



Smart Contracts: A Legal Revolution in the Contractual System

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Abstract:

Smart contracts are considered a legal revolution in the contractual system, as they represent one of the revolutionary innovations that reshape the concept of contracts. This is achieved through their legal contribution to the development of contractual standards, which is reflected in their impact on changing the parties to the contractual relationship and the possibility of replacing them with intelligent agents and smart robots, as well as their impact on the manner in which the contract is concluded and executed. This leads to considering the contract as self-concluding, as it is capable of moving from the negotiation stage to the formation of a binding obligation automatically, without direct human intervention at the moment of contract formation, and as self-executing, by virtue of the feature of execution inevitability.

Keywords: smart contract – contractual system – intelligent agent – smart robot – self-conclusion and self-execution.

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Introduction

If the traditional contract is originally built on contractual means characterized by a human and written nature, where agreement between the parties is reached through negotiation, correspondence, or the signing of a document containing the terms and obligations, and then the contract is executed according to legal controls, rules of execution, and judicial oversight in the event of a dispute, then the “text” is the center of gravity in the traditional contract, while execution often remains linked to the will of the parties or to subsequent procedures outside the logic of the contract itself.

However, in the era of digital transformation and artificial intelligence that we are currently witnessing, smart contract technology emerges as one of the revolutionary innovations that reshapes the concept of contracts through its legal contribution to the development of contractual standards.

Smart contracts have brought about a tangible transformation in the contractual system. Contracts are no longer merely agreements that are documented and later interpreted through traditional legal means; rather, they increasingly include self-executing mechanisms that operate automatically once a stipulated condition is fulfilled. Thus, the nature of the contractual relationship changes from being a bond of rights and obligations awaiting execution into an “operational logic” that executes obligations within a digital environment, often through systems based on the technical ledger and the relative immutability of data.

Thanks to these characteristics, smart contracts have the capacity to reshape some basic contractual standards, such as the mechanism of conclusion, in terms of the transition from written negotiation to electronic/automated activation; and the execution of obligations through reducing delay and refusal to perform.

Accordingly, this topic aims to demonstrate how smart contracts can bring about a change in contractual standards, while examining the extent of their compatibility with existing legal rules and the means capable

of developing them so that contracts continue to achieve contractual security and justice between the parties.

To address this topic, we raise the following problem: To what extent do smart contracts contribute to the development of contractual standards? We have attempted to answer this question by adopting the descriptive analytical method and the deductive method, which led to dividing the topic into two main axes:

1. The capacity of smart contracts to change the parties to the contract
2. The impact of smart contracts on the formation and execution of contracts

Section One: The Capacity of Smart Contracts to Change the Parties to the Contract

The parties to the contractual relationship are witnessing a radical transformation in light of the emergence of smart contract technology, through the existence of intelligent agents and smart robots that replace human presence in the contractual relationship and have become an essential part of the modern contractual landscape.

Subsection One: The Intelligent Agent as a Party to the Contractual Relationship

Contractual relationships are witnessing a remarkable transformation thanks to innovations in the field of artificial intelligence and information technology, as intelligent agent solutions emerge as an innovative alternative to traditional contracting parties.

Branch One: Definition of the Intelligent Agent

The concept of the intelligent agent has spread in many jurisprudential opinions and legal legislations that address acts issued by this type of agent.

One aspect of jurisprudence has defined the intelligent agent as a program whose software is designed to achieve specific objectives, so that it has its own ideas about how to achieve these objectives, and has its own purposes that distinguish it from other multi-functional applications. ¹

There is another definition that largely corresponds to the idea of the intelligent agent, stating that it is software that performs a specific task using information collected about its environment in order to act in an appropriate manner and complete its task successfully. Therefore, this programming must be capable of adapting itself based on any change that occurs in its environment, so that any change in the surrounding circumstances leads to a change in the results required from it. ²

As for legislative definitions, the United Nations Convention on the Use of Electronic Communications in International Contracts of 2005 defined the intelligent agent implicitly under the term automated message system in Article 4(g) as: "a computer program or an electronic or other automated means used to initiate an action or to respond, in whole or in part, to data messages or to the performance of operations without review or intervention by a natural person each time the system initiates an action or creates a response."

