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ANALYSIS OF SMART CONTRACT IN DECENTRALIZED FINANCE (DEFI) FROM THE PERSPECTIVE OF FIQH MUAMALAH AND MAQĀṢID AL-SHARĪ‘AH

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Abstract

The rapid development of blockchain technology has introduced smart contracts as automated digital agreements widely used in the Decentralized Finance (DeFi) ecosystem. These contracts operate without intermediaries and execute transactions based on algorithmic conditions, creating new legal and sharia implications. This study aims to analyze the validity of smart contracts as akad (contracts) within the framework of fiqh muamalah and to formulate regulatory needs based on maqāṣid al-sharī‘ah and positive law. This research uses normative juridical methods with statutory, conceptual, and sharia approaches by examining legal doctrines, regulations, and Islamic jurisprudence principles. The results show that smart contracts can qualify as valid akad if pillars and conditions of contract are fulfilled, including parties, consent, object, and lawful purpose, although digital consent and automated execution require interpretative expansion. From the maqāṣid perspective, smart contracts potentially support protection of wealth (ḥifẓ al-māl), transparency, and efficiency, but also pose gharar and risk if coding errors and regulatory gaps exist. Therefore, integrative regulation and sharia compliance standards are necessary to ensure legal certainty and maslahah in DeFi transactions.

Keywords: ***blockchain, DeFi, fiqh muamalah, maqasid sharia, smart contract***.

INTRODUCTION

The rapid development of digital technology has fundamentally transformed how society conducts transactions and manages economic activities. One of the most significant innovations in the last decade is blockchain technology, which enables transparent, decentralized, and trustless transaction systems without intermediaries (Kristanto et al., 2024). One of the most important implementations of blockchain is the smart contract, a digital contract designed to automatically facilitate and enforce agreements through programmed code execution. Smart contracts operate as automated agreements embedded in blockchain protocols and are widely used within the Decentralized Finance (DeFi) ecosystem. Through this mechanism, transactions can be executed automatically based on predetermined algorithmic conditions without relying on banks, notaries, or other third parties (Harahap, 2025). The growth of fintech and digital asset ecosystems shows increasing adoption of blockchain-based financial services in Indonesia, supported by the expansion of digital financial infrastructure and user participation (Otoritas Jasa Keuangan, 2025).

From a legal perspective, smart contracts present new challenges because their execution is automated, immutable, and cross-jurisdictional. Their structure differs from conventional contracts, which rely on human interpretation and enforcement. Smart contracts reduce transaction costs and increase efficiency, but raise issues related to legal validity, liability for coding errors, and regulatory certainty (Werbach & Cornell, 2017). In Indonesia, although electronic transactions are legally recognized, specific regulations regarding the structure and enforcement of smart contracts are still limited, creating a normative gap in legal protection (Makarim, 2017). From the perspective of Islamic law, every economic transaction must be based on a valid akad that fulfills pillars and conditions, including competent parties, clear consent (ijab-qabul), lawful object, and permissible purpose. Transactions must also be free from prohibited elements such as riba, gharar, and maysir (Khaerudin & Siregar, 2019). The transformation of contractual consent into algorithmic code within smart contracts raises important questions about whether digital approval mechanisms can represent valid contractual intent in fiqh muamalah (Fitri,

2023). At the same time, technological innovation in finance should be evaluated not only formally but also substantively through *maqāṣid al-sharī'ah*, which emphasizes protection of wealth, justice, and public benefit. The maqasid framework views law as a dynamic system oriented toward human welfare and adaptive to technological change (Auda, 2008). Therefore, examining smart contracts in DeFi through fiqh muamalah and *maqāṣid al-sharī'ah* perspectives becomes essential to ensure that digital financial innovation remains aligned with sharia principles and legal certainty. Thus, a thorough study of smart contracts within DeFi platforms is crucial, examined from a muamalah jurisprudence perspective to understand whether algorithms can legitimately represent the will of the parties and how Sharia principles can be accommodated in an automated and immutable system. Given that technological developments are progressing faster than Sharia regulations and fatwas, this has created an analytical gap that must be filled through academic research to fill the regulatory gap, address normative issues, and provide a reference for the development of a digital financial system that aligns with Sharia principles.

