

Comparative Analysis of the Validity and Invalidity of Smart Contracts in Imami Jurisprudence, Iranian Law, and the Principles of European Contract Law

Akram. Tajik^{1*}, Ahmad. Mohammad Ghasemi²

¹ Assistant Professor, Department of Law, Az.C., Islamic Azad University, Azadshahr, Iran

² Department of Law, Go.C., Islamic Azad University, Gorgan, Iran

* Corresponding author email address: akram.tajik@iau.ac.ir

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Smart contracts, as one of the manifestations of blockchain technology, have brought about a profound transformation in the field of contracts. These contracts, which are executed automatically, have introduced novel challenges within various legal systems. The present study, employing a descriptive–analytical method and a comparative approach, examines the conditions of validity and the grounds for invalidity of smart contracts in three systems: Imami jurisprudence, Iranian law, and the Principles of European Contract Law. The findings indicate that in Imami jurisprudence, smart contracts can be accepted under unnamed contracts based on the general evidences of the validity of transactions and principles such as the presumption of validity. In Iranian law, Article 10 of the Civil Code, along with the Electronic Commerce Law, provides sufficient capacity for the validation of such contracts. In the Principles of European Contract Law, with an emphasis on the principle of freedom of contract and party autonomy, smart contracts are considered valid provided that the essential conditions of validity are fulfilled. Nevertheless, common challenges exist, including the verification of parties' legal capacity in digital environments, the realization of valid offer and acceptance, the determination of the subject matter of the contract, and the applicability of options (khiyarat) in such agreements, all of which require reconsideration and modernization of existing regulations. This study emphasizes the necessity of developing a coherent legal framework for smart contracts through an integrative approach combining Islamic jurisprudential-legal foundations and the achievements of advanced legal systems.

Keywords: Smart contract, blockchain, Imami jurisprudence, Iranian law, Principles of European Contract Law, contract validity

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1. Introduction

The rapid advancement of information and communication technology in recent decades has produced a profound transformation in the sphere of contracts and commercial exchanges. The emergence of blockchain technology and, subsequently, the development of smart contracts have opened a new chapter in the history of contract law. Smart contracts,

first conceptualized by Nick Szabo in 1994, are agreements that are executed automatically and without the need for an intermediary on a blockchain-based infrastructure (Sarraf, 2023; Szabo, 1996). The distinctive features of these contracts, including self-execution, transparency, immutability, and the reduction of transaction costs, have turned them into an attractive instrument for international trade and, gradually, for



domestic legal systems (Alavi, 2023; Naser & Sadeghi, 2019).

Despite the significant advantages of smart contracts, numerous legal challenges exist regarding their acceptance and validation (Dehghani Tafti et al., 2022). The fundamental question is whether this emerging phenomenon, which is formed in a digital environment and through coded language, can be reconciled with traditional concepts of contract law. What are the conditions for the validity of these contracts, and what factors may lead to their invalidity? The answer to these questions differs across legal systems, depending on their different intellectual foundations and normative sources.

The present study aims to conduct a comparative analysis of the conditions of validity and the grounds for invalidity of smart contracts in three systems: Imami jurisprudence, Iranian law, and the Principles of European Contract Law. These three systems were selected because Imami jurisprudence, as the principal source of Iranian law, plays an irreplaceable role in shaping legal concepts (Katouzian, 2009). Iranian law, as a legal system with jurisprudential roots that has encountered emerging technologies in recent years, requires special examination. The Principles of European Contract Law, as one of the most important transnational instruments in the field of contracts, can also provide a model for adapting and harmonizing legal rules with technological developments (Nikbakht & Piri, 2012).

The significance of this study lies in the fact that, by identifying the commonalities and differences among these three legal systems, it becomes possible to reach a relatively comprehensive framework for validating smart contracts, one that preserves indigenous jurisprudential and legal foundations while also benefiting from the achievements of advanced legal systems. This not only contributes to the theoretical development of contract law scholarship but also provides practical guidance for legislators, judges, and economic actors when confronting this emerging phenomenon.

2. Literature Review

The study of smart contracts from jurisprudential and legal perspectives has been the subject of several studies in recent years. This literature can be examined in several general categories:

Jurisprudential studies: The master's thesis entitled "Smart Contracts in Imami Jurisprudence and Iranian Law," defended at Shahid Motahari University, is among the valuable studies in this field. Using a library-based method and a descriptive-analytical approach, this research examined the jurisprudential and legal foundations of smart contracts and concluded that, in light of the general evidences governing transactions and jurisprudential principles such as the presumption of validity, the legitimacy of smart contracts can be established under unnamed contracts (Ebadi Nasab, 2023).

