

Author:

Sabir M. Al-Mezel^{1*}, Samir M. Al-Dalalah², Nabeel F. Al-Shatnawi³, Mohammad Fawwaz Matalkaha⁴, Abd Alhade Mossa Hasan Rshdan⁵

Affiliation:

^{1,2,3}Faculty of Law, Al al-Bayt University, Mafrq, Hashemite Kingdom of Jordan

^{4,5}Faculty of Law Amman Arab University, Amman, Hashemite Kingdom of Jordan

Corresponding author:

* m.almatalqa@aau.edu.jo

Doi: 10.32332/milrev.v5i1.13661

Dates:

Received 11 January, 2026

Revised 23 April, 2026

Accepted 04 June, 2026

Published 19 June, 2026

Copyright:

© 2026. Sabir M. Al-Meze et al.

This work is licensed

under [Attribution-ShareAlike 4.0 International](#)



Read Online:



Scan this QR code with your mobile device or smart phone to read online

Contemporary Islamic Economic Law: Autonomous Smart Contracts and the Legal Dilemma of Liability for Technical Errors

Abstract: Contemporary Islamic economic law faces emerging challenges arising from the rapid development of autonomous smart contracts and blockchain-based automated contracting systems. This study examines the legal and Islamic jurisprudential implications of autonomous smart contracts and the allocation of liability for technical errors in digitally executed agreements. It aims to analyze the validity of automated contracting under contemporary Islamic economic law and comparative legal frameworks, particularly in relation to blockchain-based systems and electronic agents. Using a doctrinal legal research methodology, the study applies descriptive, analytical, and comparative approaches, drawing on statutory provisions, international conventions, and principles of Islamic jurisprudence, including liability (*damān*), causation (*sababiyah*), and risk-bearing (*al-ghurm bi al-ghunm*). The findings indicate that autonomous smart contracts are generally valid under both positive law and Sharia when they reflect prior human consent encoded in automated systems and comply with the requirements of clarity, legality, and the absence of excessive uncertainty. However, significant legal uncertainty persists regarding liability for technical errors, system malfunctions, and programming defects occurring during automated execution. The study concludes that responsibility is primarily attributed to the owner or operator of the automated system, as supported by comparative legal doctrines treating electronic agents as instruments of the contracting party and by Islamic principles linking profit with liability. Accordingly, the research contributes to bridging classical Islamic legal theory and modern digital contracting environments while highlighting the need for clearer regulatory frameworks to address emerging technological risks.

Keywords: Islamic Economic Law; Smart Contracts; Sharia Compliance; Technical Liability.

INTRODUCTION

Contemporary technological innovation has fundamentally transformed global commercial and financial activities through the integration of digital platforms, blockchain technology, artificial intelligence, and automated transaction systems. These developments have accelerated the emergence of autonomous smart contracts, which execute contractual obligations automatically through pre-programmed code without requiring continuous human intervention after their deployment. Such technological advances have reshaped traditional concepts of contract formation and performance, creating new legal relationships in which contractual obligations may be fulfilled exclusively by decentralized digital systems operating on blockchain networks.¹ Consequently, contemporary Islamic economic law is increasingly confronted with unprecedented jurisprudential and legal questions regarding the validity of autonomous contractual mechanisms, the legal status of automated decision-making, and the allocation of liability in the event of technical failures.²

The digitalization of commercial transactions has expanded beyond conventional electronic commerce into highly sophisticated automated environments capable of independently verifying contractual conditions, transferring digital assets, and executing financial obligations without intermediary participation. International legal instruments have gradually recognized the legitimacy of electronic consent expressed through automated systems. The UNCITRAL Model Law on Electronic Commerce acknowledges that contractual offers and acceptances may be expressed through electronic communications generated automatically by information systems, while the Saudi Electronic Transactions Law similarly validates legal declarations made through electronic

¹ Cátia Marques Cebola and Susana Sardinha Monteiro, 'New Trends of Digital Justice: The Online Mediation—Between a Challenge and a Reality (The Portuguese Legal Framework)', *Laws* 13, no. 2 (2024): 18, <https://doi.org/10.3390/laws13020018>.

² Azlin Alisa Ahmad et al., 'The Position of Smart Contracts in the Light of Islamic Contract Theory', *Samarah: Jurnal Hukum Keluarga Dan Hukum Islam* 8, no. 1 (2024): 144-71, <https://doi.org/10.22373/sjhk.v8i1.16372>.

means.³ These legislative developments demonstrate the growing acceptance of automated contracting within modern legal systems and provide an important foundation for regulating digital commerce.

Despite this legal recognition, autonomous smart contracts introduce unique challenges that distinguish them from ordinary electronic contracts. Unlike traditional electronic agreements, autonomous smart contracts may continue executing contractual obligations independently once deployed on blockchain platforms, often without the possibility of human intervention or modification. This characteristic significantly enhances efficiency, transparency, and transactional certainty while simultaneously generating complex legal dilemmas concerning accountability when programming defects, software vulnerabilities, coding errors, oracle failures, or blockchain malfunctions produce unintended legal consequences. As commercial reliance on decentralized technologies continues to increase, determining responsibility for technical errors has become a fundamental issue affecting legal certainty, market confidence, consumer protection, and the overall stability of digital economic transactions.

These developments are particularly significant within the framework of Islamic economic law, where contractual validity extends beyond formal legal requirements to encompass ethical principles, fairness, transparency, and compliance with the objectives of Sharia (maqāṣid al-sharīʿa). Islamic contract theory emphasizes mutual consent (tarāḍī), certainty of contractual obligations, lawful subject matter, and equitable allocation of rights and responsibilities between contracting parties. The emergence of autonomous contracting, therefore, raises important jurisprudential questions regarding whether algorithmic systems may legitimately represent contractual intent and whether liability arising from technical failures should be attributed to programmers, platform operators, users, or owners of automated systems under established principles of Islamic jurisprudence

³ 'Article 11 of UNCITRAL Model Law on International Commercial Arbitration: Appointment of Arbitrators', *IBC Laws*, n.d., accessed 26 April 2026, <https://ibclaw.in/article-11-of-uncitral-model-law-on-international-commercial-arbitration-appointment-of-arbitrators/>.

such as liability (*damān*), causation (*sababiyyah*), prevention of harm (*lā ḍarar wa lā ḍirār*), and the doctrine that liability accompanies benefit (*al-ghurm bi al-ghunm*).⁴

The rapid growth of blockchain-based financial services has prompted extensive scholarly discussion of the legal and technical implications of smart contracts. Existing literature generally defines smart contracts as self-executing digital protocols that operate on blockchain infrastructure and automatically enforce contractual terms according to coded instructions, without requiring judicial enforcement or third-party administration.⁵ Their adoption has been widely recognized for reducing transaction costs, enhancing transparency, improving operational efficiency, and minimizing opportunities for contractual manipulation or fraud. At the same time, however, scholars acknowledge that these technological advantages create significant legal uncertainties because existing contract doctrines were developed primarily for agreements concluded and performed through direct human action.

Recent legal scholarship has therefore focused on the enforceability and regulatory status of smart contracts within national and international legal systems. Systematic analyses indicate that the absence of comprehensive legislative frameworks governing blockchain-based contracts creates uncertainty about the legal validity, dispute resolution, evidentiary standards, and liability allocation in the event of automated system malfunctions.⁶ Such concerns become increasingly important in financial transactions where automated execution may produce irreversible legal consequences despite programming defects or inaccurate data inputs.

⁴ Mahmood Alaloosh et al., 'Adapting Iraqi Law to Smart Contracts: A Comparative Analysis Incorporating Islamic Law Principles and Consumer Protection in the Contemporary Digital Era', *MILRev: Metro Islamic Law Review* 5, no. 1 (2026): 210-46, <https://doi.org/10.32332/milrev.v5i1.13031>.

⁵ Zibin Zheng et al., 'An Overview on Smart Contracts: Challenges, Advances and Platforms', arXiv.Org, 22 December 2019, <https://doi.org/10.1016/j.future.2019.12.019>.

⁶ Omar Farouk Al Mashhour et al., 'Legal and Regulatory Aspects of Smart Contracts: A Systematic Review', *Eurasian Journal of Management & Social Sciences - Open Access* 4, no. 2 (2023): 156-72, <https://doi.org/10.23918/ejmss.V4i2p156>.