LITERATURE REVIEW

The development of smart contracts and Decentralized Finance (DeFi) has attracted multidisciplinary attention from legal, technological, and Islamic economic scholars. Existing literature generally discusses smart contracts from three major perspectives: blockchain technology and digital contracts, legal validity within modern contract law, and sharia compliance within fiqh muamalah and *maqāṣid al-sharī'ah* frameworks. From a technological and regulatory perspective, blockchain is understood as a distributed ledger system that enables secure, transparent, and immutable record-keeping without centralized control. Its legal and institutional implications have been widely discussed in relation to digital transformation and regulatory adaptation. Kristanto et al. (2024) explain that blockchain technology reshapes legal relationships by shifting trust from institutions to code-based verification systems. Hendraswara et al. (2023) further emphasize that blockchain adoption in Indonesia shows strong potential across financial and administrative sectors, but requires legal readiness and governance standards. Harahap (2025) notes that fintech innovation, including smart contract usage, accelerates financial efficiency while simultaneously creating new categories of legal risk and compliance challenges.

In contract law theory, smart contracts are often debated in terms of whether they should be classified as legally binding agreements or merely as automated technical tools. Werbach and Cornell (2017) argue that smart contracts provide execution certainty but do not eliminate the need for legal interpretation of intent, obligation, and fairness. They stress that code-based execution cannot fully replace normative legal reasoning. Within Indonesian legal doctrine, electronic contracts and digital signatures are generally recognized as valid, provided that essential elements of agreement are fulfilled. Makarim (2017) explains that electronic transactions law has expanded the recognition of digital agreements, although specific operational standards for automated contracts remain underdeveloped. Salim (2016) also emphasizes that the evolution of contract law in Indonesia allows flexibility of form but still requires fulfillment of substantive validity elements. From the Islamic law perspective, akad functions as the central legal foundation of economic transactions. Fiqh muamalah literature consistently states that a valid akad must fulfill pillars and conditions covering parties, consent, object, and lawful purpose. Khaerudin and Siregar (2019) outline that contractual validity depends not only on formal consent but also on the absence of prohibited elements such as riba, gharar, and maysir. Ismaliyanto et al. (2024) add that contemporary Islamic economic practices must preserve transparency, fairness, and risk clarity in order to maintain sharia compliance in modern financial instruments.

Recent Islamic finance studies have begun to address smart contracts specifically. Fitri (2023) analyzes the potential application of sharia-based smart contracts on blockchain and concludes that they are permissible in principle but require careful structuring to avoid uncertainty and unlawful gain. Gunawan (2025) highlights that integration of blockchain and Islamic finance instruments such as zakat, waqf, and halal investment is promising, yet still requires deeper fiqh analysis and governance frameworks. Kurnaini and Rohmah (2024) show that digital transaction models must still be measured against classical akad theories to determine their permissibility. The *maqāṣid al-sharī'ah* framework provides a higher-order evaluative structure beyond formal contractual elements. Auda (2008) proposes a system-based maqasid approach that is dynamic, multidimensional, and responsive to social and technological change. In this approach, legal evaluation must consider outcomes, impacts, and systemic benefit, especially in protecting wealth (ḥifẓ al-māl) and preventing harm. Application of maqasid in Islamic economic contracts has been further discussed by Mufid (2018), who emphasizes that technological innovation is acceptable when it advances justice, benefit, and risk protection. Although prior studies have examined blockchain legality, fintech regulation, and sharia digital finance separately, the literature shows a gap in integrated analysis focusing specifically on the validity of smart contract akad within DeFi ecosystems using both fiqh muamalah and *maqāṣid*

al-sharī'ah frameworks. Most previous works either focus on positive law contract validity, technological infrastructure, or general Islamic finance principles without conducting a structured doctrinal mapping of smart contract elements against akad pillars. Therefore, this study positions itself to fill that gap by providing a combined normative legal and sharia analysis of smart contracts in DeFi transactions based on established fiqh and maqasid theory.