³ This is the same approach adopted by national legislations before that date.

The American Uniform Computer Information Transactions Act (UCITA) of 2002 provided that it is: "a computer program or any electronic or automated means used independently to initiate a specific act or respond to electronic messages or acts on behalf of a person without review or action by any individual at the time of initiating the act and responding." ⁴

As for Arab legislations, the Emirati legislator defined the intelligent agent using the term electronic agent in Article One of Federal Law No. 1 of 2006 on Electronic Transactions and Commerce ⁵, under the designation automated electronic intermediary, as: "a program or electronic system of an information technology means that operates automatically and independently without supervision by a natural person at the time the action is performed or responded to."

Iraqi Law No. 78 of 2014 also defined it in Article One, paragraph 8, using the term electronic intermediary, as a computer program or any other electronic means used to execute a procedure or respond to a

procedure, with the aim of creating, sending, or receiving information, and these means and mechanisms take multiple forms.⁶

The Jordanian Electronic Transactions Law No. 15/2015 defined it in Article 1/11 as: “the electronic program used to execute or respond to a procedure automatically with the aim of creating, sending, or delivering an information message.”⁷

However, despite the differences among legislations regarding the designations of the intelligent agent, they agree on its substance as a computer program capable of collecting and processing information, through which specific tasks and objectives can be carried out on behalf of the person using it without human intervention, and with a high degree of flexibility, ability to interact and communicate with others, learn, and adapt to its changing environment.

Branch Two: The Intelligent Agent Replacing the Parties to the Contract

The intelligent agent intervenes in the process of concluding smart contracts at two stages: the pre-contractual stage and the stage of completing the contract. In both cases, its use includes negotiation, conclusion, and execution of contracts on behalf of its users, whether these users are consumers or providers.

First: The Intelligent Agent Replacing the Consumer (Buyer)

The intelligent agent can replace the consumer, i.e., the buyer, as a representative acting on their behalf, and it plays an important role in identifying and searching for the buyer’s needs. Virtual commerce and producing companies require consumer-buyers who visit their websites to provide detailed data about their identity and personality by identifying their needs and preferences. Examples of such data include identifying the products consumed, the consumer’s social status and profession, or data that takes the form of a profile after each transaction, through recording and analyzing their contractual requests. This allows retailers to present offers that are compatible with the needs of the consumer-buyer.

Through the negotiations conducted by the intelligent agent on behalf of the consumer-buyer, in accordance with the instructions directed to it by its user and programmed into it, the specifications of the goods or services are determined, and their prices and contractual terms are negotiated. This may also extend to comparing the offered goods and services in terms of price, quality, and personal conditions suitable for the buyer, and presenting them to the buyer with a recommendation to purchase a specific type, while stating the reasons for that.⁸

The intelligent agent benefits from this evaluation by limiting its negotiations the second time to the list of providers who have gained consumers’ trust by fulfilling their obligations in accordance with what was agreed upon at the negotiation stage, and excluding from this stage all those who received a negative or unsatisfactory evaluation in their dealings with consumers.⁹

After the consumer accepts the intelligent agent’s recommendation to purchase, the latter concludes the contract as a representative of the buyer and issues the offer and acceptance to the provider in order to conclude the contract.

Examples of intelligent agents designed for negotiation include Tête-à-Tête, developed by the Massachusetts Institute of Technology in the United States, where this program negotiates various contractual terms.¹⁰

Some jurists have also argued that the intelligent agent may pay the agreed price using the consumer’s credit card supplied to it, and that, in the blockchain era, it may also authenticate the smart contract.¹¹

An example in this field is the Eyes agent, designed by Amazon, which monitors books offered for sale on the Internet and notifies the customer of the latest ones that may be of interest to them.¹²

Second: The Intelligent Agent Replacing the Provider (Seller)

The intelligent agent can replace the provider or seller and assist them in collecting data on consumers, their consumption and purchasing preferences, and their preferred services. This enables the seller to know all the information and data related to the consumer, so that targeting them with new goods and services to entice them to purchase becomes easier than using any other means.