Comparative studies with foreign law: The article "Evaluation of the General Conditions for Validity of Smart Contracts from the Perspective of Iranian and American Law," published in the Legal Research Quarterly, provides a comparative analysis of the four general conditions for contractual validity in the two legal systems. The findings of this study indicate that the legal capacity of the parties is not examined in the ordinary process of concluding a smart contract and therefore requires special arrangements. It also shows that the consent of the parties can be identified in such contracts and that smart contracts may be concluded either for consideration or gratuitously (Nejat-Zadegan & Soltani, 2023).

Studies related to European law: The article "The Position of Smart Contracts in Commercial Transactions: English Law and European Union Law" examines the comparative approach of these systems toward smart contracts. This study shows that England and the European Union have taken effective steps in recent years toward the recognition and regulation of smart contracts, and the proposal submitted to the UK government in November 2021 regarding smart legal contracts confirms this claim (Yousefkhani, 2022).

Studies related to contract dissolution: The article "Analysis of the Foundations and Legal Consequences of Dissolution of Virtual Contracts from the Perspective of Imami Jurisprudence and Common Law" comparatively examines the foundations of the dissolution of electronic contracts. The findings show that Imami jurisprudence bases contract dissolution on the will of the parties and the traditional rules of termination and mutual rescission, whereas English law, relying on the doctrine of fundamental breach, allows the rapid and automatic

dissolution of contracts in cases of substantial breach of obligation (Rajabloo et al., 2023).

Research gap: Despite the valuable studies conducted, no study has yet simultaneously examined Imami jurisprudence, Iranian law, and the Principles of European Contract Law from the perspective of the conditions of validity and the grounds for invalidity of smart contracts. In addition, most existing studies have focused on the general validation of smart contracts, while a precise analysis of the grounds for invalidity and the specific challenges of these contracts has received less attention. The present study seeks to fill this research gap.

3. Methodology

In terms of its nature, this research falls within the category of fundamental–applied studies, and in terms of method, it is descriptive–analytical with a comparative approach. Data were collected through a library-based method by consulting authoritative sources, including jurisprudential books, statutory laws, judicial opinions, and scholarly articles published in the last five years.

Comparative method: This study employs a functional comparative model. Accordingly, the concept and characteristics of smart contracts are first explained; then the conditions of contractual validity in each of the three legal systems are examined; finally, similarities and differences are identified and analyzed.

Criteria for selecting the legal systems: Imami jurisprudence was selected because it serves as a source for Iranian law and because of its theoretical richness in the field of contracts. Iranian law was selected as a legal system currently interacting with emerging technologies and therefore requiring special examination. The Principles of European Contract Law were selected because of their influence on developments in contract law at the international level and their relative commonalities with civil-law legal systems.

Data collection tools: Data were collected through note-taking from library sources and reputable databases, including SID, Magiran, Civilica, SSRN, and HeinOnline.

Data analysis method: The data were analyzed through qualitative content analysis with an interpretive and comparative approach. In this method, the main concepts and categories were extracted from the texts and then compared with one another.

4. Conceptualization and Nature of the Smart Contract

Before conducting a comparative examination of the conditions of validity and invalidity of smart contracts in different legal systems, it is necessary to precisely explain the concept and nature of this emerging phenomenon. Understanding the technical and legal features of the smart contract is an unavoidable prerequisite for analyzing its position within traditional frameworks of contract law and for assessing its adaptability to long-established jurisprudential and legal concepts.

4.1. Definition of Smart Contract

A smart contract refers to an agreement written in the form of computer code and executed on a blockchain infrastructure. Nick Szabo, a computer scientist, defined this concept in 1994 as computerized transaction protocols that execute the terms of a contract (Szabo, 1996). Unlike traditional contracts, whose performance requires action by the parties or intervention by judicial authorities, smart contracts are executed automatically once predetermined conditions are met (Hewa & et al., 2021).

Researchers distinguish between two models of smart contracts: the internal model, in which the contract exists solely in the form of code and software and is executed automatically; and the external model, in which the smart contract is incorporated as an implied term within a traditional contract. In the external model, the smart contract is not itself the contract but rather an instrument for performing the obligations arising from the principal contract (Ferreira, 2021).