METHOD

This research uses a normative juridical method focusing on the analysis of legal norms, doctrines, and principles governing contracts, electronic transactions, and Islamic commercial law. The study examines smart contracts in the Decentralized Finance (DeFi) ecosystem through an integrative framework combining positive law and fiqh muamalah, supported by *maqāṣid al-sharī'ah* theory. Normative legal research is appropriate because the core issue concerns the validity of akad structures, legal qualification of smart contracts, and the need for regulatory formulation rather than empirical behavioral measurement (Amirudin & Asikin, 2006). The research employs several approaches. First, the statutory approach analyzes relevant legal instruments governing contracts and electronic transactions, including general contract law principles and electronic transaction regulations (Makarim, 2017). Second, the conceptual approach is used to examine doctrinal concepts such as smart contracts, digital consent, akad validity, and decentralized systems based on legal and sharia theories (Kristanto et al., 2024). Third, the sharia approach applies fiqh muamalah principles and *maqāṣid al-sharī'ah* frameworks to evaluate contractual legitimacy and compliance (Khaerudin & Siregar, 2019).

Sources of legal materials consist of primary, secondary, and tertiary legal materials. Primary materials include statutory regulations, official policy documents, and sharia normative instruments such as DSN-MUI fatwas related to technology-based financing services. Secondary materials include books, scholarly journals, and academic publications on blockchain, smart contracts, contract law, and Islamic economic law (Ismaliyanto et al., 2024). Tertiary materials include legal dictionaries and reference works supporting conceptual clarification. Legal materials are collected through document study and library research, focusing on authoritative texts and peer-reviewed academic sources. The analytical technique uses qualitative normative analysis, conducted by systematically mapping smart contract characteristics against (1) pillars and conditions of akad in fiqh muamalah, (2) validity elements of contracts in positive law, and (3) *maqāṣid al-sharī'ah* objectives, particularly protection of wealth, justice, and prevention of harm. Interpretation is carried out using doctrinal and systematic legal interpretation methods to produce prescriptive legal conclusions and regulatory recommendations (Nurbani, 2020). Through this method, the study develops a structured normative evaluation model to determine the legal and sharia validity of smart contract implementation within DeFi transactions and to formulate principles for sharia-aligned regulatory development.

RESULTS AND DISCUSSION

This section presents the normative findings of the study regarding the validity of smart contract implementation in the Decentralized Finance (DeFi) ecosystem from the perspective of fiqh muamalah and *maqāṣid al-sharī'ah*, as well as its position within positive law. The analysis is conducted by mapping the technical and legal characteristics of smart contracts against akad pillars and conditions, sharia prohibitions, and regulatory principles.

1. Analysis of Akad Pillars in Smart Contracts According to Fiqh Muamalah

In relation to business, Islamic business ethics seeks to explain in depth the issues of halal and thayyib business according to the perspective of Islamic law while still considering the maqāṣid al-syarī'ah. Islam teaches that Muslims are only allowed to consume and produce something, whether goods or services, that are halal and thayyib. The principles of halal and thayyib are essentially realized through a valid contract (akad) mechanism according to sharia, because every activity of production, distribution, and consumption in Islamic business must be based on clear legal relationships and in accordance with the provisions (Nur Chanifah, 2021). In fiqh muamalah, an akad (contract) is defined as a legal act (*taṣarruf qānūnī*) that produces legal consequences over property and rights of the contracting parties. The validity of an akad is not determined merely by formal agreement, but by the fulfillment of essential pillars and conditions reflecting free will, legal capacity, object clarity, and lawful purpose. Classical and contemporary fiqh doctrine identifies four main pillars of akad: the contracting parties (al-'āqidān), the expression of consent (ṣīghah ijab–qabul), the contractual object (ma'qūd 'alaih), and the contractual purpose (maudū' al-'aqd) (al-Zuhaili, 2011). Islamic legal scholars emphasize that legal capacity (*ahliyyah al-adā'*) and voluntary consent are fundamental requirements for contractual validity. A contract concluded by an incapable party or under coercion is considered defective or invalid because it lacks genuine will. This principle is grounded in the Qur'anic rule that