In Islamic finance, numerous studies have examined the potential of blockchain technology and smart contracts to enhance governance, transparency, and operational efficiency across Islamic banking, sukuk issuance, zakat administration, and fintech services. Existing research suggests that smart contracts may strengthen Sharia compliance by reducing human error, increasing transactional transparency, and facilitating automated implementation of contractual conditions.⁷ Nevertheless, scholars consistently emphasize that technological innovation must remain consistent with the prohibition on *gharar* (excessive uncertainty), *maysir* (speculation), and unjust enrichment, while preserving fairness and legal certainty in commercial relationships.⁸

Islamic jurisprudential scholarship has similarly explored the compatibility of smart contracts with classical theories of contract (*'aqd*). Contemporary studies generally conclude that technological automation does not invalidate contractual relationships provided that essential elements of Islamic contracting—including mutual consent, lawful object, certainty of obligations, and clarity of contractual terms—remain satisfied.⁹ However, several researchers caution that algorithmic execution may itself generate uncertainty when contracting parties do not fully understand the programming logic or when software behavior produces outcomes inconsistent with their original intentions, thereby raising potential concerns under the doctrine of *gharar*.

Further studies have examined the integration of smart contracts into Islamic financial institutions and digital economic systems, highlighting both their practical advantages and the regulatory challenges they pose. The existing literature highlights improvements in transparency, efficiency, compliance monitoring, and cost reduction, while also identifying persistent concerns regarding governance structures, legal uncertainty, technological risks, and institutional readiness for blockchain

⁷ Riris Mesta Riani et al., 'The Implementation of Smart Contracts and Blockchain-Based Smart Sukuk in Islamic Finance: A Sharia Economic Law Perspective', *Proceeding International Conference on Islam, Law, and Society (INCOILS)* 2 (2023), <https://doi.org/10.70062/incoils.v2i1.488>.

⁸ Retno Endah Kusuma Wardani, 'The Implementation of Blockchain-Based Smart Contracts in Islamic Finance: Opportunities and Challenges', *Dalwa Islamic Economic Studies: Jurnal Ekonomi Syariah* 4, no. 2 (2025): 130–52, <https://doi.org/10.38073/dies.v4i2.3760>.

⁹ Ahmad et al., 'The Position of Smart Contracts in the Light of Islamic Contract Theory'.

implementation.¹⁰ Moreover, scholars argue that although smart contracts may advance several objectives of Islamic law, including the protection of wealth and transactional justice, their effective implementation requires comprehensive governance mechanisms to ensure both legal certainty and Sharia compliance.¹¹

Another significant area of contemporary scholarship concerns liability arising from the execution of autonomous smart contracts. Researchers recognize that blockchain systems operate through decentralized architectures in which contractual performance may occur automatically without direct human control, making it difficult to identify the legally responsible party when technical defects, coding errors, software vulnerabilities, or external data failures cause financial loss. Traditional legal doctrines concerning negligence, agency, and contractual responsibility often provide only partial solutions because autonomous systems function independently after deployment and may execute irreversible transactions without subsequent human authorization.¹²

Although contemporary Islamic legal scholarship has begun to address the relationship between blockchain technology and classical jurisprudential principles, most existing studies focus on the general permissibility, Sharia compliance, or technological characteristics of smart contracts rather than on a comprehensive analysis of liability arising from technical errors in autonomous execution. Similarly, comparative legal research often examines electronic contracting or blockchain regulation without systematically integrating Islamic jurisprudential doctrines of liability, causation, and risk allocation into the analysis of autonomous contractual systems.¹³ Consequently, the interaction between positive law

¹⁰ Mimma Maripatul Uula, *Smart Contracts and the Islamic Finance Industry* | *Journal of Islamic Economics Literatures*, n.d., accessed 26 May 2026, https://journals.smartinsight.id/index.php/JIEL/article/view/631?utm_source=chatgpt.com.

¹¹ Wardani, 'The Implementation of Blockchain-Based Smart Contracts in Islamic Finance'.

¹² Massimo Bartoletti and Livio Pompianu, 'An Empirical Analysis of Smart Contracts: Platforms, Applications, and Design Patterns', arXiv.Org, 18 March 2017, <https://doi.org/10.1007/978-3-319-70278-0>.

¹³ Wandy Zulkarnaen, 'Shariah in the Age of Blockchain: Rethinking Legal Authority and Smart Contracts in Decentralized Islamic Finance', *Journal of Contemporary Islamic Law and Studies* 1, no. 1 (2025): 56-68, <https://doi.org/10.47353/jcils.v1i1.371>.

governing electronic agents and Islamic legal principles governing responsibility for automated technical failures remains insufficiently explored.

This research seeks to address this scholarly gap by examining autonomous smart contracts through an integrated comparative legal and Islamic jurisprudential framework that specifically focuses on technical error liability. Unlike previous studies that primarily assess the legality or Sharia compliance of blockchain contracts, the present study investigates the legal characterization of autonomous electronic agents. It evaluates responsibility for programming defects and system malfunctions by synthesizing contemporary legislation with classical Islamic doctrines of *ḍamān*, *sababiyyah*, *lā ḍarar wa lā ḍirār*, and *al-ghurm bi al-ghunm*. In doing so, the study develops a coherent analytical framework that reconciles emerging technological realities with established principles of Islamic economic law.

The novelty of this research, therefore, lies in its interdisciplinary approach, combining comparative legal analysis with Islamic jurisprudential reasoning to propose a principled allocation of liability for technical errors in autonomous smart contracts. Rather than treating technological automation merely as a matter of contract validity, the study considers autonomous systems as legal instruments through which previously expressed human consent operates, while emphasizing that responsibility for the resulting risks remains with those who benefit from such systems. This perspective helps bridge the conceptual divide between classical Islamic legal theory and contemporary digital contracting environments.

The significance of this study extends beyond theoretical legal analysis to practical regulatory development. As blockchain technologies become increasingly integrated into Islamic finance, electronic commerce, and digital asset markets, clear rules governing liability for technical failures are essential to promote legal certainty, investor confidence, consumer protection, and sustainable technological innovation. The absence of explicit legislative provisions governing technical error liability in autonomous smart contracts, particularly in Saudi legislation and broader Islamic economic law frameworks, underscores

the need for comprehensive legal guidance that balances technological advancement with the fundamental objectives of Sharia. Accordingly, this research contributes to contemporary debates on digital commerce by providing an integrated legal and jurisprudential model for addressing one of the most significant unresolved challenges in automated contracting systems.

METHOD

This study adopts a doctrinal legal research design using descriptive, analytical, comparative, and jurisprudential methodologies to examine the legal dilemma of technical error liability in autonomous smart contracts within the framework of contemporary Islamic economic law. The research primarily relies on qualitative legal analysis, drawing on the interpretation of statutory provisions, legal doctrines, jurisprudential principles, and comparative legal frameworks. The study examines selected legislative systems, including the Saudi Electronic Transactions Law, the UNCITRAL Model Law on Electronic Commerce, and the U.S. Uniform Electronic Transactions Act (UETA), to identify legislative approaches governing automated contracting and liability attribution.

Primary sources include legislation, international conventions, official regulations, and judicial precedents relating to electronic commerce and automated systems. Secondary sources include academic writings, legal commentaries, Islamic jurisprudential studies, and contemporary research on smart contracts and digital commerce. The analytical method focuses on evaluating the legal characterization of autonomous smart contracts and determining the legal basis for assigning liability arising from technical errors. A comparative analysis is also employed to identify similarities and differences between international and national approaches to automated contracting systems. Regarding Sharia analysis, the study applies Islamic jurisprudential principles relevant to contractual liability and commercial responsibility, including liability (*ḍamān*), causation (*sababiyyah*), prevention of harm (*lā ḍarar wa lā ḍirār*), and the doctrine of bearing risk alongside benefit (*al-ghurm bi al-ghunm*). These principles are utilized to assess the extent to which liability for

technical malfunctions may legitimately be attributed to the owner or operator of autonomous systems under Islamic economic law.