4.2. Characteristics of Smart Contracts

Smart contracts possess distinctive features that distinguish them from traditional contracts. These features are as follows:

Self-execution: The most important feature of a smart contract is the automatic performance of obligations once the relevant conditions are fulfilled. This feature reduces the need for intermediaries and lowers transaction costs (Naser, 2018).

Immutability: Once a smart contract is recorded on a blockchain, it cannot be altered or manipulated. This feature increases the parties' trust, but at the same time

it makes it difficult to amend the contract in cases of error or changed circumstances (Taskforce, 2019).

Transparency: All parties to the contract can observe its terms and the manner of its performance. This transparency reduces the likelihood of fraud and breach of obligations (Alavi, 2023).

Decentralization: Smart contracts are executed on decentralized networks and do not require a central institution for validation (Hewa & et al., 2021).

4.3. Technical Mechanism of Smart Contracts

Smart contracts operate according to “if-then” logic; that is, if certain conditions are fulfilled, then the contract is executed automatically. This process takes place on the basis of distributed ledger technology, which ensures that all participants in the network have access to identical information (Ferreira, 2021).

The Ethereum platform is the most popular infrastructure for creating and executing smart contracts. The Ethereum Virtual Machine is responsible for managing these contracts. For the execution of each smart contract, a fee known as “gas” is paid, which functions both as a reward for network validators and as a mechanism to prevent the network from being overloaded by complex or numerous contracts (Sarraf, 2023).

5. Conditions for the Validity of Smart Contracts

After explaining the concept and nature of smart contracts, it is now necessary to analyze the conditions for the validity of these contracts in the three systems of Imami jurisprudence, Iranian law, and the Principles of European Contract Law. A comparative examination of the essential conditions of validity is necessary because, without the fulfillment of these conditions, a smart contract lacks legal validity and cannot produce the legal effects attributed to it by law.

5.1. In Imami Jurisprudence

In Imami jurisprudence, the validity of every transaction depends on the fulfillment of conditions inferred from the four sources of the Qur’an, tradition, consensus, and reason. These conditions are as follows:

Intention and consent of the parties: A contract must be based on constructive intention and the consent of the parties (Mahaqqiq Hilli, 1990). In smart contracts, the

question is whether clicking on options or interacting with a user interface indicates the serious intention of the parties. It appears that, in light of prevailing custom in cyberspace and the legal framework of electronic commerce, such actions can be regarded as indicating intention, provided that the parties are aware of the nature of their act (Naser, 2018).

Legal capacity of the parties: The contracting parties must possess the capacity to exercise rights, including maturity, reason, and sound judgment (Shahid Thani, 1993). In smart contracts, verifying legal capacity is challenging because the real identity of the parties may be unknown. Solutions such as the use of valid digital certificates and multi-factor authentication can reduce this problem (Dehghani Tafti et al., 2023).

Determinate and known subject matter of the transaction: The subject matter of the transaction must be known in terms of quantity, type, and characteristics, and must not involve uncertainty (Mousavi Khomeini, 2006). In smart contracts, computer codes usually specify the subject matter precisely, but ambiguity may sometimes arise in the interpretation of the codes (Naser & Sadeghi, 2019).

Legitimacy of the purpose of the transaction: The objective and motive of the parties in concluding the contract must not be unlawful (Mahaqqiq Hilli, 1990). This condition also applies to smart contracts.

Legitimacy of the contract itself: The contract must not be contrary to religious legal rules. For example, smart contracts involving usury or gambling would be invalid (Shahid Thani, 1993).

On the basis of the general evidences governing transactions, including the Qur’anic command to “fulfill contracts,” the principle that parties are bound by their conditions, and the presumption of validity, smart contracts are recognized as valid in Imami jurisprudence, provided that the above-mentioned conditions are observed (Hurr Amili, 1989; Naser, 2018).

5.2. In Iranian Law

The Iranian legal system, inspired by Imami jurisprudence and also influenced by Western legal systems, has provided a relatively flexible framework for recognizing modern contracts.

Article 10 of the Iranian Civil Code, as one of the most important pillars of Iranian contract law, provides that private contracts are binding on those who have

concluded them, provided that they are not explicitly contrary to law. This article, which recognizes the principle of freedom of contract, creates an appropriate capacity for validating smart contracts (Katouzian, 2009).