Each time, the provider can also benefit from these data when dealing with this buyer or with others, which enables providers to supply the required goods and services with great speed or high accuracy, better than traditional search engines. When the intelligent agent and the consumer reach a mutual agreement on all the details of the contract, including after-sales service information, the contract is concluded. In some cases, the intelligent agent executes it and obtains the price for the benefit of the provider.¹³

Examples of this type of intelligent agents include the Brood Vision agent, the CBB agent, and the Agent Ware agent.¹⁴

Subsection Two: The Smart Robot as a Party to the Contract

Thanks to developments in artificial intelligence, sensory capabilities, and the ability to make semi-autonomous decisions, smart robots have begun to enter increasing areas of economic and legal life. Their role is no longer limited to performing tasks automatically; rather, it has extended to negotiation, the conclusion of transactions, and the execution of contractual obligations in digital or semi-digital environments.

Branch One: Definition of the Smart Robot

The American Robotics Institute defined a robot as a multifunctional manipulator designed to move materials, parts, and equipment, and to perform various tasks through a number of actuators and programming.¹⁵ Some have defined it as an active artificial agent whose environment is the natural world. The requirement of activity excludes immobile and inanimate objects; the requirement of artificiality excludes animals of all kinds; and the requirement of the natural world excludes computer software and even science fiction. The focus here is therefore on real robots that possess autonomy of movement and interact with their environment through the feedback they receive from sensory devices.¹⁶

Meanwhile, the United Nations defined the robot in a 2005 report as: “a machine that can be reprogrammed and operates semi-autonomously or fully autonomously in performing industrial operations, such as industrial robots, or robots that provide useful services for human welfare, such as service robots.”¹⁷

The Robotics Journal also defined it as “a mechanical system consisting of several bodies connected by links that enable the achievement of the required movement of an end body fixed on the robot, and programmed to perform certain tasks automatically.”¹⁸

It is clear from the previous definitions that the smart robot is a human-like machine that has an intelligent system based on the principles of artificial intelligence, capable of learning, thinking, and making autonomous decisions about what should be done in various environments.

Branch Two: The Contractual Capacity of the Smart Robot

One view in jurisprudence holds that the term “person” is not limited only to a natural person or a legal person, but also extends to include all entities capable of enjoying rights and performing duties. Accordingly, there is nothing to prevent the granting of legal personality to robots, especially since some legal systems in the United States of America, Japan, and South Korea have granted smart robots a specific legal personality. In the State of Nevada, for example, robots have been implicitly recognized as having some powers of a legal person by subjecting them to registration procedures in a special register established for this purpose and allocating a financial patrimony to them for insurance purposes.¹⁹

The Kingdom of Saudi Arabia also granted Saudi nationality to a robot in the form of a middle-aged woman named Sophia, created by Hansen Robotics in 2017 in Hong Kong. Its distinguishing feature is its ability to simulate and learn human behaviors through interaction with people, as it has been equipped with the latest developments in the field of artificial intelligence, represented by predictive algorithms based on

computational statistics, smooth artificial speech, rapid processing of the information it receives, and a broad ability to recognize faces and voices, making it an actual simulation of a human being.²⁰

The European Parliament also recommended granting legal personality to the smart robot and establishing a new legal status for robots in the long term. This would lead to the smart robot enjoying a set of rights, foremost among which is contractual capacity, which resembles that granted to natural persons, with some differences, since robot software is intelligent software that enjoys full autonomy in concluding contracts without intervention by the human entity.²¹

SECTION TWO: THE IMPACT OF SMART CONTRACTS ON THE FORMATION AND EXECUTION OF CONTRACTS

The technology based on smart contracts has brought about a tangible transformation in the manner of forming contracts and executing their obligations. Instead of relying entirely on the written text and the limits of execution imposed by the judge or the administration in the event of a dispute, the terms of the contract are translated into a program that operates automatically through blockchain platforms, so that obligations are fulfilled and their effects are triggered when specific pre-determined conditions are met. Accordingly, the role of the smart contract is not limited to regulating the relationship between the parties, but also extends to making execution part of the very nature of the contract itself.

Subsection One: The Self-Conclusion of Smart Contracts

Smart contracts are described as self-concluding when the contract is capable of moving from the negotiation stage to the stage of forming a binding obligation automatically, without direct human intervention at the moment of contract formation.