RESULTS AND DISCUSSION

The Legality of Autonomous Smart Contracts in Islamic Economic Law: Definition and Legal Nature of Autonomous Smart Contracts

Autonomous smart contracts are digitally programmed agreements that automatically execute contractual obligations upon the fulfillment of predetermined conditions, enabled by blockchain technology or automated systems. Unlike ordinary electronic contracts, autonomous smart contracts may execute contractual terms independently without direct human supervision during performance.¹⁴ The Saudi legislator uses the term "electronic data system" to refer to what is commonly known in international law as an "automated system" for the conclusion of electronic commerce contracts.¹⁵ Internationally, "information system" is used in the UNCITRAL Model Law, Article 1, 1996, and the American legislator adopts "electronic agent".¹⁶

The phrase "programmed automated system" is common in jurisprudence to refer to an "electronic agent" or an "electronic intermediary." Although this term is popular, there is no consensus. Some call the automated system "robots" or "task-based robots," while others use the term "intelligent agent."¹⁷ The European Directive on Electronic Commerce also defines "electronic agent" as: "An electronic program or any other electronic means that allows the conclusion of an electronic contract or response to documents or electronic contracts, in whole or in part, without examination by a natural person at the time the response or contract is made".¹⁸

The American legislator defines an "electronic agent" as "a computer program or an electronic or other automated means used independently to initiate an action or respond

¹⁴ Alaloosh et al., 'Adapting Iraqi Law to Smart Contracts'.

¹⁵ The Saudi Electronic Transactions Law, Pub. L. No. No. M/18 (2007).

¹⁶ UETA, Section 6, 1999.

¹⁷ E. Hamid, *Electronic Agent* (Raya Higher Institute of Management and Foreign Trade, 2020).

¹⁸ European Directive No. 31-2000.

to electronic records or performances in whole or in part, without review or action by an individual".

In Islamic jurisprudence, contractual validity depends on mutual consent (*tarāḍī*), lawful subject matter, certainty, and the absence of prohibited elements, such as excessive uncertainty (*gharar*).¹⁹ Contemporary Islamic jurists increasingly recognize that electronic systems may validly express contractual intent when they accurately reflect the will of the contracting parties through prior authorization and programming.²⁰ Conversely, the 'automated system' is defined by the Saudi legislature as: 'one or more electronic devices or programs used to create, extract, send, broadcast, receive, store, display, or process electronic data'.²¹

According to jurisprudential definitions, an 'automated system' is a computer program that carries out a specific task on behalf of its user and has some degree of independence in doing so. This means it does not require the user's direct interaction to accomplish the task.²² An 'electronic agent' is described by others as an automated system programmed by the intervenor to respond to electronic messages or execute electronic transactions for the intervenor's benefit, without the intervenor reviewing the task at the time of creation or at the time of response.²³ In addition, some describe an 'electronic agent' as a person representing the buyer or seller in an electronic transaction and apply this to the e-store's automated system.²⁴ Care is needed when explaining the automated system for concluding contracts. Any arbitrary or inaccurate description is not permitted because

¹⁹ Indiharwati Arum et al., 'Gharar in Shafi'i Jurisprudence: Reassessing Its Validity in E-Commerce Transactions', *Al-Iktisab: Journal of Islamic Economic Law*, 2025.

²⁰ Ghassan Adhab Atiyah et al., 'Legitimacy of Smart Contracts from the Perspective of Islamic Law: A Case Study of Blockchain Transactions', *Al-Istinbath: Jurnal Hukum Islam* 9, no. 1 (2024): 155-92, <https://doi.org/10.29240/jhi.v9i1.8726>.

²¹ Aidh bin Sultan Al-Buqami, 'Electronic Commerce in the Saudi Legal System: A Comparative Study', Dar Al-Ijada, 2017, <https://daralejadh.com/dyldWr>.

²² Alaa Yaqoob Al Noaimi, 'The Electronic Agent: Its Concept and Legal Nature', *University of Sharjah Journal for Sharia and Legal Sciences* 7, no. 2 (2010): 149-92.

²³ Baker Akram Falah Jarrah et al., *The Relationship Between the Accounting Information System and Perceived Performance: The Moderating Effect of Managerial Qualifications According to Company Law*, "Quality, 2025, <https://doi.org/https://doi.org/10.47750/QAS/26.208.07>.

²⁴ Al-Buqami, 'Electronic Commerce in the Saudi Legal System: A Comparative Study'.

precise identification is essential. The party responsible for technical errors depends on whether the programmed automated system is seen as an electronic agent, a legal person with independent legal status from the online store owner, or just a channel for electronic communication.

The validity of contracts concluded through the automated system

The United Nations Convention on the Use of Electronic Communications in International Contracts permitted electronic contracting through an automated data system, as it stated: Use of Automated Message Systems for Contract Formation: (A contract formed by the interaction of an automated message system and a natural person, or by the interaction of mechanical message systems, shall not be denied validity or enforceability on the sole ground that no natural person reviewed or intervened in each of the separate actions carried out by the automated message systems or the resulting contract.²⁵

The American legislator also permitted electronic contracting that takes place through electronic agents, whether the contract is between two electronic agents or between an electronic agent and a natural person, as it stipulated that: A contract may be formed by the interaction of the parties' electronic agents, even if no individual was aware of or reviewed the electronic agents' actions or the resulting terms and agreements. (2) A contract may be formed by the interaction of an electronic agent and an individual, acting on the individual's behalf or for another person, including by an interaction in which the individual performs actions that the individual is free to refuse to perform and which the individual knows or has reason to know will cause the electronic agent to complete the transaction or performance. (3) The contract terms are determined by the substantive law applicable to it.²⁶

²⁵ UN Convention, Article 12, 2005, art. 12 2005.

²⁶ UETA, 1999, Section 14.

However, the Saudi legislator considered the contract concluded through an electronic data system as a valid contract that produces its legal effects, whether the contract is between two or more electronic data systems or between an electronic data system and a natural person, provided that he knows or is supposed to know that he deals with a programmed electronic data system. (1- A contract may be concluded through automated or direct electronic data systems between two or more electronic data systems that are prepared and programmed in advance to carry out such tasks, and they are considered representatives of both parties to the contract. The contract shall be valid, enforceable, and produce its legal effects despite the nonexistence of direct intervention by any natural person in the process of its conclusion. 2- A contract may be concluded between an automated electronic data system and a natural person if he knows, or is presumed to know, that he is dealing with an automated system that will undertake the task of concluding or implementing the contract.²⁷ It is acceptable to rely on information provided by an automated system designed and controlled by one or both parties to express the will, to create a legally binding offer, or to accept it exactly as specified in the offer. Thus, one of the electronic ways of expressing the will is the programmed automated system.²⁸

Since most jurisprudence takes into account the possibility of a computer concluding a contract with a person who lacks legal capacity or with another computer, it is appropriate for the computer to act as an electronic agent when concluding contracts on behalf of a person who lacks legal capacity.²⁹ Accordingly, the offer and acceptance occur automatically based on pre-programmed information entered into the computer and transmitted through the Internet³⁰.

Similarly, some jurists argue that the legal policy of contract law was initially based on the conclusion of contracts face-to-face between natural persons. However, the law must

²⁷ The Saudi Electronic Transactions Law.

²⁸ Shadi Ramadan Ibrahim Tantawi, *The Legal Framework of Contracting and Signature in E-Commerce*, 1st ed (Arab Center for Publishing and Distribution, 2016).

²⁹ Noura Jabbara, 'Contracting through the Electronic Agent', *Al-Shamela Journal of Legal Studies* 1, no. 1 (2021): 136-44.

³⁰ Alaloosh et al., 'Adapting Iraqi Law to Smart Contracts'.

adjust whenever technical or commercial innovations make it possible to conclude contracts in other ways; it must be modified accordingly. For the same considerations of ethical justice and commercial pragmatism, the legislature took this same action concerning computer-completed contracts.³¹

The international legislator requires that the contract be concluded through an automated system programmed by the originator of the data message or their representative to maintain the validity of an electronic contract. Hence, the transfer of the effects of the contract to the owner of the automated system, this law stipulates that: As between the originator and the addressee, a data message is deemed to be that of the originator if it was sent (a) by a person who had the authority to act on behalf of the originator in respect of that data message or (b) by an information system programmed by, or on behalf of, the originator to operate automatically.³² According to jurisprudence, Elobaidi, two conditions must be met for the electronic message to be issued by the originator and bear all the legal effects arising from the electronic contract concluded through an automated data system³³: The first condition: An automated information system (automated system) must have transmitted the electronic message. To meet this need, the automated system must be able to perform the assigned tasks independently, without assistance from a natural person, while the tasks are being completed.

