

The Impact of Artificial Intelligence and Blockchain Technology on the Legal Liability of Transnational Corporations in International Transactions: Challenges and Emerging Legal Solutions

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Abstract

In the digital era, emerging technologies such as artificial intelligence (AI), blockchain, and smart contracts have fundamentally transformed the traditional structure of commercial transactions and the conceptualization of legal liability for transnational corporations. While these technologies enhance efficiency and transparency and reduce transaction costs, they simultaneously raise novel legal questions concerning the legal personality of machines, the establishment of causation, the allocation of liability across production and supply chains, and the legal validity of self-executing contracts. Accordingly, in light of the unprecedented integration of these technologies into international commercial agreements, this article seeks to develop a coherent legal framework governing the liability of transnational corporations and to bridge the gap between technological efficiency and the traditional principles of contract law. This study adopts an analytical-critical approach and relies on library-based sources and international legal instruments to examine the legal challenges arising from automated decision-making, the role of oracles, algorithmic discrimination, and regulatory deficiencies within both the Iranian legal system and international legal frameworks. The findings indicate that the absence of a clear legal framework regarding the legal personality of artificial intelligence, risk-based civil liability, and ex ante oversight of algorithms has contributed to persistent regulatory uncertainty and diminished investor confidence. Finally, the article proposes several innovative legal solutions, including the recognition of a limited legal personality for intelligent systems, the establishment of mandatory insurance funds, the development of algorithmic transparency standards, and the creation of a specialized supervisory authority for artificial intelligence. These measures are intended to preserve fundamental legal principles while fostering innovation and ensuring legal certainty for commercial actors.

Keywords: Artificial Intelligence, Blockchain, Legal Liability, Transnational Corporations, Smart Contracts, Limited Legal Personality, Mandatory Algorithmic Insurance.

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1. Introduction

In recent decades, artificial intelligence has evolved from an auxiliary tool into an “intelligent partner” within the global trade ecosystem, to the extent that many companies can no longer compete at the negotiating table without relying on this technology. Deep learning algorithms can now monitor hundreds of thousands of historical contracts in real time, extract hidden patterns of pricing, payment clauses, guarantees, and even the negotiation behavior of the opposing party, and deliver them to the legal team as reliable assumptions. The result is a paradigm shift from “experience-based negotiation” to “data-driven negotiation,” where the initial draft of the contract is prepared not by a lawyer but by an artificial intelligence recommendation engine, while the lawyer assumes the role of a “governance supervisor” over machine decisions. In this context, artificial intelligence is not merely a “fast assistant”; rather, it is a “live risk-assessment system” that, during online negotiations, connects to legal, financial, and even media databases to identify real-time changes in the counterparty’s credit rating, the issuance of new judgments against it by international courts, or even geopolitical tensions that may delay the delivery of goods. Some advanced platforms possess the capacity for “automated negotiation up to an authorized threshold,” meaning that the system can operate within a framework predetermined by the board of directors (Ghorbani, 2023). Artificial intelligence refers to a human-made system that absorbs data in real or virtual environments, understands it, and makes the optimal decision to achieve a complex objective. Over the past decade, this capacity has moved from a dream to an inseparable part of life, to the point that today it has transformed the global economy from factories and stock exchanges to ships, containers, and digital negotiation tables. The price of goods is adjusted by algorithms before cargo is even loaded; shares are transferred within microseconds; governments design sanctions intelligently; and companies complete “pre-consumption” production before consumers even express demand. This means that power is no longer measured by the size of geographical borders, but by the volume and speed of data processing (Parizad & Saeedi, 2024).

In recent decades, emerging technologies such as artificial intelligence, blockchain, smart contracts, and big data have not only transformed the structure of businesses but have also confronted traditional concepts of contract law with unprecedented challenges. These developments have created opportunities to increase efficiency, enhance transparency, and reduce costs, yet at the same time they have raised new legal questions concerning liability, contractual validity, privacy, and the role of human agency in decision-making processes (Brownsword, 2019; Zetzsche et al., 2020). Technological developments have prompted transnational corporations to use algorithms for decision-making in purchasing, sales, transportation, and even dispute resolution. In this regard, commercial companies face the concern of whether traditional contracts can still meet their needs or whether they must move toward contracts compatible with emerging technologies (De Filippi & Wright, 2018). The comparative study by Dehghani Tafti and colleagues shows that in France, smart contracts/transactions are not regarded merely as “tools”; rather, where human intention is established, courts treat them as binding instruments, whereas in Iran, the absence of intention at the moment of automatic code execution may lead to nullity (Dehghani Tafti et al., 2022).