Branch One: The Concept of Self-Conclusion of Smart Contracts

A self-concluding smart contract (Self-executing / Self-contracting Smart Contract) refers to a smart contract recorded in the form of a program within a technology such as blockchain, whereby the contractual relationship is created, and the binding obligation is formed automatically once pre-determined conditions are met, without the need for direct human intervention at the time those conditions are fulfilled. More precisely:

- The rules and the condition that lead to the emergence of the contract are agreed upon in advance;
- Then the system/program carries out the “conclusion” process, or activates the contract/transaction, when the input data or real events are fulfilled, such as payment of the amount, completion of delivery data, arrival of verification data, or fulfillment of a temporal/technical condition.²²

Branch Two: The Stages of Self-Conclusion of the Smart Contract

The stages of self-conclusion of the smart contract pass through the steps of drafting and writing, as is the case with the rules governing the conclusion of traditional contracts, with differences in the procedures of each stage due to the specificity of this type of contract.

First: Drafting

At this stage of contract formation, all the necessary terms are established, which closely resemble the principle that the contract is the law of the contracting parties, as provided for in the Civil Code²³. Pursuant to this principle, the form of the contract, its specific model, its duration, and all the terms subject to discussion and dialogue by the contracting parties are determined, with the possibility of referring to the terms that require its termination.²⁴

Second: Writing

After agreement has been reached on all the terms of the smart contract, it is written in a manner different from that of a traditional contract, through the use of digital electronic means based on techniques known to the machine. This makes contracting subject to a certain degree of restriction due to the link between

the contract and the knowledge of how to use a computer, or any other means that enables dealing with others in concluding the smart contract, such as smart tablets.

Thereafter, the verified smart contracts may be published through blockchain platforms, which allow all parties to access these contracts. In addition, the digital assets of both parties in the smart contract are secured by freezing the corresponding digital wallets.²⁵

Branch Three: The Consequences of the Self-Conclusion of Smart Contracts

The self-conclusion of smart contracts results in the following:

First: Speed of Performance

In response to the problems raised by traditional contracts at the pre-contractual stage, represented by negotiations, which some describe as an unsafe zone due to the lack of trust and security between the parties, their multiplicity, or the intervention of intermediaries, smart contracts have emerged, in which the conclusion stage is carried out automatically, rapidly, and at the lowest cost. The reason for this lies in the automation of the conclusion stage in a decentralized manner through the electronic writing, verification, and execution of terms. This results in dispensing with third parties, namely intermediaries, unlike traditional contracts, which are often concluded through a third party. This may lead to the loss of privacy concerning the contractual clauses, in addition to increasing costs and prolonging legal procedures.

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Second: Speed and Security in Contract Conclusion

Smart contracts contribute to enhancing security and transparency in the conclusion of contracts and the execution of all obligations. This is due to the reliance of this type of contract on the blockchain platform, which constitutes a trusted guarantor of the various legal documents related to the stage of concluding the contractual transaction until its execution, as well as verifying the authenticity of those documents and their reliable and rapid delivery to the contracting parties without any manipulation or forgery, while maintaining a high level of transparency by allowing all users to access this platform.²⁷

In addition, blockchain technology provides the highest levels of contractual security because it operates according to a secure multi-stage system, both at the level of the contractual transaction itself and at the level of blockchain technology.

At the level of the contractual transaction, this technology provides security with regard to the creation of the contract within the system in the first place, because it takes place between the contracting parties through the public and private dual encryption key as an expression of their consent. Its validity is then verified and it is granted a special box within this system, after which it is linked to the system according to blockchain technology, through which miners authenticate it according to the encryption system related to proving the validity of the transaction in conformity with the rules of this technology.