The second condition: The automated system must be programmed by the creator or another person or entity on his behalf. The creator or their representative must provide the automated system with specific conditions, instructions, and orders that it can

³¹ Mahmood Shaker Abood Alaloosh, 'Integrating Ricardian Contracts with SQL Databases: A Legal and Technical Framework for Digital Commerce in Iraq', *International Journal of Civil Law and Legal Research*, 1 February 2026, <https://doi.org/https://doi.org/10.22271/civillaw.2026.v6.i2a.192>.

³² 'UNCITRAL Model Law on Electronic Commerce (1996) with Additional Article 5 Bis as Adopted in 1998', United Nations Commission on International Trade Law, United Nations Commission on International Trade Law, accessed 28 April 2026, https://uncitral.un.org/en/texts/ecommerce/modellaw/electronic_commerce.

³³ Ali Hadi Elobaid, 'Attribution Rules of the Electronic Message to the Creator in the UAE E-Commerce and Transactions Law', *UAEU Law Journal*, 2013.

accurately implement. The content of the programming reflects the creator's will in electronic contracting.

Therefore, the contract is not considered an electronic contract made through an automated system if it is concluded between the originator and his representative, rather than through a programmed data system. The originator is not bound by the effects of the electronic contract, in which it is proven that the electronic data was sent through a system programmed by a person who has no authority to prepare this programming. As a result, part of jurisprudence said that a computer does not negotiate or dialogue with the other party, whether a natural person or another computer, as it does not go beyond the limits of what it has been programmed to do. This entails stating that it is possible to imagine the use of an automated system in electronic contracting via web pages on the Internet for shopping, according to specific instructions and orders prepared in advance on the merchant's or service provider's computer.³⁴

Hence, the American legislator defines "automated transactions" as: Automated transaction" means a transaction conducted or performed, in whole or in part, by electronic means or electronic records, in which the acts or records of one or both parties are not reviewed by an individual in the ordinary course in forming a contract, performing under an existing contract, or fulfilling an obligation required by the transaction.³⁵ As part of the jurisprudence, Jane K. Winn and Benjamin Wright have stated that the choice to create a contractual bond is implicitly available to the contracting parties from the moment they decide to program the automated system with specific conditions to make an offer or acceptance. This provokes questions about the extent to which the "automated system" must intend to contract to produce legal effects. This section confirms that contracts can be formed by machines functioning as electronic agents for parties to a transaction. It negates any claim that a lack of human intent at the time of contract formation prevents

³⁴ Imparato Nicholas, *Public Policy and the Internet: Privacy, Taxes, and Contract* (Hoover Institution Press, 2010; repr., 2010).

³⁵ UNIFORM ELECTRONIC TRANSACTIONS ACT (1999), Section 2.

contract formation. When machines are involved, the requisite intention flows from the machine's programming and use.³⁶

Under Islamic economic law, the validity of autonomous smart contracts depends on the fulfillment of the fundamental contractual pillars recognized in Islamic jurisprudence. Islamic law does not require that offer and acceptance occur exclusively through verbal or physical interaction. Rather, consent may be expressed through any reliable means capable of demonstrating the contracting parties' intent.³⁷ The contractual intent embedded within autonomous smart contracts originates from the programming instructions established by the parties before execution. Therefore, the automated system functions as a technical instrument implementing the previously authorized contractual will.³⁸

Furthermore, the principle of permissibility in commercial transactions (*aṣl al-ibāḥah fī al-mu'āmalāt*) supports the adoption of new technological contracting methods, provided they do not violate explicit Sharia prohibitions.³⁹ Consequently, autonomous smart contracts are generally compatible with Islamic economic law when they avoid unlawful subject matter, excessive uncertainty, deception, or injustice.⁴⁰ In conclusion, autonomous smart contracts possess both legal and Sharia validity because the essential contractual intention derives from the human parties who program and authorize the automated system to operate on their behalf.

Table 1. Comparative Legal Recognition of Autonomous Smart Contracts

No	Legal Framework	Recognition Basis	Comparative Legal Position
----	-----------------	-------------------	----------------------------

³⁶ UETA, 1999, Comment. No. 1, § Section 14.

³⁷ Mourad Abdellaoui, 'The Legitimacy and Procedure of Electronic Contracts in Islamic Jurisprudence and Algerian Legislation', *The International Tax Journal* 51, no. 6 (2024): 309-17.

³⁸ Alaloosh et al., 'Adapting Iraqi Law to Smart Contracts'.

³⁹ Mahmood Alaloosh et al., 'Securing Digital Trade: A Techno-Legal Analysis of E-Commerce Safeguards in Iraq's Regulation No. 4/2025', *Nusantara: Journal of Law Studies* 5, no. 1 (2026): 44-60, <https://doi.org/10.5281/zenodo.18452737>.

⁴⁰ Atiyah et al., 'Legitimacy of Smart Contracts from the Perspective of Islamic Law'.

1	UNCITRAL Convention	Automated message systems	Recognizes contracts formed through automated systems without direct human intervention.
2	U.S. Law (UETA/E-SIGN)	Electronic agent	Validates contracts concluded between electronic agents or between an electronic agent and a natural person.
3	Saudi Electronic Transactions Law	Electronic data system	Considers automated systems as representatives of contracting parties and recognizes the validity of resulting contracts.
4	Islamic Economic Law	Mutual consent (<i>tarāḍī</i>)	Accepts automated contracting when programming reflects the prior consent of the contracting parties.
5	Overall finding	Comparative legal position	Autonomous smart contracts are legally valid because contractual intent originates from human authorization and programming.

Data Source: UNCITRAL Convention (2005), UETA, Saudi Electronic Transactions Law, and Islamic jurisprudence.

Legal Liability Arising from Technical Errors in Autonomous Smart Contracts

This section analyzes the legal framework for liability arising from technical errors in autonomously executed smart contracts, focusing on the fundamental question of identifying the responsible party. Given the heavy reliance on pre-coded technology, substantial technical risks emerge that may lead to contractual breaches, calling for an exhaustive analysis of legislative and jurisprudential stances, both at the international and national levels, to determine the entity obligated to compensate for damages resulting from malfunctions in the automated system.

The party responsible for technical Errors

Undoubtedly, the positions of international and national legislators on the validity of electronic contracts concluded through automated systems are consistent with the speed and flexibility required for e-commerce transactions. Since "automated transactions" depend almost entirely on electronic communication technology that is pre-programmed

with the merchant's terms and orders, it is conceivable that many technical risks will result from a breach of the electronic programs the online store owner relies on.

Based on this, the "automated transactions" conducted through the automated system raise a fundamental legal question: who is responsible for breaches resulting from electronic errors or technical problems in the automated system used by the online store owner?

Given that no specific national legislative regulations govern this issue, the importance of addressing this question increases. Referring to the United Nations Convention, we find that the international legislator came up with special provisions for this case, as stated under the title "Error in Electronic Communications": "1. Where a natural person makes an input error in an electronic communication exchanged with the automated message system of another party and the automated message system does not provide the person with an opportunity to correct the error, that person or the party on whose behalf that person was acting, has the right to withdraw the portion of the electronic communication in which the input error was made if: (a) The person, or the party on whose behalf that person was acting, notifies the other party of the error as soon as possible after having learned of the error and indicates that they made an error in the electronic communication; and (b) The person, or the party on whose behalf that person was acting, has not used or received any material benefit or value [from the goods or services, if any, received from the other party".⁴¹

This article makes it clear that the agreement allows parties to automate transactions to correct any electronic errors that may have occurred during contract execution, thereby avoiding the consequences that may result from such errors. However, the agreement established two conditions for implementing this solution: The first condition: The party that committed the error, whether the natural person or the other party that owns the automated system, must notify the other party of the error that occurred, provided that the

⁴¹ UN Convention, 2005, § Article 14/ 1.

agreement did not specify a specific time during which it is permissible to undo or reverse the error. Instead, the legislator stipulated that notification of the error must be made within a reasonable period after the legislator becomes aware of it. Therefore, the determination of the appropriate period is left to the judge in the event of a dispute. However, this solution also depends on the fulfillment of the second condition.