The purpose of this study is to provide a legal framework for the liability of transnational corporations in the use of artificial intelligence and blockchain in international transactions.

1. Legal and Civil Opportunities Related to the Impact of Artificial Intelligence

The growing application of artificial intelligence in areas such as autonomous transportation, medical diagnosis, banking services, and even facial recognition has placed the Iranian legal system before an unprecedented opportunity to adopt innovative solutions that both ensure citizens’ legal security and strengthen the innovation environment. The first opportunity is the “creation of limited legal personality for intelligent systems.” This opportunity was first raised in the 2017 report of the European Parliament, which proposed defining a form of “electronic personality” for advanced autonomous robots so that their civil and financial liability for possible damages could be clearly claimed (Bagheri, 2025; Voynikas, 2020). This idea does not mean granting full human rights; rather, it is an instrument for distinguishing the burden of liability between humans and machines. Accordingly, if an autonomous vehicle causes an accident without human intervention, the injured party could claim damages directly against the “registered assets of that system” without needing to pursue a chain of manufacturers, programmers, and owners (Ward, 2025).

The second solution is the “establishment of a mandatory compensation fund,” similar to third-party motor insurance. In this model, every high-risk system must pay an insurance premium to a central fund before market release. As envisaged in

European legal discourse, this fund compensates damage without requiring proof of fault and merely upon establishing the causal link (Bagheri, 2025; Vasiliev & Ibragimov, 2019). Such a mechanism both accelerates adjudication and reduces investor risk, because the developer's assets remain protected against massive claims.

The third opportunity is the “development of guidelines for artificial intelligence transparency and interpretability.” According to Wachter and colleagues, the more traceable and explainable an algorithmic decision is, the easier it becomes to prove fault or causation in court. It is therefore proposed that a legal authority, such as the National Cyberspace Center or the Judiciary, require “high-risk” decision-making systems to retain a technical decision report for at least five years so that it can be relied upon in litigation (Bagheri, 2025; Wachter et al., 2017). In addition, transparency increases public trust and empowers consumers against unfair or discriminatory decisions (Dev.to, 2025).

The fourth solution is the “use of international standards to facilitate service exports.” Iran can align itself with global standards by joining frameworks such as the European Union's artificial intelligence regulatory model or the United Nations ethical principles, while also gaining the ability to export intelligent medical or agricultural software to regional markets. This is because foreign buyers will be assured that the product has entered the market within a recognized legal framework (Schulz et al., 2023).

Overall, these opportunities show that if the Iranian legislator approves the regulation on “mandatory insurance for high-risk systems” in the short term and submits the bill on “limited legal personality” to Parliament in the medium term, it can ensure citizens' legal security and reduce investor risk without negating innovation (Bagheri, 2025).

The fifth opportunity is the “creation of a specialized algorithm oversight institution.” Unlike general regulatory bodies that supervise the food or pharmaceutical industries, there is still no specific institution in Iran for assessing “algorithmic safety and fairness.” It is proposed that a “National Center for Artificial Intelligence Oversight” be established under the Supreme Council of Cyberspace and tasked with pre-market risk assessment, issuance of conformity certificates, receipt of citizens' complaints, and issuance of orders to modify or suspend systems (Bagheri, 2025). Similar models in Japan and South Korea have been successful and have led start-ups to conform to standards before releasing their products (Gabov & Khavanova, 2018). The sixth solution is “strengthening accountability through smart contracts.” Since in many applications, such as automatic insurance exchange or digital payment, artificial intelligence becomes a contractual actor, automatic obligation codes can be inserted into the contract to pre-formulate the conditions for compensation. Thus, if an algorithmic decision causes damage to the counterparty, the guaranteed amount is automatically released (Raskin, 2017). This method reduces litigation costs and accelerates the performance of obligations. As a result of these opportunities, it can be argued that if the Iranian legal system applies a combination of “limited legal personality,” “mandatory insurance,” “algorithmic transparency,” and a “specialized oversight institution,” it will be able to ensure citizens' legal security and reduce investor risk without suppressing innovation; this is also an objective emphasized in Article 44 of the Constitution, namely public welfare and economic growth. Therefore, the final recommendation is that in the short term, namely 2025–2026, the mandatory insurance regulation should be approved by the Council of Ministers, and in the medium term the bill on “limited legal personality” should be submitted to Parliament so that the legal gap can be addressed (Bagheri, 2025).