The Iranian Electronic Commerce Law, enacted in 2004 with subsequent amendments, also determines the legal framework for electronic transactions. Article 6 of this law provides that data messages have legal validity. Article 12 also recognizes offer and acceptance through data messages as valid (Dehghani Tafti et al., 2022; Soltani, 2016).

The analysis of the general conditions of contractual validity in Iranian law identifies four essential elements (Safaei, 2011):

Legal capacity of the parties: In the ordinary process of concluding a smart contract, the legal capacity of the parties is not examined. This requires special arrangements to ensure that the parties possess legal capacity (Nejat-Zadegan & Soltani, 2023).

Consent: The consent of the parties in smart contracts can be identified and objectively verified. Digital signatures and confirmation mechanisms on the blockchain can indicate consent (Nejat-Zadegan & Soltani, 2023).

Subject matter of the transaction: Smart contracts may be concluded either for consideration or gratuitously. In both cases, the subject matter of the transaction must be lawful and must possess a rational benefit (Naser, 2018).

Purpose of the transaction: If the purpose and motivating reason of a smart contract are unlawful, the contract will be invalid. This rule applies equally to all contracts, whether traditional or smart (Katouzian, 2009).

5.3. In the Principles of European Contract Law

The Principles of European Contract Law, drafted by the Commission on European Contract Law, constitute one of the most important transnational instruments in the field of contracts. Although these principles are not binding, they have had a significant influence on the development of contract law in European countries (Nikbakht & Piri, 2012).

Principle of party autonomy: Article 2:101 of the Principles of European Contract Law provides that the requirements for the conclusion of a contract are the parties' intention to be legally bound and sufficient

agreement without any further requirement (Lando & Beale, 2000). This minimalist approach creates an appropriate capacity for recognizing smart contracts, because participation in a blockchain network and execution of codes may indicate intention and agreement.

Conditions of validity: The conditions of contractual validity in the Principles of European Contract Law include capacity, which makes the contract voidable in cases of lack of capacity according to national law; sound consent, including defects of consent such as mistake, fraud, and duress; and legality, under which contracts contrary to fundamental principles of morality and public order are invalid (Lando & Beale, 2000).

Approach to electronic contracts: The European Union has provided a framework for electronic contracts through instruments concerning electronic commerce and consumer rights. Although these instruments do not directly address smart contracts, their general principles may be extended to them (Ferreira, 2021; Yousefkhani, 2022).

In 2019, the UK Jurisdiction Taskforce issued a legal statement confirming that smart contracts may be regarded as binding contracts under English law, which shares many features with European legal systems (Taskforce, 2019).

6. Grounds for Invalidity of Smart Contracts and Challenges

After examining the conditions for the validity of smart contracts, it is now necessary to analyze the grounds for invalidity and the challenges facing these contracts in the three legal systems. Identifying the factors that render smart contracts invalid, as well as the common and system-specific challenges in this regard, is necessary for presenting a complete picture of the position of this emerging phenomenon in contract law.

6.1. Common Challenges in the Three Legal Systems

Lack of sound consent: In all three legal systems, a contract concluded under duress, fraud, or mistake is voidable (Katouzian, 2009; Lando & Beale, 2000). In smart contracts, the technical and coded nature of the contract may place a non-specialist party in an unequal position. If one party signs the contract without fully

understanding its terms, which are written in code, a claim of mistake may be raised (Ferreira, 2021).

Uncertainty in the subject matter of the transaction:

The requirement that the subject matter of the transaction be known exists in all three legal systems (Shahidi, 2009). In smart contracts, although codes are usually precise, the translation of legal concepts into code may create ambiguities that are not visible on the face of the code (Dehghani Tafti et al., 2022).

Illegality of purpose or subject matter: If the subject matter of a smart contract is unlawful, such as transactions related to narcotics or gambling, it will be invalid in all legal systems. This rule is independent of the form of the contract (Taskforce, 2019).

6.2. Specific Challenges in Imami Jurisprudence

The system of option rights: One of the most important challenges in Imami jurisprudence concerns the interaction between smart contracts and the system of option rights. Options such as the option for gross disparity, fraud, defect, and session-based rescission allow the parties to terminate the contract in specific circumstances (Mahaqqiq Hilli, 1990). However, the automatic and immutable performance of smart contracts may conflict with the exercise of these option rights (Naser & Sadeghi, 2019).