The second condition: To apply this solution, the agreement stated that neither party could have used goods or products, profited from services rendered to them by the other party, or acquired any material value or benefit as a result of the transaction in which the error was made, such as getting paid for the goods or services in exchange. Therefore, the contract stipulated that: 2. Nothing in this article affects the application of any rule of law that may govern the consequences of any error other than as provided in paragraph 1.⁴²

Accordingly, we believe that the provisions of the substantive law that governs contracting in general, as well as the error and liability resulting from it, remain binding to manage the consequences resulting from the electronic error resulting from automated transactions concluded through the programmed automated system, both in terms of determining the party responsible for this error or in terms of determining the legal basis for establishing the responsibility of either party, as well as the legal penalties resulting from this electronic error. Regarding the American legislator, we may deduce the legislator's stance on this issue even if we fail to find any specific laws governing the legal responsibility requirements resulting from electronic errors in automated transactions. We previously indicated the American legislator's position on contracting conducted through an automated system. It became clear to us that the legislator recognizes the validity of electronic contracting via the concept of the "electronic agent." He also gave the contracts concluded through the agent the term "automated transactions." Notably, the legislator deliberately used the term "electronic agent" to emphasize the owner of the automated system's responsibility for electronic errors arising from the automated system's reliance on it. The legislator also stipulated the contracting parties' responsibility for the obligations

⁴² UN Convention, 2005, § Article 14/ 2, art. 14/ 2.

arising from this contract and granted them rights. As a result, some jurisprudence held that the owner of the automated system bears full responsibility for any errors arising from reliance on the electronic agent in electronic contracting.⁴³ This is because the electronic agent follows the owner's instructions and directives, lacking independence.⁴⁴

Similarly, a part of the jurisprudence holds that if an error in computer programming causes an electronic agent to make an error and third parties contract with it, the third parties may demand that the contract be invalid. The lawsuit is brought against the owner of the automated system because he bears original responsibility for the electronic agent's work. The owner of the automated system is left with little alternative but to pursue legal action against the company that created the software for him in this situation, as the harmed party may also demand payment.⁴⁵ Referring to the UETA law, we find that the American legislator clarified the meaning of the term "electronic agent" in the "commentary" on the second section of this law, where it stated: "Electronic agent." This definition specifies that an electronic agent is a machine. As the term "electronic agent" has come to be recognized, it is limited to a tool function. The effect on the party using the agent is addressed in the act's operative provisions.⁴⁶

Although the Saudi Electronic Transactions Law does not contain any particular legal provisions addressing the owner of an automated system's liability for electronic errors, it is clear from the Ministry of Commerce's position, which supervises the Kingdom's electronic commerce sector and is in charge of resolving disputes related to it, that legal responsibility is increasingly being placed on the system owner. In a similar legal precedent, the Ministry of Commerce required United Electronics Company "Extra" to fulfill its contractual obligations to clients by delivering the "laptops" they had agreed to purchase.

⁴³ Walid Al-Saad, *The Legal System of the Electronic Agent*. (Al-Halabi Legal Publications, 2017), <https://www.neelwafurat.com/itempage.aspx?id=lbb262177-245561&search=books>.

⁴⁴ Ibrahim M, *E-Commerce Contracts under the UAE Federal Law* (Dar Al-Fikir publication, 2020).

⁴⁵ Benjamin Wright and Jane K. Winn, 'The Law of Electronic Commerce', Berkeley Law, Aspen Law & Business, 1998, <https://lawcat.berkeley.edu/record/496606>.

⁴⁶ Patricia Brumfield Fry et al., *UNIFORM ELECTRONIC TRANSACTIONS ACT*, 1999.

For instance, the case "Extra Company" offered an HP laptop at a price of (189) SR instead of (1899) SR on the online store on 12/16/2013, and customers had already purchased the product and paid the price. The company later apologized to customers for failing to deliver the product due to a technical error caused by an automated system programmed to list the product at an incorrect price. Additionally, the company acknowledged that purchase orders exceeded the available delivery quantity and promised to reimburse customers for any bank transfer payments they had made to cover the product cost. The customers rejected this apology and, because of the company's intransigence and failure to fulfill its delivery obligations, turned to the Ministry of Commerce. The Ministry decided that the company bears full responsibility for any technical Errors resulting from the use of the automated system. As a result, the company was required to deliver the product to customers before compensating them with purchase vouchers worth 1899 per purchase order, due to the need for a sufficient number of these products in its stores.

Finally, some jurisprudence acknowledges that an automated system has a legal personality separate from that of its owner. This is because the automated system functions as the owner's electronic agent and can express its will by virtue of its properties. As such, it is more like a natural person than a legal person because it has the independence and freedom of action to enter into contracts, unlike a legal person, which lacks a real will and instead acts through a legal representative.⁴⁷ However, this tendency has come under fire, arguing that the concept of legal personality is essentially associated with financial accountability. As a result, the electronic agent can be recognized as an independent legal personality only if it has financial liability and legal capacity.

From an Islamic jurisprudential perspective, liability may be attributed based on several foundational principles. First, the principle of bearing risk with benefit (*al-ghurm bi al-ghunm*) requires that the party benefiting economically from commercial activity must also bear the risks associated with that activity. Since the owner of an autonomous system gains commercial benefits from automated transactions, the owner also bears liability for

⁴⁷ Jabbara, 'Contracting through the Electronic Agent'.

the resulting technical harms.⁴⁸ Second, the principle prohibiting harm (lā ḍarar wa lā ḍirār) supports imposing liability upon the party whose controlled instruments cause damage to others. The automated system remains under the authority and supervision of its operator, even when operating autonomously.⁴⁹

Third, Islamic jurisprudence traditionally attributes liability to the person exercising control over tools, instruments, or agents that cause harm, particularly when the owner has the capacity to prevent or reduce foreseeable risks through proper supervision, maintenance, and programming.⁵⁰ Therefore, assigning liability to the owner or operator of the autonomous smart contract system remains the most legally and jurisprudentially coherent solution under both comparative legal systems and Islamic economic law.

Table 2. Comparative Allocation of Liability for Technical Errors

No	Legal Framework	Basis of Liability	Comparative Legal Position
1	UNCITRAL Convention	Electronic communication errors	Permits withdrawal of erroneous electronic communications under specified conditions.
2	American law	Electronic agent doctrine	Attributes responsibility to the owner of the electronic agent.
3	Saudi legal practice	System owner liability	Holds the e-store owner responsible for technical malfunctions and contractual consequences.

⁴⁸ Nasrun Mohamad Ghazali et al., 'The Fiqh Maxim Al-Ghunm Bi al-Ghurm: A Critique on Interpretation of the Maxim Relating to the Risk-Return Concept in Islamic Banking and Finance', *ISRA International Journal of Islamic Finance* 16, no. 2 (2024): 4-19.

⁴⁹ Hafidz Ramadhan Noor Matondang et al., 'Prinsip Non-Harm Sebagai Kerangka Etis Pengelolaan Sengketa Bisnis Syariah Di Era Digital', *Jurnal Ekonomi Dan Bisnis Islam (JEBI)* 6, no. 1 (2026): 15-24, <https://doi.org/10.56013/jebi.v6i1.5254>.

⁵⁰ Salah Eldin Ragab Semida et al., 'From Remedial to Preventive Justice: A Contemporary Reframing of Civil Liability in Islamic and Comparative Law', *MILRev: Metro Islamic Law Review* 5, no. 1 (2026): 722-52, <https://doi.org/10.32332/milrev.v5i1.13126>.

4	Comparative jurisprudence	Automated system as an agent	Most scholars regard the automated system as an instrument expressing the owner's will.
5	Islamic jurisprudence	<i>Al-ghurm bi al-ghunm</i>	Liability attaches to the party that receives the commercial benefit from automated transactions.

Data Source: UNCITRAL Convention, UETA, Saudi legal practice, and comparative legal scholarship.