2. Legal Challenges of the Impact of Artificial Intelligence on the Civil Liability System

Against the opportunities mentioned above, four fundamental challenges exist, without resolving which any innovative solution will fail. The first challenge is the “absence of independent legal personality.” Under Article 2 of the Electronic Commerce Law and the dominant legal theory, artificial intelligence is regarded merely as an “instrument” and lacks the “will and intention” necessary for personality recognition (Bagheri, 2025; Shahbazinia & Zolghadr, 2024). As a result, the court cannot issue a judgment against the system itself and must inevitably hold one of the human actors in the production chain liable, even though that person may have had no involvement at the moment of decision-making. This contradicts the principles of “justice” and “personal liability” (Katouzian, 2019).

The second challenge is the “difficulty of proving causation.” In deep learning systems, the final decision results from the interaction of hidden network layers and training data, and even the designer cannot predict what output will be produced at a

specific moment (Bagheri, 2025). Therefore, in order to prove the causal relationship between the “algorithmic error” and the “damage,” the injured party must pay heavy expert costs, costs that in medical cases or autonomous vehicle accidents may easily exceed the capacity of an ordinary injured party (Wachter et al., 2017).

The third challenge is the “multi-actor nature of the production chain.” An intelligent system is composed of: a) the algorithm designer; b) the data supplier; c) the hardware manufacturer; d) the final owner; and e) the user. In some cases, even the “regulatory authority” may contribute to the occurrence of damage, for example by issuing authorization without risk assessment. In the absence of a rule for apportioning liability, the judge must rely on “technical custom” to estimate the percentage of liability for each actor; this is both time-consuming and requires specialized knowledge (Al-Sadat Makki et al., 2024; Bagheri, 2025).

The fourth challenge is the “absence of specific legislation.” Article 1 of the 1960 Civil Liability Act is based on “fault,” whereas in automated decision-making there may be no human fault at all. On the other hand, “risk liability” or “strict liability” has not been provided for in Iranian law. Therefore, the judge must either apply an expansive interpretation of Article 1, which conflicts with the principle of legal clarity in criminal and civil laws, or leave the injured party without compensation (Zakerinia, 2023). This situation creates chronic legal uncertainty and reduces public trust in emerging technologies (Bagheri, 2025).

The fifth challenge is the “conflict of interests and the risk of weak oversight.” Large technology companies seek to reduce legal costs, while consumers seek maximum compensation. In the absence of an independent supervisory body, regulatory uncertainty benefits the holder of technical power (Bagheri, 2025). Moreover, “algorithmic opacity” not only makes litigation difficult to prove but also constitutes a form of “systemic discrimination.” Studies in loan-granting or facial-recognition cases have shown that an algorithm may create discrimination against specific groups without the designer’s awareness (Dev.to, 2025).

As a result of these challenges, it can be argued that any opportunity-oriented solution will remain incomplete unless the following four gaps are addressed: 1) the absence of independent legal personality; 2) the absence of a clear causation standard; 3) the lack of a rule for apportioning liability in the production chain; and 4) the absence of a rule on strict liability or mandatory insurance. Therefore, it is recommended that in the short term, the Judiciary, through the issuance of a unifying precedent decision, stabilize the joint and several liability of “developer + operator” in relation to high-risk systems, and that in the medium term, Parliament adopt an “Artificial Intelligence Civil Liability Act” to establish a clear framework for limited legal personality, mandatory insurance, and causation standards. Only through such a revision can “justice” be ensured without halting “technological growth” (Bagheri, 2025).