The rule against excessive uncertainty: The rule prohibiting transactions involving excessive uncertainty is among the established jurisprudential rules (Shahid Thani, 1993). The question is whether smart contracts, which are based on complex codes, create excessive uncertainty for a non-specialist party. It appears that if the parties can understand the terms of the contract with the assistance of experts, such uncertainty is removed (Naser, 2018).

The no-harm principle: The no-harm principle may also be invoked in cases where the automatic execution of a contract causes harm to one of the parties (Mousavi Khomeini, 2006).

6.3. Specific Challenges in Iranian Law

Absence of specific legislation: The most important challenge in Iranian law is the absence of specific legislation on smart contracts. Although Article 10 of the Civil Code and the Electronic Commerce Law create

certain capacities, courts may hesitate to recognize this type of contract (Nejat-Zadegan & Soltani, 2023).

Formalism in certain contracts: Some contracts, such as those concerning immovable property, require the preparation of an official deed. The question is whether registration of a contract on a blockchain can replace an official deed. The answer is negative, because blockchain registration does not possess the legal status of official registration in notarial offices (Katouzian, 2009).

Burden of proof: In disputes involving smart contracts, proving the occurrence of offer and acceptance and verifying the identity of the parties may be difficult (Shahidi, 2009).

6.4. Specific Challenges in the Principles of European Contract Law

Consumer protection: European legal instruments provide extensive rights for consumers, including the right of withdrawal in distance contracts. Exercising this right in self-executing smart contracts is challenging (Ferreira, 2021; Yousefkhani, 2022).

Conflict of laws: Smart contracts are usually transnational. Determining the governing law and the competent forum for dispute resolution is one of the major challenges. Comparative studies show that traditional conflict-of-laws rules are not fully responsive to cyberspace (Dehghani Tafti et al., 2022; Soltani, 2016).

Performance of obligations and remedies: Remedies in traditional contracts, such as claims for specific performance, may lose their practical relevance in smart contracts where performance has already occurred automatically (Ferreira, 2021).

7. Findings and Discussion

After the comparative analysis of the conditions of validity and the grounds for invalidity of smart contracts in Imami jurisprudence, Iranian law, and the Principles of European Contract Law, it is now necessary to present and examine the findings of the study. In this section, the findings are first presented through a systematic comparative analysis, and then the commonalities and differences among the three legal systems are discussed and evaluated analytically.

7.1. Comparative Analysis of the Conditions of Validity

To explain more precisely the commonalities and differences among the legal systems under study, the conditions of validity of smart contracts in Imami jurisprudence, Iranian law, and the Principles of European Contract Law are examined comparatively. The conditions of contractual validity in these three legal systems have significant similarities, although differences can be observed in the way each condition is verified and interpreted.

The intention and consent of the parties are essential pillars of the conclusion of any contract. In Imami jurisprudence, a contract must be based on constructive intention and the consent of the parties (Muhaghiq Hilli, 1990), and this intention may be verified through any means capable of expressing it. In smart contracts, the user's interaction with the system and confirmation of the contractual terms through the user interface can be regarded as indicating intention and consent, provided that the parties are aware of the nature of their act (Naser, 2018). In Iranian law, the Electronic Commerce Law recognizes offer and acceptance through data messages as legally valid (Dehghani Tafti et al., 2022; Soltani, 2016). In the Principles of European Contract Law, Article 2:101 requires only the parties' intention to be legally bound and sufficient agreement (Lando & Beale, 2000), thereby adopting a minimalist and flexible approach.

Legal capacity of the parties is another common condition. In Imami jurisprudence, the contracting parties must possess the capacity to exercise rights, including maturity, reason, and sound judgment (Shahid Thani, 1993), and these conditions are necessary for the validity of every transaction. In smart contracts, the main challenge is the verification of identity and legal capacity in the digital environment, because the parties' real identities may be unknown (Dehghani Tafti et al., 2023). In Iranian law as well, legal capacity is an essential condition for contractual validity, and comparative studies show that in the ordinary process of concluding a smart contract, the legal capacity of the parties is not examined and therefore special arrangements, such as the use of valid digital certificates, are required (Nejat-Zadegan & Soltani, 2023). In the Principles of European Contract Law, the issue of legal capacity is referred to national laws (Lando & Beale, 2000); nevertheless,

verification of capacity remains necessary for contractual validity.