property transactions must be based on mutual consent (Q.S. al-Nisā' [4]: 29) and reinforced by the Prophetic tradition stating that trade is valid only when based on mutual willingness. Therefore, smart contract transactions in the Decentralized Finance (DeFi) ecosystem must be assessed based on whether digital mechanisms preserve conscious intent and voluntary approval despite pseudonymous identities. Research findings indicate that the pillar of **contracting parties (al-'āqidān)** is functionally satisfied in DeFi smart contracts through wallet ownership and cryptographic signatures using private keys. Although identities are pseudonymous, fiqh muamalah does not require public identity disclosure as a validity pillar, but rather legal capacity and conscious intent. As long as users understand the transaction mechanism and act voluntarily, the subject requirement is considered fulfilled (al-Sarakhsi, n.d.; al-Zuhaili, 2011). The pillar of **ṣīghah (offer and acceptance)** in smart contracts is expressed through digital conduct rather than spoken or written declarations. User actions such as approving, confirming, and signing blockchain transactions function as consent expression. Fiqh doctrine recognizes written and conduct-based consent (*ṣīghah kitābiyyah and fi'liyyah*) and does not restrict validity to verbal form. Ibn Qudāmah explains that any form recognized by custom as expressing agreement is sufficient. Smart contract interaction therefore corresponds to conduct-based akad (akad al-mu'āṭāh) and is valid in principle when clarity and voluntariness exist. Regarding the **object of contract (ma'qūd 'alaih),** the study confirms that smart contract code is not the contractual object but the execution instrument. The object consists of digital assets, tokens, or economic rights transferred or generated through the protocol. Fiqh requires that the object be lawful, valuable, deliverable, and clearly defined. Contemporary fiqh accepts new asset forms as māl when recognized as having value and benefit. However, extreme volatility and protocol complexity may introduce gharar when users lack adequate understanding (Ibn Taymiyyah, n.d.; al-Zuhaili, 2011).

The **contractual purpose (maudū' al-'aqd)** is the most decisive factor. The legal maxim *al-umūr bi maqāṣidihā* establishes that legal acts are judged by their objectives. Even when formal pillars are satisfied, contracts become invalid if their purpose contradicts sharia principles. The findings show that many DeFi protocols rely on interest-based returns, speculative yield mechanisms, and high-risk leverage resembling riba and maysir structures. In such cases, the akad becomes substantively non-compliant despite structural validity. Additionally, smart contract technical properties immutability, code complexity, bug risk, absence of khiyār (cancellation option), and hack vulnerability raise concerns regarding gharar, justice, and wealth protection. Fiqh muamalah recognizes corrective safeguards to prevent harm, while many DeFi smart contracts lack such mechanisms. This indicates that DeFi smart contracts often satisfy akad pillars formally but not substantively under fiqh muamalah and *maqāṣid al-sharī'ah* standards.

Table 1. Fulfillment of Akad Validity Requirements in DeFi Smart Contracts (Fiqh Muamalah Perspective)

No	Akad Requirement Component	Implementation in DeFi Smart Contract	Fulfilled	Not Fulfilled
1	Contracting Parties (al-'Āqidān): legally capable & voluntary	User controls wallet and signs with private key	☑	☐
2	Mutual Consent (Riḍā')	Explicit approve/confirm transaction	☑	☐
3	Ṣīghah (Ijab–Qabul)	Represented through code offer + user interaction	☑	☐
4	Object (Ma'qūd 'Alaih)	Digital assets/tokens; technically defined	☑	☐
5	Lawful Purpose	Many DeFi models use interest-based yield	☐	☑
6	Clarity (Anti-Gharar)	Code complexity and bug risk	☐	☑
7	Free from Riba	Automated interest mechanisms common	☐	☑
8	Free from Maysir	Yield farming & leveraged speculation	☐	☑
9	Justice Balance	Immutability may cause unfair loss	☐	☑
10	Khiyār (Cancellation Right)	No reversal mechanism	☐	☑
11	Wealth Protection (Hifẓ al-Māl)	Hack and exploit vulnerability	☐	☑