3. Legal Opportunities of Artificial Intelligence in Commercial Contracts

3.1. Increasing Accuracy and Reducing Risk in Contract Drafting

By processing vast volumes of legal data, judicial precedents, and arbitral practices, artificial intelligence can draft contractual provisions with minimal human error, enabling the parties to become aware of weaknesses, inconsistencies, or future risks before signing (Ghorbani, 2023). This capacity is particularly useful in complex BOT contracts or public-private partnerships, where the smallest error may result in billion-level losses (Alijani & Joneidi, 2020). Through big data analysis and machine learning, artificial intelligence is capable of drafting and reviewing commercial contracts: identifying legal risks, reviewing judicial precedents, and providing revised drafts within seconds (Susskind & Susskind, 2015). In transnational corporations, this capability has made it possible for initial drafts of oil sales contracts to be prepared in less than 24 hours and for legal consulting costs to be reduced by up to 30 percent (Susskind, 2022). A similar study also refers to this advantage: text-analysis algorithms can reduce 30 percent of future disputes through more precise drafting of compensation clauses (Dehghani Tafti et al., 2022).

3.2. *Automating Negotiation and Reducing Negotiation Costs*

Advanced chatbot systems trained on deep learning make it possible to conduct the initial stages of negotiation, such as determining the price range, delivery time, or qualification of the counterparty, without human intervention. In addition to reducing travel and consulting costs, this also reduces the risk of disclosure of confidential information (Zarepour & Ahmadi Harandi, 2021). In international contracts, this capacity creates an equalizing opportunity, especially for companies that lack the financial capacity for prolonged presence at the negotiation table.

3.3. *Facilitating Compliance with Domestic Laws and International Conventions*

Algorithms can compare the contract text within seconds against domestic laws, such as Article 10 of the Civil Code, and conventions such as the CISG or PICC, and highlight cases of non-compliance (Dehghani Tafti, 2021). This capacity plays a vital role in the export of technological goods to the European Union, because the foreign buyer is assured that the contract is at least consistent with PICC principles, and in the event of arbitral dispute, the risk of claim rejection is reduced.

3.4. *Increasing Transparency and Strengthening the Principle of Good Faith*

Artificial intelligence reduces the possibility of “concealment or deception” by providing impartial analyses of the parties’ records; therefore, the principle of good faith, emphasized in Article 10 of the Civil Code, is strengthened (Barikloo & Khazaei, 2011). In addition, contradiction-detection systems can warn before signing that certain clauses conflict with public order or good morals, thereby reducing the possibility of future contract nullity.

4. **Smart Arbitration and Automated Contracts**

Contracts coded on blockchain execute obligations, such as payment installments or delivery of documents, without human intervention. In domestic and international e-commerce, this feature reduces enforcement costs and the risk of non-performance (Esmailpour, 2024). However, in order for these contracts to be recognized as “binding” in the Iranian legal system, the requirements of Article 219 of the Civil Code, namely intention and consent, must be satisfied through a transparent user interface; otherwise, nullity may arise (Rashvand Boukani & Naser, 2019).

Smart contracts executed on blockchain technology are among the innovations that have fundamentally changed the traditional concept of “contract.” These contracts are self-executing agreements in which contractual terms are coded and executed without the need for a human intermediary (Szabo, 1997). From a legal perspective, such contracts can reduce enforcement costs, minimize the possibility of fraud, and increase transparency (Corda, 2021). In international transportation contracts, this feature has meant that once a GPS signal confirms the arrival of goods at the destination port, funds are automatically released and bank confirmation becomes unnecessary (Porter, 2023).

Artificial intelligence, through its capacity for big data analysis and machine learning, plays an increasing role in the drafting, analysis, and preparation of commercial contracts. This technology can identify legal risks, provide standardized drafts, and even guide parties in contractual negotiations (Surden, 2019). However, this efficiency has also created new legal challenges. For example, if an artificial intelligence algorithm makes an error in analyzing or drafting a contract, who bears liability for that error? Is a contract drafted by artificial intelligence legally valid? And can artificial intelligence analyses be relied upon as a basis for legal decision-making? (Doshi-Velez & Kim, 2017). These questions show that despite the efficiency of artificial intelligence, the supervisory role of humans, especially professional lawyers, remains irreplaceable.