The subject matter of the transaction must also satisfy specific conditions in all three legal systems. In Imami jurisprudence, the subject matter must be known and determinate and must be free from excessive uncertainty (Mousavi Khomeini, 2006). In smart contracts, computer codes usually define the subject matter precisely, but ambiguity may sometimes arise in the interpretation of the codes (Naser & Sadeghi, 2019), which should be resolved with the assistance of experts. In Iranian law, the subject matter of the transaction must be determinate and lawful (Safaei, 2011). In the Principles of European Contract Law, it is sufficient for the subject matter to be determinate or determinable (Lando & Beale, 2000).

The purpose or cause of the obligation is the final common condition. In Imami jurisprudence, the legitimacy of the purpose of the transaction is necessary (Muhaghiq Hilli, 1990), and if the motive and objective of the parties in concluding the contract are unlawful, the contract will be invalid. The same rule applies in Iranian law, and according to Katouzian, an unlawful purpose leads to the invalidity of the contract (Katouzian, 2009). In the Principles of European Contract Law, contracts contrary to fundamental principles of morality and public order are considered invalid (Lando & Beale, 2000).

The comparative examination shows that, despite conceptual and structural differences, all three legal systems recognize similar essential conditions for contractual validity, and these conditions can be adapted to smart contracts, although the manner of verifying some of these conditions in the digital environment requires redefinition and special arrangements.

7.2. Commonalities and Differences

Commonalities: All three systems recognize the principle of freedom of contract (Katouzian, 2009; Lando & Beale, 2000).

The essential conditions of validity, namely intention, legal capacity, subject matter, and legality, are similar in all three systems (Muhaghiq Hilli, 1990; Safaei, 2011). None of these systems considers a contract invalid merely because it is electronic in form (Dehghani Tafti et al., 2022; Yousefkhani, 2022).

Differences: Imami jurisprudence and Iranian law place greater emphasis on concepts such as excessive uncertainty and option rights (Shahid Thani, 1993).

The Principles of European Contract Law adopt a more functionalist approach and emphasize party autonomy (Lando & Beale, 2000).

Consumer protection is more prominent in the European system (Yousefkhani, 2022).

7.3. Discussion

The findings of the study show that, from a theoretical perspective, smart contracts can satisfy the conditions of validity in all three legal systems. The principle of freedom of contract serves as the main basis for the validity of these contracts. However, there are numerous practical challenges that require attention.

First, although the self-executing feature of smart contracts is an advantage, it conflicts with traditional concepts such as option rights and the possibility of contract termination. It appears that the solution lies in designing smart contracts with the capacity to be suspended or amended under specific circumstances (Ferreira, 2021; Naser & Sadeghi, 2019).

Second, the legal gap is evident in all systems, especially in Iranian law. The enactment of specific laws or the addition of provisions to existing laws can provide a solution (Nejat-Zadegan & Soltani, 2023).

Third, training judges, lawyers, and legal experts in blockchain technology and smart contracts is necessary (Taskforce, 2019).

8. Conclusion

The present study was conducted with the aim of comparatively analyzing the conditions of validity and the grounds for invalidity of smart contracts in Imami jurisprudence, Iranian law, and the Principles of European Contract Law. The findings of the study can be summarized as follows:

Smart contracts are capable of validation in all three legal systems. In Imami jurisprudence, based on the general evidences governing transactions and the presumption of validity, these contracts can be accepted under unnamed contracts. In Iranian law, Article 10 of the Civil Code and the Electronic Commerce Law provide the necessary capacity. In the Principles of European Contract Law, with emphasis on party autonomy and

freedom of contract, smart contracts are considered valid if the essential conditions are fulfilled.

The essential conditions of validity, namely intention and consent, legal capacity, subject matter, and legality, are similar in all three systems, but the manner of verifying these conditions in the digital environment requires redefinition and special arrangements.

The most important common challenges include verification of legal capacity in the digital environment, realization of sound consent, precise determination of the subject matter of the transaction, and the possibility of exercising option rights and terminating the contract. The specific challenges of each system also require special attention.

In all systems, especially Iranian law, there is a need to revise and update existing regulations. The development of a coherent legal framework for smart contracts, through an integrative approach combining indigenous jurisprudential-legal foundations and the achievements of advanced legal systems, is an undeniable necessity.

Research on the following topics is recommended:

Comparative analysis of option rights in smart contracts
Civil liability arising from incomplete or defective execution of smart contracts

Governing law in transnational smart contracts

Consumer protection in smart contracts

Feasibility of establishing specialized courts and arbitral bodies for resolving disputes arising from smart contracts

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

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