2. Regulatory Needs Analysis of Smart Contracts Based on *Maqāṣid al-sharī'ah* and Positive Law

a. Comparative Review of Global Legal Legitimacy of Smart Contracts

The legal legitimacy of smart contracts in the global legal landscape has shifted from theoretical debate toward concrete regulatory implementation. Different jurisdictions adopt varying approaches, ranging from permissive

innovation-driven models to prescriptive regulatory control, depending on economic policy priorities and consumer protection frameworks. This comparative mapping is important to evaluate how regulatory structures may align with *maqāṣid al-sharī'ah* principles, particularly justice, legal certainty, and wealth protection.

1). United States: Juridical Inclusion and Specific Legalization Approach

The United States represents one of the most progressive jurisdictions in recognizing the legal validity of smart contracts. Rather than creating a separate legal regime, the U.S. integrates blockchain-based contracts into the existing electronic contract framework, emphasizing functional equivalence and evidentiary certainty.

a) Federal Foundation: E-SIGN Act and UETA

At the federal level, smart contract legitimacy rests on two principal legal foundations: the Electronic Signatures in Global and National Commerce Act (E-SIGN Act) and the Uniform Electronic Transactions Act (UETA), which has been adopted by nearly all states. The E-SIGN Act guarantees that electronic signatures and contracts have the same legal validity as paper-based documents in interstate and international commerce. A contract may not be denied legal effect solely because it is in electronic form. Because smart contracts consist of executable electronic instructions, this framework provides baseline legitimacy for code-based agreements. UETA further affirms that electronic records and signatures cannot be denied legal effect, provided that the parties intend to be bound. In blockchain systems, cryptographic signatures using private keys satisfy the definition of electronic signatures when intent is present. In practice, smart contract platforms often include click-wrap consent mechanisms to ensure legally demonstrable agreement before code execution.

b) State-Level Specific Legalization (Arizona and Tennessee)

Several U.S. states have introduced more specific statutes addressing distributed ledger and smart contract characteristics. Arizona and Tennessee are widely recognized as pioneers in state-level smart contract legislation.Arizona law defines a smart contract as an event-driven program operating on a decentralized, distributed, and replicated ledger. Arizona House Bill 2417 explicitly recognizes that asset ownership rights may be transferred via smart contracts and that contractual clauses are not invalid merely because they are executed automatically by code. This removes ambiguity regarding algorithmic execution capacity. Tennessee similarly confirms that smart contract usage in commerce does not diminish parties' legal rights over information and records, balancing blockchain transparency with privacy protection. These specific statutes reduce interpretive uncertainty, encourage fintech investment, and bridge programming language and legal doctrine a development particularly relevant for global Islamic digital finance requiring akad clarity.

2) European Union: Prescriptive Regulatory Approach (EU Data Act)

In contrast to the U.S. flexibility model, the European Union adopts a more prescriptive and interventionist approach. Through the EU Data Act, effective across member states beginning in 2024–2025, smart contracts are subject to strict operational standards. The EU treats smart contracts not merely as private tools but as digital infrastructure subject to public oversight. Service providers must ensure technical robustness, security audits, and resistance to manipulation or coding errors. Interoperability standards are also mandated to prevent technological monopolies and ensure cross-network functionality.

A central and controversial requirement is the mandatory inclusion of a termination or override mechanism ("kill switch") in smart contracts handling data exchange. The EU explicitly rejects an absolute "code is law" doctrine. Contracts must be stoppable or resettable in cases of error, dispute, or emergency. From an Islamic legal perspective, this aligns with the doctrine of faskh (contract annulment upon defect) and harm prevention principles. The EU framework also clearly assigns legal liability to deployers or service providers, eliminating ambiguity common in decentralized ecosystems. Violations may result in significant administrative penalties comparable to GDPR enforcement. This model emphasizes accountability, consumer protection, and systemic risk control.