Despite the smartification of contracts and commercial transactions through blockchain and artificial intelligence, important legal challenges also arise around this opportunity. These include: who bears legal liability if an error occurs in the contract code? Can a smart contract be recognized as a binding instrument in court? And is it possible to amend or terminate it in emergency circumstances, such as sanctions or war? (De Filippi & Wright, 2018; Raskin, 2017). At present, many legal

systems have not developed a specific framework for this type of contract, and this legal gap can create serious problems in international disputes, including the rejection of claims (Dehghani Tafti, 2021).

In the data-driven era, one of the key issues in commercial contracts is determining data ownership and protecting privacy. With the expansion of big data, companies increasingly use the data of customers, users, and contractual parties. This raises important legal questions: Do collected data belong to the collecting company or to the data subject? Is commercial use of such data permissible without the explicit consent of the data subject? And in the event of a violation, which contractual party bears liability? (Zarsky, 2017). New regulations such as the GDPR in the European Union require companies to transparently disclose how data are collected, processed, and stored (Bradford, 2020; Zarsky, 2017). Therefore, commercial contracts must include specific clauses determining the rights and obligations of the parties in relation to data in order to prevent future disputes.

Despite the increased speed of contract drafting, a challenge exists around this advantage of artificial intelligence: if an artificial intelligence analysis leads to the drafting of a clause that later causes damage, who bears liability for the algorithmic error? Can artificial intelligence analyses be relied upon as a basis for legal decision-making? (Brownsword, 2019). Until international standards are developed for proving the acceptance of machine analysis, commercial lawyers must continue to maintain “human oversight” (Susskind, 2022).

5. Accelerating Smart Arbitration and Mediation

Artificial intelligence-based platforms can analyze the judgments of hundreds of similar cases, provide fair settlement proposals, and even issue interim decisions. This reduces the cost and time of proceedings by up to 40 percent (Keshtkar & Hajilou, 2024). In long-term oil and gas contracts, where technical disputes are complex, the algorithm can simulate different scenarios and predict the “probable range of the award.” Accordingly, the parties are encouraged to reach consensual settlement before entering formal arbitration.

6. Feasibility of Mandatory Insurance and Compensation Funds

Given emerging risks, the model of third-party motor insurance can be followed. Accordingly, each intelligent system should be required before release to pay an insurance premium to an “electronic compensation fund,” and the injured party should receive compensation without proving fault (Masoumi Jenaghard & Zarei, 2024). This solution both increases public trust and frees investors from unlimited risks, thereby encouraging market entry.

7. Legal Challenges

7.1. Unclear Contractual and Non-Contractual Liability

In Iranian law, contractual liability is based on Articles 219 and 221 of the Civil Code. However, when artificial intelligence decisions lead to a breach of obligation, determining “who” is at fault, the designer, owner, operator, or the system itself, is difficult (Al-Sadat Makki et al., 2024). If the parties have not signed the contract correctly and knowingly, the contract may be deemed invalid (Rashvand Boukani & Naser, 2019). In the field of non-contractual liability, Article 329 of the Civil Code provides for compensation for damage arising from a “harmful act,” but it is silent concerning the “harmful act of a machine,” forcing the judge to rely on analogy.

7.2. The Challenge of Proving Intention and Consent under Article 219 of the Civil Code

Artificial intelligence lacks “intention” and “will.” Therefore, if negotiation or contract drafting is carried out by an algorithm, it must be established that a human ultimately made the decision with full awareness; otherwise, the contract may be nullified (Al-Sadat Makki et al., 2024). The proposed solution is to include a “final transparency report” in the contract text in order to prove that the parties received the logic of the algorithmic decision before signing.

7.3. *Conflict of Laws and Determination of the Governing Law*

In international contracts, the law governing the algorithmic decision, for example the law of the server state, may differ from the law governing the contract, such as the CISG. This creates a “conflict of laws” (Dehghani Tafti, 2021). It is recommended that the parties expressly state in the “governing law” clause that algorithmic decisions are also subject to the same law, so as to reduce the risk of jurisdictional rejection or annulment of the arbitral award.

7.4. *Security of Commercial Data and Privacy*

Under consumer protection rules and electronic commerce law, any disclosure of commercial information without consent gives rise to civil and even criminal liability for the violator (Dwork & Mulligan, 2013; Zarsky, 2017). In contracts where artificial intelligence has access to sensitive data of the parties, end-to-end encryption mechanisms and distributed storage must be provided so that, in the event of cyber intrusion, the contract is not rendered invalid and liability is expressly imposed on the violator.