The basis of the store's responsibility for technical Errors

Most jurists consider the automated data system an "electronic agent" for the store owner or the "originator" when determining the system's legal status. This is because the automated system is a true expression of the seller's or buyer's will, and as such, it does not have a will independent of the owner's.⁵¹ Therefore, a computer can contract with other natural parties or computers. It can also act as an electronic agent, such as entering into contracts on behalf of a natural person. In this case, the computer automatically makes the offer and acceptance using pre-programmed, documented information transmitted over the Internet.⁵²

A part of jurisprudence has considered that a programmed automated system is essentially a communication tool, similar to a phone or Telex. Hence, any action issued through it is considered an act issued by its owner. Thus, the owner of the automated system bears an implicit obligation to fulfill all contractual obligations resulting from contracts made using the system, including any errors or malfunctions that may arise during the electronic contracting process. The automated system's function is limited to transmitting the owner's will to the other party.⁵³ This opinion, however, has been criticized

⁵¹ Al-Buqami, 'Electronic Commerce in the Saudi Legal System: A Comparative Study'.

⁵² Ahmad Mahmoud Al Masadeh et al., 'Impact of Jordanian Electronic Transactions Law and Digital Transformation on Commercial Contracts and Their Proof', *Journal of Human Security* 20, no. 1 (2024): 104-8.

⁵³ Alaloosh et al., 'Adapting Iraqi Law to Smart Contracts'.

for rejecting the idea that a programmed, automated system, or "electronic agent," can express will in electronic contracting. Instead, it claims that the electronic agent is just a tool the contractor uses, like pens and paper, to express will, and that it is just a machine subject to a natural person's will.⁵⁴

Consequently, a part of the jurisprudence holds that the program's "independent nature" refers to the electronic agent's ability to operate without the natural person's (i.e., the owner's) intervention. The system owner only has to install the program on his electronic store and provide it with the inputs, instructions, and orders he wants implemented on his behalf. However, the system's capabilities extend beyond the data entered, as it can generate new data based on transactions it processes and restart itself without the site owner's supervision.⁵⁵

The electronic agent is also distinguished by its ability to interact with others, including natural persons, customers, and potential purchasers. In addition, it interacts with other electronic agents and obtains the information it needs from them; it also assigns some of the tasks it is prepared to perform. It can respond to changes in its environment. The electronic agent is characterized by its quick response to offers and its ability to conclude contracts. Moreover, it enables the contract to be executed at the same pace, especially when the obligation concerns the delivery of a digital commodity, such as an e-book. This does not negate the statement that the automated system acts in accordance with the purpose for which it was programmed, as an agent for the owner. Therefore, the electronic agent does not act contrary to its programmed purpose or is prevented from attaining it for personal reasons. Thus, the jurisprudence considered it rational or objective.⁵⁶

⁵⁴ A. Abu-Hashima, *Electronic Information Service Contracts in Private International Law*. (Dar Al-Nahda publication., 2004).

⁵⁵ Mohamed Saadi, *AlNazariyah al-'Ammah Lil-Iltizamat: Dirasah Muqaranah [The General Theory of Obligations: A Comparative Study]* (Dar Al-Ma'arif, 2023).

⁵⁶ Hamid, *Electronic Agent*.

Part of the jurisprudence holds that the damages arising from the use of a programmed automated system include the transmission of false or incomplete information, a defect in the product's specifications, or any result of non-compliance with the contract. Generally, the programmer of the electronic agent, or the owner of the store, is responsible for all these damages under omissive responsibility, or "responsibility of the supervisor," since he controls the automated system. Thus, he is responsible for the information if it was obtained irregularly by the other party with whom it was contracted through the automated system.⁵⁷

Another side of jurisprudence states that the responsibility of the online store, the "owner" of the programmed automated system, for technical errors is based on objective commitment, or what is known as the theory of "bearing responsibility," which was presented by the jurist Jousran and the jurist Labbe in 1899 when they abandoned their adherence to error as a basis for civil liability (contractual and negligent), and based responsibility on the occurrence of damage, considering that whoever creates new risks must bear their consequences.⁵⁸

This theory is based on the simple principle that whoever creates risks in society through their actions must bear the consequences of those risks and compensate those affected by the damage they cause.⁵⁹ This theory is based on only two elements of responsibility: damage and causality.⁶⁰ It is not required for the conduct of the person producing these risks to be erroneous, as this duty does not depend on the error, and the lack of an error does not excuse the person from paying this obligation. Based on this theory, the person responsible for this damage is the one who engages in the act that causes

⁵⁷ Nayef bin Jamaan Juraidan, 'Guarantee of Damage Resulted from Conclusion of the Contract by Electronic Agent: A Comparative and Rooting Study', *Journal of the Faculty of Sharia and Law*, 2020, <https://doi.org/https://doi.org/10.21608/JFSLT.2020.105692>.

⁵⁸ Hassan Ali Al-Dhnoon, *AlMabsoot in Civil Liability* (House of Wael Publication, 2021).

⁵⁹ Putra Perdana Ahmad Saifulloh et al., 'Political Dynasties in General Elections According to Human Rights and A Comparison in Four ASEAN Countries', *Trunojoyo Law Review* 7, no. 1 (2025): 123-60, <https://doi.org/10.21107/tlr.v7i1.28492>.

⁶⁰ Yordan Gunawan et al., 'Indonesian Sea Sand Exports: UNCLOS Compliance v. Environmental Sustainability Dilemma Explored', *Jurnal Hukum* 41, no. 2 (2025): 394-410, <https://doi.org/10.26532/jh.v41i2.32294>.

the plaintiff damage, even if he did not make any error. In exchange for the advantages, he received from engaging in the activity, he bears the obligation to pay the plaintiff's losses.⁶¹

According to this, the responsibility of the online store, the "owner" of the programmed automated system, is held by the provisions of the liability theory as soon as the consumer suffers damage that is proven to be attributed to errors in the computer the owner of the system uses in his activity, even if the error of the online store is not proven, the theory excludes the element of error, whether in the form of a error that must be confirmed or an assumed error that cannot be proven otherwise. Nevertheless, we believe that embracing this theory in any way holds the online store, the "owner" of the programmed automated system, accountable for any adverse effects stemming from technical Errors or malfunctions that might happen as a result of depending on the programmed automated system, which would have a detrimental impact on the development of the e-commerce sectoris witnessingevery effort made at every level to developit and encourage all parties to complete their transactions electronically.

To sum up, it is impossible to deny the necessity of granting legal personality to the programmed automated system, also known as the "electronic agent," since doing so would absolve the owner of all liability for Errors made by the electronic agent. This would promote the adoption of this technology and help revitalize e-commerce. However, responding to this need is challenging and may even be impossible. Establishing the electronic agent's legal personality is difficult, as no practical solution has been identified to address its lack of financial obligations beyond the owner's liability. On the other hand, denying the electronic agent's responsibility because it is considered a communication tool is unfair since it is characterized as independent, intelligent, rational, and direct. The programmed automated system has now played a positive role in electronic transactions since the electronic agent has become able to perform actions that mimic the actions of a natural person, as it can move from one site to another to search for and negotiate

⁶¹ Sharif Muhammad Ghannam, *The Bank Is Responsible for Computer Errors in the Electronic Transfer of Money* (New University Publisher, 2006).

information related to the required goods and services, as well as conclude and implement a contract.

Based on the preceding analysis, it is clear that the full legal liability for technical errors and functional malfunctions in programmed automated systems rests squarely upon the e-store owner, who serves as the principal party and proprietor of the system. This conclusion is founded upon two primary rationales. First, the legal nature of the automated system as an "electronic agent" that expresses its owner's will and follows their instructions renders it a tool, with the consequences borne by the owner's financial liability. Second, pragmatic issues aimed at protecting consumers and guaranteeing the stability of the e-commerce environment are paramount; exempting the owner from liability or assigning it to the electronic agent as an independent legal entity is deemed legally impracticable and economically inequitable under the current circumstances. Consequently, all legal ramifications and compensation arising from system failures fall within the owner's direct responsibility.