3) Singapore and United Arab Emirates: Technology-Finance Hybrid Hubs

Singapore and the United Arab Emirates position themselves as regulatory bridges between technology and finance. Singapore's updated Electronic Transactions Act adopts a functional approach, ensuring that existing contract law can accommodate automated transactions without narrowly redefining smart contracts. In the UAE, particularly Dubai, the Virtual Assets Regulatory Authority (VARA) provides regulatory certainty for blockchain and smart contract use in virtual asset industries. Dubai integrates English common law principles with blockchain operational needs, making it an influential reference point for digital Islamic finance development. Regulatory clarity, licensing, and technical audit requirements form the backbone of this hybrid approach.

Table 2.
Comparative Global Smart Contract Regulatory Approaches

Jurisdiction	Regulatory Model	Legal Basis	Key Features	Relevance to Maqāṣid
United States	Functional inclusion	E-SIGN Act, UETA	Electronic equivalence, intent-based validity	Supports legal certainty
Arizona & Tennessee	Specific legalization	State blockchain statutes	Smart contract definition, asset transfer validity	Reduces ambiguity
European Union	Prescriptive control	EU Data Act	Audit duty, interoperability, kill switch, liability	Strong harm prevention
Singapore	Functional adaptation	Electronic Transactions Act	Tech-neutral contract recognition	Flexibility & innovation
UAE (Dubai)	Hybrid fintech model	VARA framework	Licensing, audit, virtual asset governance	Structured oversight

Based on the above analysis, the regulation of smart contracts that aligns with fiqh muamalah and *maqāṣid al-sharī'ah* should prioritize the substance of the contract rather than merely its technological mechanism. Shariah parameters should be developed using Jasser Auda's contemporary maqāṣid framework, which emphasizes justice, wealth protection, systemic openness, and multidimensional evaluation. A smart contract may be considered valid when its algorithmic structure ensures fairness, prevents exploitation, and minimizes information asymmetry, reflecting the principle of *al-'adl* in fiqh muamalah. Key regulatory parameters include protection of wealth (*ḥifẓ al-māl*) through strict technical security, mandatory audits, and fail-safe mechanisms; avoidance of *gharar* through transparency, clear documentation, and auditable code; and prevention of *maysir* by rejecting purely speculative contract structures. Smart contracts should also demonstrably generate public benefit (*jalb al-maṣlaḥah*), such as efficiency and broader financial access, while preventing systemic harm. Therefore, shariah-compliant smart contract regulation must integrate maqāṣid values with positive law instruments such as KHES, DSN–MUI Fatwa No. 117/2018, Law No. 12/2011, and international digital asset regulations like AETA, EU Data Act and VARA forming a comprehensive and adaptive compliance model for automated contracts in the global digital finance ecosystem.

CONCLUSION

Smart contracts in the Decentralized Finance (DeFi) ecosystem demonstrate that, at a structural level, the essential pillars of contract (*rukun akad*) in fiqh muamalah—namely the contracting parties, expression of consent, and identifiable object—can be functionally fulfilled through digital mechanisms such as cryptographic signatures, programmable consent actions, and tokenized assets. However, substantive compliance remains problematic. Many DeFi implementations still contain elements of riba, gharar, and maysir, along with technical risks, immutability constraints, and the absence of corrective options (*khiyār*), which challenge the realization of justice and wealth protection required by *maqāṣid al-sharī'ah*. As a result, smart contracts are often formally valid but substantively deficient from a shariah perspective. But, in Indonesia, smart contracts can be accommodated under general contract law and electronic transaction law, but specific regulatory and shariah-governance gaps remain. Accordingly, future smart contract regulation should adopt a maqāṣid-based approach that emphasizes contractual substance, algorithmic fairness, technical security, auditability, and public benefit. Integrating maqāṣid principles with positive law frameworks and shariah standards provides a more comprehensive compliance model and offers a normative foundation for developing shariah-aligned smart contracts in the global digital finance system.

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