7.5. *Impact on the Principle of Party Autonomy and Independence*

If algorithmic defaults are designed in a way that restricts the free will of the parties, for example by removing price options or imposing unilateral terms, the principle of party autonomy is violated (Barikloo & Khazaei, 2011; Katouzian, 2019). Therefore, the user interface must be designed in such a way that the party can reject the algorithmic proposal and enter its preferred terms; otherwise, the contract may be nullified under Article 10 of the Civil Code.

7.6. *The Need for Modern Regulation and Continuous Oversight*

Given the rapid growth of technology, it is necessary for the legislature in the medium term to adopt a “Smart Contracts Act” with three chapters: a) validity and formal requirements; b) liability and insurance; and c) privacy and data security. It should also establish a “National Algorithm Oversight Center” under the Supreme Council of Cyberspace to issue conformity certificates before market release (Dehghani Tafti et al., 2022). At the international level, accession to Hague conventions concerning “electronic contracts” and cooperation with UNCITRAL to develop a “smart contracts model” are also recommended in order to prevent conflict of laws.

By reviewing the above sources, it can be argued that domestic and international literature converges around three axes:

The main “opportunity” is increased accuracy, reduced cost, and accelerated performance.

The central “challenge” is the determination of liability and the preservation of fundamental legal principles, including will, good faith, and privacy.

The dominant “solution” is the combination of “limited legal personality + mandatory insurance + ex ante oversight.”

Automated Decision-Making by Artificial Intelligence: Challenges of Accountability and Discrimination

In some commercial contracts, artificial intelligence is not only an analyst but also the final decision-maker, for example in insurance, credit assessment, or financing contracts. This raises serious legal questions about accountability. If an artificial intelligence decision harms one of the parties, is there a possibility of objection? Can artificial intelligence be accused of discrimination or breach of contract? And ultimately, who should be accountable for algorithmic errors or discrimination? (Binns, 2018). To prevent such risks, many jurists emphasize the necessity of maintaining “human oversight” in decision-making processes so that intervention, correction, and legal accountability remain possible (Dwork & Mulligan, 2013).

8. **The Basis of Liability in Smart Contracts**

8.1. *Contractual Liability: Automatic Breach of Obligation and the Legal Gap*

In blockchain-based commercial contracts, obligations such as payment or delivery of documents are performed through smart code and without human intervention. If the code fails to execute because of a bug or incorrect oracle input, the injured party faces the challenge of “breach of obligation without human fault,” because Article 219 of the Iranian Civil Code requires

human “intention and consent” as a condition of binding force (Katouzian, 2019). English courts have also so far treated smart contracts as “instruments” and have placed liability on the “designer or publisher of the code” (Katouzian, 2019). Therefore, until the domestic legislator recognizes “strict liability of code,” the injured party must prove the designer’s fault, which is nearly impossible in distributed networks (Corda, 2021).

When an artificial intelligence pricing clause in an international supply contract suddenly causes financial loss to the counterparty, the injured party must prove the “causal relationship” between the algorithmic output and the loss. However, deep learning models are inherently opaque, and even the developer cannot predict the exact output (Wachter et al., 2017). Under the Iranian Civil Liability Act, Article 1, the claimant must prove fault, damage, and causation. Yet the “black box” nature of artificial intelligence effectively eliminates the possibility of identifying the defective node (Zakerinia, 2023). Some authors therefore propose replacing this standard with “risk-based liability,” under which the party that controls the artificial intelligence and benefits from it is liable for any damage arising from it regardless of proof of fault (Ward, 2025).

9. Innovative Solutions

9.1. *Limited Legal Personality and Mandatory Insurance Fund*

To address the liability gap, the European Union model, including the 2017 parliamentary report, can be followed by defining a registered “electronic personality” in an international registry for decision-making systems. In this model, the transnational corporation would be required to register the source code, risk report, and insurance wallet address (Ward, 2025). In the event of damage, the injured party could claim directly against the assets registered in the wallet without proving fault or pursuing the chain of parent actors (Springer, 2023). In addition, the creation of a “mandatory compensation fund” modeled on third-party motor insurance, for example at 0.25 percent of the annual transaction value, would enable rapid compensation without proof of fault and reduce investor risk (Schulz et al., 2023).

