdictions regarding smart contracts.

It can be said that the fundamental argument evolving from this study is that the automated implementation of contracts in Islamic finance requires a degree of interpretative flexibility to meet Sharia requirements. However, once smart contracts are adopted, they implement automatically according to their automated rules. This could reduce the discretionary ruling, which is usually essential to sustain justice and to ensure it is operated according to the Islamic legal rules. Moreover, the study illustrates that fully automated contractual processes might violate Sharia rules and principles, especially as profit divisions or asset transfers are prompted by inaccurate external data or occur without human supervision. Therefore, this challenge highlights the necessity for hybrid structures that combine human-in-the-loop mechanisms, such as supervisory Sharia boards or manual dispute-resolution systems, to support on-chain operations. Thus, these approaches operate under the Sharia principle of fairness, as they prioritize equality and ethical assessment over completely automatic enforcement (Al Janabi, 2020; Allen & Overy, 2019).

As a result, these findings request GCC regulators to follow policies to manage digital finance regulations while applying the national man-made legal system and Sharia rules. Mechanisms such as local organization through the Arab Monetary Fund or the establishment of an interjurisdictional Sharia advisory council could facilitate consistent enforcement and reduce transaction costs related to cross-border issuance (AMF, 2022).

An additional challenge to find is the limitation of legal recognition provided to smart contracts. Although electronic transaction laws exist, like the UAE's support for digital consent and online contract arrangement, they do not address the challenges of self-executing code or responsibility for software errors and oracle failures. This gap shows the need for a dedicated regulatory framework illuminating how smart contracts associate with conventional contract elements such as offer, acceptance, and performance. Accordingly, GCC regulators may draw valuable lessons from the UK model, which provides doctrinal clarity in relation to crypto-assets and smart contracts. The UK model explains that

effective guidance and case law can reduce uncertainty without requiring major legislative reform (UKJT, 2019).

Sharia governance is another key issue that is found in this study. Thus, Malaysia's framework shows the value of conducting a Sharia review early in the regulatory process. This reduces uncertainty and ensures that tokenized tools meet doctrinal requirements before entering the market. GCC jurisdictions could implement similar approaches by requiring Sharia board approval, hybrid legal documentation, and accurate alignment with AAOIFI standards. These phases can increase investor confidence and limit fulfillment disputes after operation. Therefore, hybrid documentation, which combines machine-readable code with human-readable legal contracts, is essential. As a result, this will help courts and arbitrators to interpret blockchain events and provide enforceable legal remedies while preserving doctrinal consistency (SC, 2024; BNM, 2024).

Finally, strong dispute resolution mechanisms are essential for managing both technical and Sharia-related issues. Thus, classical courts have difficulties with lacking qualified and expert judges to interpret blockchain code or assess automated consequences. In this context, arbitration councils knowledgeable in Sharia with technical experts, or specialized fintech courts such as the DIFC Digital Economy Court, present more active forums. These bodies can address technical disputes while holding legal enforceability and Sharia compliance (DIFC, 2022; Zetzsche et al., 2020).

Lastly, the discussion highlights that implementing smart contracts in GCC Islamic finance requires a multi-layered method. Firstly, legal frameworks must obviously recognize electronic and automated contracts. Secondly, Sharia governance must be combined and be part of the system to prevent uncertainty of the contracts. Thirdly, hybrid documentation is necessary to ensure that coded terms continue to be interpretable. Fourthly, professional dispute-resolution committees are required for governing both technical and Sharia-related disputes. In that regard, GCC states can take advantage of smart contracts by combining enhanced legal supervision, new rules, and technological protections. These steps could assist in keeping Sharia compliance and boost investor confidence.

7- Recommendations

According to the findings, there are several recommendations that enhance the enforceability and Sharia compliance of smart contracts in

the GCC Islamic finance system. Automation based on blockchain has much potential to make things more open, efficient, and cost-effective. Nevertheless, these potentials are still limited due to the gaps in legal recognition, Sharia authority, regulatory alignment, and methods to settle disputes. In this case, concentrating on gaps needs a lot of work that includes changes to the law, technological protections, and good Sharia oversight.

7-1- Clarifying Legal Recognition of Smart Contract

GCC jurisdictions shall enact specific regulations or some legal provisions to state clearly when smart contracts are legally binding. Existing electronic transaction laws support digital agreements but often do not address the unique features of self-executing code, such as immutability and automatic execution. In this context, financial regulators shall provide guidelines on how blockchain outputs correspond to traditional contract elements, including offer, acceptance, and performance, to reduce legal uncertainty (AMF, 2022). Thus, this precision will enhance market confidence in smart contract enforceability and reduce reliance on case-by-case interpretations in courts or arbitration.

7-2-Integrating Sharia Governance Early

It is noted that an Islamic finance smart contract might conflict with Islamic principles if Sharia compliance is not combined in design and approval procedures. Accordingly, GCC regulators in relation to financial institutions shall ask for the formal Sharia board evaluation of any smart contract proposed for Islamic finance applications. In this sense, adopting practices like Malaysia, where centralized Sharia advisory councils cooperate with regulatory authorities, can ensure that tokenized sukuk, profit-sharing agreements, and other automated contracts operate under Sharia rules and principles before market placement (BNM, 2024). Thus, initial combination helps in reducing post-issuance disputes and enhances investor confidence.