Within Islamic economic law, the theory of liability based on causation (*sababiyah*) and risk-bearing (*al-ghurm bi al-ghurm*) provides strong jurisprudential support for this position. The owner of the autonomous system voluntarily introduces technological risk into commercial activity and benefits financially from the resulting transactions. Consequently, fairness and justice in Islamic jurisprudence require that liability accompany the commercial benefit derived from the activity, ensuring that profit is inseparably linked with responsibility for potential harm. This principle is well established in contemporary Islamic financial jurisprudence, where risk-sharing is considered a foundational rule of contractual justice and market accountability, requiring that entitlement to gain must be matched with exposure to corresponding liability and loss.⁶²

Furthermore, modern Islamic legal studies emphasize that liability in both traditional and digital transactions is not detached from causation but is instead attributed

⁶² Mohamad Ghazali et al., 'The Fiqh Maxim Al-Ghurm Bi al-Ghurm'.

to the party whose actions or systems generate and control the risk environment, reinforcing the Sharia objective of preventing unjust enrichment and ensuring equitable distribution of harm and benefit in commercial dealings.⁶³ Therefore, contemporary legal and Islamic jurisprudential analysis overwhelmingly supports maintaining the liability of online platform owners or system operators for technical errors arising from autonomous smart contracts.

Table 3. Islamic Jurisprudential Principles Supporting Liability in Autonomous Smart Contracts

No	Islamic Jurisprudential Principle	Legal Foundation	Application to Autonomous Smart Contracts
1	<i>Al-ghurm bi al-ghunm</i>	Risk and benefit	The party benefiting from commercial activity must bear its associated risks.
2	<i>Lā ḍarar wa lā ḍirār</i>	Prevention of harm	Liability is imposed on the party whose controlled system causes damage.
3	<i>Sababiyyah</i>	Causation	Responsibility is attributed to the person who creates and controls the technological risk.
4	Consumer protection	Fairness principle	Protecting the weaker contracting party supports assigning liability to the platform owner.
5	Overall conclusion	Sharia compatibility	Islamic economic law supports holding the owner/operator liable

⁶³ A. Kulthum Haji Al-Tuwayni, 'The Basis of Civil Liability in Islamic Jurisprudence', *almarifa journal for Humanities and Applied Sciences* 1, no. 5 (2025): 21-45.

for technical errors generated by
autonomous smart contracts.

Data Source: Islamic jurisprudential principles and contemporary Islamic finance literature.

CONCLUSION

This study examined the legal and Islamic jurisprudential dimensions of liability arising from technical errors in autonomous smart contracts within the framework of contemporary Islamic economic law. The research confirmed that autonomous smart contracts constitute legally valid and Sharia-compliant contractual mechanisms when the essential pillars of consent, lawful subject matter, and contractual certainty are fulfilled through authorized automated systems. The study further established that the primary legal responsibility for technical errors and system malfunctions rests upon the owner or operator of the autonomous system. This conclusion is supported by comparative legal analysis, which characterizes automated systems as electronic agents expressing the owner's will, as well as by Islamic jurisprudential principles concerning liability, causation, and the obligation to bear risks associated with commercial benefit. Scientifically, the study contributes to contemporary legal scholarship by integrating Islamic economic jurisprudence with modern digital contracting theory. It clarifies the adaptation of classical jurisprudential principles to technologically advanced commercial environments and proposes a more coherent framework for assigning liability within autonomous contracting systems. The research also highlights important legislative gaps in the regulation of technical error liability in autonomous smart contracts, particularly in Saudi electronic commerce legislation and contemporary Islamic financial regulation. Nevertheless, the study remains limited by its doctrinal and comparative nature and does not include empirical judicial data or technical performance analysis of blockchain-based contracting systems.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to Al al-Bayt University, Faculty of Law, and Amman Arab University, Faculty of Law, for their academic support and research environment that facilitated the completion of this study. Special appreciation is extended to all colleagues and academic staff who provided valuable insights, guidance, and constructive feedback during the development of this research. The authors also acknowledge the contributions of researchers and scholars whose works formed the intellectual foundation of this study on autonomous smart contracts and Islamic economic law. Finally, the authors gratefully thank all individuals and institutions that directly or indirectly supported the research process.

AUTHOR CONTRIBUTIONS STATEMENT

SM, SD, NF, MF, and RA contributed to the conceptualization and design of the study. SM and SD conducted the legal and doctrinal analysis of autonomous smart contracts and comparative legal frameworks. NF and MF were responsible for collecting and interpreting jurisprudential sources and conducting Sharia-related analysis. RA contributed to the design of the methodology, the critical review, and the refinement of the manuscript. All authors participated in drafting, revising, and approving the final version of the manuscript.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest regarding the research, authorship, and publication of this article.

AI USAGE STATEMENT

The authors declare that Artificial Intelligence (AI) tools were used strictly for supportive and technical purposes in the preparation of this manuscript, including language editing, grammar correction, and improving clarity and readability. AI tools were not used to generate research ideas, develop the conceptual framework, conduct legal or jurisprudential analysis, interpret data, or formulate scholarly arguments and conclusions. All intellectual contributions, analyses, and academic interpretations presented in this

study are entirely the responsibility of the human authors. The authors further confirm that AI tools are not listed as authors or contributors and that full accountability for the originality, accuracy, and integrity of the content rests solely with the authors, in accordance with established academic publishing ethics and guidelines.

BIBLIOGRAPHY

- Abdellaoui, Mourad. 'The Legitimacy and Procedure of Electronic Contracts in Islamic Jurisprudence and Algerian Legislation'. *The International Tax Journal* 51, no. 6 (2024): 309–317.
- Abu-Hashima, A. *Electronic Information Service Contracts in Private International Law*. Dar Al-Nahda publication., 2004.
- Ahmad, Azlin Alisa, Mat Noor Mat Zain, and Nur Diyana Amanina Zakaria. 'The Position of Smart Contracts in the Light of Islamic Contract Theory'. *Samarah: Jurnal Hukum Keluarga Dan Hukum Islam* 8, no. 1 (2024): 144–171. <https://doi.org/10.22373/sjhk.v8i1.16372>.
- Al Noaimi, Alaa Yaqoob. 'The Electronic Agent: Its Concept and Legal Nature'. *University of Sharjah Journal for Sharia and Legal Sciences* 7, no. 2 (2010): 149–192.
- Alaloosh, Mahmood, Govar Majed Ahmad, and Lara Adel Jabbar. 'Adapting Iraqi Law to Smart Contracts: A Comparative Analysis Incorporating Islamic Law Principles and Consumer Protection in the Contemporary Digital Era'. *MILRev: Metro Islamic Law Review* 5, no. 1 (2026): 210–246. <https://doi.org/10.32332/milrev.v5i1.13031>.
- Alaloosh, Mahmood, Ali Shaker Mahmood, and Sabir Hussien Eliwy. 'Securing Digital Trade: A Techno-Legal Analysis of E-Commerce Safeguards in Iraq's Regulation No. 4/2025'. *Nusantara: Journal of Law Studies* 5, no. 1 (2026): 44–60. <https://doi.org/10.5281/zenodo.18452737>.
- Al-Buqami, Aidh bin Sultan. 'Electronic Commerce in the Saudi Legal System: A Comparative Study'. Dar Al-Ijada, 2017. <https://daralejadh.com/dyldWt>.
- Al-Dhnoon, Hassan Ali. *Al-Mabsoot in Civil Liability*. House of Wael Publication, 2021.

Al-Saad, Walid. *The Legal System of the Electronic Agent*. Al-Halabi Legal Publications, 2017.

<https://www.neelwafurat.com/itempage.aspx?id=lbb262177-245561&search=books>.

Al-Tuwayni, A. Kulthum Haji. 'The Basis of Civil Liability in Islamic Jurisprudence'. *almarifa journal for Humanities and Applied Sciences* 1, no. 5 (2025): 21-45.

'Article 11 of UNCITRAL Model Law on International Commercial Arbitration: Appointment of Arbitrators'. *IBC Laws*, n.d. Accessed 26 April 2026. <https://ibclaw.in/article-11-of-uncitral-model-law-on-international-commercial-arbitration-appointment-of-arbitrators/>.

Arum, Indiharwati, Mailah Mailah, and Binti Mohamad Nor Asiah. 'Gharar in Shafi'i Jurisprudence: Reassessing Its Validity in E-Commerce Transactions'. *Al-Iktisab: Journal of Islamic Economic Law*, 2025.

Atiyah, Ghassan Adhab, Nazura Abdul Manap, Ahmed Ismael Ibrahim, and Abdur Rahman. 'Legitimacy of Smart Contracts from the Perspective of Islamic Law: A Case Study of Blockchain Transactions'. *Al-Istinbath: Jurnal Hukum Islam* 9, no. 1 (2024): 155-192. <https://doi.org/10.29240/jhi.v9i1.8726>.