10. Conclusion

Emerging technologies have made commercial contracts smarter, faster, and more efficient, but at the same time they have created new legal challenges. Smart contracts, artificial intelligence, and big data have significant advantages, but without clear legal frameworks, they can become sources of complex litigation. Therefore, commercial companies must revise their contracts in light of these developments and use forward-looking legal frameworks so that they can both benefit from technology and remain protected against future risks.

Therefore, commercial contracts must include special clauses clarifying the obligations of the parties concerning data: determining ownership, retention period, right to deletion, and the mechanism for data transfer in the event of contract dissolution (Zarsky, 2017). In the absence of these clauses, European courts may treat the contract as “privacy-infringing” and refuse its enforcement.

Artificial intelligence has assumed the role of automated decision-maker in many commercial contracts. However, if an artificial intelligence decision harms one of the parties, is there a possibility of objection? If artificial intelligence discriminates in contract performance, who is accountable? Unless “human oversight” is preserved, the contract may be nullified under Article 10 of the Civil Code for violation of good morals (Katouzian, 2019). The proposed measures are: 1) inclusion of an “artificial intelligence error liability” clause in contracts; 2) determination of the level of human oversight and registration of it in the technical annex; 3) development of an international XAIS standard for disclosure of decision logic; and 4) creation of a “mandatory insurance fund” similar to third-party motor insurance so that damages can be compensated without proof of fault (Susskind, 2022).

The scholarly literature agrees that without “limited legal personality,” “mandatory insurance,” and a “transparency standard,” legal liability in commercial transactions based on artificial intelligence/blockchain will remain in a state of legal vacuum. Therefore, it is recommended that the Iranian legislature, in the short term, amend Article 2 of the Electronic Commerce Law to provide for the registration of electronic personality and the creation of a mandatory insurance fund, and in

the medium term, participate in the UNCITRAL working group to develop a convention on “transnational smart contracts” in order to prevent conflict of laws and ensure investors’ legal security.

Without granting “limited legal personality” and “mandatory insurance,” the liability of transnational corporations for damages arising from blockchain/artificial intelligence will remain in a state of legal vacuum (Dev.to, 2025; Ward, 2025). Algorithmic transparency and oracle standardization are prerequisites for the validity of smart contracts in international arbitration (Schulz et al., 2023). Preservation of party autonomy and the principle of good faith will be the red line of any future legislation. The final recommendation is that, in the short term, the Iranian legislature should amend Article 2 of the Electronic Commerce Law to provide for the registration of electronic personality and the creation of a mandatory insurance fund, and in the medium term, participate in the UNCITRAL working group to develop a convention on “transnational smart contracts.”

At the international level, it is proposed that UNCITRAL develop a convention on “transnational smart contracts” recognizing limited legal personality, mandatory insurance, and the preservation of party autonomy (Schulz et al., 2023).

Without granting “limited legal personality” and “mandatory insurance,” the liability of transnational corporations for damages arising from blockchain/artificial intelligence will remain in a state of legal vacuum.

Algorithmic transparency and oracle standardization are prerequisites for the validity of smart contracts in international arbitration.

Protection of privacy and the principle of party autonomy constitute the red line of any future legislation.

Accordingly, relying on this framework, the present study will subsequently test the proposed model of “limited legal personality + mandatory insurance fund + XAIS standard” for transnational corporations operating in Iran. To adapt to technological developments, companies must draft their contracts with a “forward-looking” approach. The following are among the proposed solutions:

Inclusion of artificial intelligence liability clauses: contracts must specify which party bears liability in the event of an error by artificial intelligence: the system owner, the developer, or the user.

Determination of data ownership rights: contracts must clearly specify to whom generated data belong and how they may be used.

Development of internal regulations for the use of artificial intelligence: companies must develop ethical and legal frameworks for using artificial intelligence in contractual decision-making.

Compliance with international standards: companies active in international markets must incorporate the regulations of different jurisdictions, such as GDPR or CCPA, into their contracts.

Preservation of human oversight: even where artificial intelligence is used, the role of lawyers and legal experts in reviewing, approving, and supervising contractual processes must be maintained.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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