Linking the contracting transaction with the remaining transactions according to the blockchain chain also provides a new level of security by inserting it into the system with full transparency and integrity. This ultimately enables every participant in this system to easily access it, and consequently makes it impossible to amend or forge it.²⁸

Third: The Self-Sufficiency of the Smart Contract

The self-sufficiency of the smart contract means removing the need for a third party to mediate its conclusion between the contracting parties, because this reduces many factors that complicate financial transactions, such as the need for a guarantor and the accuracy required for settlements. This is due to the reliance of smart contracts, in their conclusion process, on blockchain technology, which in turn follows a peer-to-peer policy, whereby dealings take place directly between the two parties to the contract without the intervention of intermediaries in the transaction concluded between them.²⁹

Subsection Two: The Self-Execution of Smart Contracts

The objective of concluding a smart contract through blockchain technology is to automate the stage of contract execution, as this technology leads to the adoption of the method of automatic self-execution of the smart contract, in consolidation of the principle of inevitability of execution.

Branch One: Definition of the Self-Execution of the Smart Contract

The self-execution of the smart contract takes place automatically through computers; that is, execution through the judiciary is replaced by algorithms, because the value of self-execution lies in eliminating any human discretion, whether by the contracting parties or by arbitrators.

Once the contractual clauses are agreed upon and drafted in an encrypted digital form, those clauses are executed automatically without the need for human intervention. Therefore, one view in jurisprudence considers that the smart contract addresses the executive deficiency that affects traditional contracts, because the feature of inevitability of execution facilitates the fulfillment of contractual obligations and reduces the risks of human participation.³⁰

After the smart contract is concluded in accordance with the terms accepted by the parties to the contractual relationship, blockchain technology begins to activate and execute the obligations of the parties according to the terms, dates, and method agreed upon automatically.³¹

After verifying the validity of the transaction and the contract concluded and executed through blockchain technology, and ensuring its validity so that the contract produces its effects, the self-execution of the smart contract takes place through encrypted commands in the form of self-executing computer software, and through the use of blockchain technology to control the transfer of encrypted digital currencies and the transfer of ownership of assets between several parties under certain conditions. Smart contracts do this by taking information as inputs, assigning value to it through the rules stipulated in the contract, and executing the procedures required under these contractual terms. These contracts are stored on blockchain technology and are then recorded as a new "Block" on the blockchain.³²

After the completion of the smart contract execution process, the latter updates the status of each of the contracting parties, records all changes in legal positions and financial patrimonies, and digitally records each step of the conclusion and execution of the contract as a separate transaction in the form of a block in the blockchain.³³

Branch Three: Advantages of the Self-Execution of Contractual Obligations

The self-execution of contractual obligations leads to achieving a set of results, including the following:

First: Providing Effective Protection in Execution

Effective protection in the execution of contractual obligations is provided through the stability of the information and accurate data contained in smart contracts. This is due to the impossibility of modifying the contents of the documents and records placed in these contracts, which are stored within the decentralized ledger using encryption techniques, ultimately leading to the absence of cases of fraud and manipulation.³⁴

Second: Monitoring the Execution of the Contractual Obligation

The execution of smart contracts through blockchain technology makes it possible to monitor the contracting process and provide the documents related to it, starting from the conclusion of the contract until its execution, as well as to monitor the legal effects resulting from it, including rights, obligations, and their due dates, and to prevent their lapse.³⁵

In this regard, Atlas Company and AXA Insurance Company in France conducted a test in 2017 of the execution of the obligation contained in blockchain contracts, by defining specific cases in which insurance companies are obliged to compensate airline customers in the event of flight delays. The success of these

contracts in execution was indeed proven, as once the insured event occurred, namely the flight delay, the smart contracts automatically executed the payment through the blockchain technology integrated into them.³⁶

Third: Ensuring Speed of Execution

Self-execution is characterized by a high capacity to complete transactions at the very moment when the contractual conditions are fulfilled, without the need for bureaucratic procedures or administrative reviews, which significantly shortens the time required to fulfill obligations.³⁷

CONCLUSION

In conclusion of our research paper, we have concluded that the smart contract can change the contractual system by developing contractual standards and making them compatible with the era of digital transformation and artificial intelligence. This may lead to the possibility of changing the contracting parties and replacing them with an intelligent agent or a smart robot, in addition to affecting the process of concluding and executing the contract and making it characterized by autonomy.

In order to achieve legal security in smart contracts, there must be transparency of terms, traceability and evidentiary capacity, and rules for dispute resolution, along with the codification of liability and the determination of the limits of self-execution, so that technical speed does not turn into a difficulty in protecting rights.

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FOOTNOTES

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