Bartoletti, Massimo, and Livio Pompianu. 'An Empirical Analysis of Smart Contracts: Platforms, Applications, and Design Patterns'. arXiv.Org, 18 March 2017. <https://doi.org/10.1007/978-3-319-70278-0>.

Cebola, Cátia Marques, and Susana Sardinha Monteiro. 'New Trends of Digital Justice: The Online Mediation—Between a Challenge and a Reality (The Portuguese Legal Framework)'. *Laws* 13, no. 2 (2024): 18. <https://doi.org/10.3390/laws13020018>.

Elobaid, Ali Hadi. 'Attribution Rules of the Electronic Message to the Creator in the UAE E-Commerce and Transactions Law'. *UAEU Law Journal*, 2013.

European Directive No. 31-2000.

Fry, Patricia Brumfield, Stephen Y. Chow, Kenneth W. Elliott, and Henry Deeb Gabriel. *Uniform Electronic Transactions ACT*. 1999.

Ghannam, Sharif Muhammad. *The Bank Is Responsible for Computer Errors in the Electronic Transfer of Money*. New University Publisher, 2006.

Gunawan, Yordan, Muhammad Praditya Dananjaya, Setiyantoro Wahyu Aditama, and Muhammad Daffa Auliarizky Oniella. 'Indonesian Sea Sand Exports: UNCLOS Compliance v. Environmental Sustainability Dilemma Explored'. *Jurnal Hukum* 41, no. 2 (2025): 394-410. <https://doi.org/10.26532/jh.v41i2.32294>.

Hamid, E. *Electronic Agent*. Raya Higher Institute of Management and Foreign Trade, 2020.

Jabbara, Noura. 'Contracting through the Electronic Agent'. *AlShamela Journal of Legal Studies* 1, no. 1 (2021): 136-144.

Jarrah, Baker Akram Falah, Zeyad AlMatarneh, Nehad Ibrahim Ineizeh, Haneen Aqel Al-Khawaja, and Emran Abdulsalam AlZubi. *The Relationship Between the Accounting Information System and Perceived Performance: The Moderating Effect of Managerial Qualifications According to Company Law," Quality*. 2025. <https://doi.org/https://doi.org/10.47750/QAS/26.208.07>.

Juraidan, Nayef bin Jamaan. 'Guarantee of Damage Resulted from Conclusion of the Contract by Electronic Agent: A Comparative and Rooting Study'. *Journal of the Faculty of Sharia and Law*, 2020. <https://doi.org/https://doi.org/10.21608/JFSLT.2020.105692>.

M, Ibrahim. *E-Commerce Contracts under the UAE Federal Law*. Dar Al-Fikir publication, 2020.

Masadeh, Ahmad Mahmoud Al, Malek Hamad Abunaseir, and Rami Omar Abu Rukba. 'Impact of Jordanian Electronic Transactions Law and Digital Transformation on Commercial Contracts and Their Proof'. *Journal of Human Security* 20, no. 1 (2024): 104-108.

Mashhour, Omar Farouk Al, Ahmad Shamsul Abd Aziz, and Nor Azlina Mohd Noor. 'Legal and Regulatory Aspects of Smart Contracts: A Systematic Review'. *Eurasian*

Matondang, Hafidz Ramadhan Noor, Intan Geandra, and Abdul Rahman Sofyan. 'Prinsip Non-Harm Sebagai Kerangka Etis Pengelolaan Sengketa Bisnis Syariah Di Era Digital'. *Jurnal Ekonomi Dan Bisnis Islam (JEBI)* 6, no. 1 (2026): 15–24.
<https://doi.org/10.56013/jebi.v6i1.5254>.

Mohamad Ghazali, Nasrun, Mohd Fuad Md. Sawari, Bouhedda Ghalia, and Syed Musa Syed Jaafar Alhabshi. 'The Fiqh Maxim Al-Ghunm Bi al-Ghurm: A Critique on Interpretation of the Maxim Relating to the Risk-Return Concept in Islamic Banking and Finance'. *ISRA International Journal of Islamic Finance* 16, no. 2 (2024): 4–19.

Nicholas, Imparato. *Public Policy and the Internet: Privacy, Taxes, and Contract*. Hoover Institution Press, 2010. Reprint, 2010.

Riani, Riris Mesta, Lisnawati Utami, and Maulida Rahma Layyin Syifa. 'The Implementation of Smart Contracts and Blockchain-Based Smart Sukuk in Islamic Finance: A Sharia Economic Law Perspective'. *Proceeding International Conference on Islam, Law, and Society (INCOILS)* 2 (2023).
<https://doi.org/10.70062/incoils.v2i1.488>.

Saadi, Mohamed. *Al-Nazariyah al-'Ammah Lil-Iltizamat: Dirasah Muqaranah [The General Theory of Obligations: A Comparative Study]*. Dar Al-Ma'arif, 2023.

Saifulloh, Putra Perdana Ahmad, Sonia Ivana Barus, Novendri M. Nggilu, Asrul Ibrahim Nur, and Dindha Shahrazade Sulaiman. 'Political Dynasties in General Elections According to Human Rights and A Comparison in Four ASEAN Countries'. *Trunojoyo Law Review* 7, no. 1 (2025): 123–160.
<https://doi.org/10.21107/tlr.v7i1.28492>.

Semida, Salah Eldin Ragab, Zeyad Tareq Al-Rawe, Sarmad Dalaf Hanoosh, Tarek El-Sayed Mahmoud Abu Aqil, and Mahmood Shaker Alaloosh. 'From Remedial to

Preventive Justice: A Contemporary Reframing of Civil Liability in Islamic and Comparative Law'. *MILRev: Metro Islamic Law Review* 5, no. 1 (2026): 722–752.

<https://doi.org/10.32332/milrev.v5i1.13126>.

Tantawi, Shadi Ramadan Ibrahim. *The Legal Framework of Contracting and Signature in E-Commerce*. 1st ed. Arab Center for Publishing and Distribution, 2016.

The Saudi Electronic Transactions Law, Pub. L. No. No. M/18 (2007). 2007.

UETA, 1999, Comment. No. 1, § Section 14. 1991.

UETA, 1999, Section 14.

UETA, Section 6, 1999.

UN Convention, Article 12, 2005.

UN Convention, 2005, § Article 14/ 1. 2005.

Uniform Electronic Transactions ACT (1999), Section 2.

United Nations Commission on International Trade Law. 'UNCITRAL Model Law on Electronic Commerce (1996) with Additional Article 5 Bis as Adopted in 1998'.

United Nations Commission on International Trade Law. Accessed 28 April 2026.

https://uncitral.un.org/en/texts/ecommerce/modellaw/electronic_commerce.

Uula, Mimma Maripatul. *Smart Contracts and the Islamic Finance Industry | Journal of Islamic Economics Literatures*. n.d. Accessed 26 May 2026.

https://journals.smartinsight.id/index.php/JIEL/article/view/631?utm_source=chatgpt.com.

Wardani, Retno Endah Kusuma. 'The Implementation of Blockchain-Based Smart Contracts in Islamic Finance: Opportunities and Challenges'. *Dalwa Islamic Economic Studies: Jurnal Ekonomi Syariah* 4, no. 2 (2025): 130–152.

<https://doi.org/10.38073/dies.v4i2.3760>.

Wright, Benjamin, and Jane K. Winn. 'The Law of Electronic Commerce'. Berkeley Law, Aspen Law & Business, 1998.

<https://lawcat.berkeley.edu/record/496606>.

Zheng, Zibin, Shaoan Xie, Hong-Ning Dai, et al. 'An Overview on Smart Contracts: Challenges, Advances and Platforms'. arXiv.Org, 22 December 2019.

<https://doi.org/10.1016/j.future.2019.12.019>.

Zulkarnaen, Wandy. 'Shariah in the Age of Blockchain: Rethinking Legal Authority and Smart Contracts in Decentralized Islamic Finance'. *Journal of Contemporary Islamic Law and Studies* 1, no. 1 (2025): 56-68. <https://doi.org/10.47353/jcils.v1i1.371>.