7-3- Implementing Hybrid Documentation and Operational Fallbacks

It is recommended for GCC authorities to implement hybrid documentation models to complete automation with legal and Sharia rules. Accordingly, smart contracts should be complemented by legally binding, human-readable agreements that explicitly define the parties' rights and obligations, as well as the applicable dispute resolution

mechanisms. Furthermore, to enable human control, there should be active protections like emergency stop systems or intervention protocols. Thus, these steps are remarkably significant when there is a technical failure, an oracle error, or regarding Sharia fulfillment. This approach ensures that automated execution functions effectively while preserving the flexibility required under Sharia law without undermining its fundamental principles.

7-4- Strengthening Dispute Resolution Structure

Due to the technical and Sharia-compliance complexities in smart contracts, conventional courts may lack qualified judges to resolve disputes successfully. In this situation, GCC jurisdictions should support arbitration mechanisms and specialized fintech courts that combine technical and Sharia expertise. Adding arbitration-related clauses directly into smart contracts can enable faster dispute resolution while maintaining compliance with regional and international legal standards. Thus, these methods will enhance cross-border enforceability, particularly for tokenized Islamic instruments operating across different jurisdictions.

7-5- Harmonizing Regulatory Standards Across GCC States

Fragmented regulations across GCC countries hinder the cross-border issuance of Sharia-compliant smart contracts. Regional harmonization, possibly through the Arab Monetary Fund or inter-regulatory councils, shall determine minimum standards for Sharia review, documentation, and asset transfer verification. In addition, it should also meet requirements for the permissibility of electronic evidence. Consequently, such harmonization would lower compliance costs, reduce legal uncertainty, and boost a more integrated GCC Islamic fintech market.

7-6- Promoting Capacity Building and Technical Literacy

It is also recommended that regulators, Sharia Supervisory boards, and financial institutions invest in technical training and human capacity. Thus, the staff of the Islamic financial institutions should take training courses to gain specific knowledge in smart contracts. Understanding blockchain design, smart contract coding, and oracle mechanisms is necessary for accurately assessing Sharia compliance, evaluating risks, and interpreting contractual execution. In this context, training programs for judges, arbitrators, and Sharia scholars would enhance the strength of enforcement and supervision in this emerging digital finance environment.

Finally, GCC authorities can improve their insight and effective operation of smart contracts within the Islamic financial industry via the adoption of comprehensive policy frameworks. These policies should encompass legal clarification, early integration of Sharia authority, hybrid documentation approaches, robust dispute resolution mechanisms, regulatory coordination, and the enhancement of technical capacity. Collectively, these measures improve the enforceability of Sharia-compliant digital financial services, support Sharia adherence, and promote their sustainable long-term development.

8- Conclusion

The study examined the enforceability and legal challenges of smart contracts in Sharia-compliant financial systems across the GCC, which comprises Saudi Arabia, the UAE, Bahrain, Kuwait, Oman, and Qatar. The study applies critical analysis to evaluate how smart contracts operate under Sharia rules in the GCC countries. Thus, the study provides significant advantages, such as automation, transparency, and efficiency of smart contracts. However, smart contract implementation in Islamic finance faces legal, regulatory, and Sharia compliance challenges. Therefore, GCC jurisdictions have initial legal structures, which include electronic transaction laws and fintech sandboxes, but these do not usually address the unique features of self-executing code. Legal diversity across civil law, Sharia law, and free-zone common law creates cross-jurisdiction uncertainty, complicates enforcement, and raises transaction costs for Sharia-compliant digital instruments. Besides, gaps in Sharia governance, particularly the absence of formal regulation on blockchain and smart contracts from AAOIFI and national Sharia boards, pose risks that automated contracts could unintentionally breach fundamental Islamic rules.

The legal implications for GCC financial markets are important regarding the smart contracts. However, without clear legal recognition or interpretive instructions, smart contracts may face uncertainty in traditional courts. This often makes investors less confident in tokenized Islamic financial products like sukuk, crowdfunding agreements, and profit-sharing arrangements. Accordingly, this study states that hybrid methodologies are vital to merge automated execution with Sharia compliance. Furthermore, regulatory divergence among GCC jurisdictions needs a regulated system to support cross-border activities, standardize Sharia assessment, and minimize the risk of inconsistent interpretations. In this regard, the development of tailored legal and operational models for Sharia-compliant smart contracts would enhance

their enforceability. Such initiatives would also improve market transparency and attract both domestic and international investment into the region's Islamic fintech ecosystem.

The study concludes by highlighting a full understanding of smart contract operation within hybrid legal frameworks. It provides evidence-based guidance for regulators and Islamic financial institutions on aligning technological innovation with Sharia principles. Moreover, it identifies operational best practices drawn from comparable jurisdictions, including the United Kingdom and Malaysia.

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