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## **The Legal Aspects of Smart Contracts on Block-chain Technology**

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**Abstract:**

The study aimed to highlight the importance of smart contracts in our digital age, This is achieved by exploring the possibility of finding a legal framework capable of creating a balance between the use of smart contracts on the one hand and protecting the rights of its parties on the other. The descriptive-analytical approach was adopted when analyzing legal and jurisprudential opinions on whether a smart contract is considered a real contract.

One of the main conclusions reached was that a fully automated smart contract is considered a legal contract in the true sense of the word, and therefore the study recommended the need to enact international and national legislation regulating the provisions of this contract.

**Keywords:** Blockchain technology ، Ethereum software ، Smart contract ، The overall smart contract ، Partial smart contract.

**Introduction:**

In light of the rapid development of digital technologies and the emergence of blockchain applications as one of the most prominent contemporary innovations. The concept of the smart contract has emerged as a modern technological tool for automatically concluding and executing obligations according to pre-programmed terms, this reflects a qualitative shift in legal and economic practices, and underscores the need for an in-depth study of its position within the legislative system, The smart contract combines technical accuracy and speed of performance, and enhances trust and transparency between the parties. The smart contract combines technical accuracy and speed of performance, and enhances trust and transparency between the parties.

The smart contract combines technical accuracy and speed of performance, and enhances trust and transparency between the parties. This necessitates that legal scholars examine its nature and determine the extent of its compatibility with the general rules of contracts. This makes this study an attempt to clarify the concept of the smart contract and explain its legal nature within the framework of traditional rules, which contributes to enriching the discussion about its place in the modern legal system.

**The importance of the study:**

The importance of studying smart contracts stems from the fact that they represent a link between law and modern technology.

This provides a new mechanism for automatically and accurately concluding and executing commitments, thereby enhancing trust and transparency in digital transactions and keeping pace with the rapid transformations in the global economy. This makes understanding its legal nature essential to ensure its consistency with traditional rules and to protect the rights of the contracting parties.

**The problem of the study**

The main problem addressed by this study is the extent to which it is possible to achieve a balance between the requirements of modern technology that have given rise to the smart contract.

It also addressed the need to protect the rights of contracting parties from legal and technical problems arising from dealing with it, in addition to the extent of

the legality of these contracts and the possibility of integrating them with the rules of traditional legal contracts.

**This main problem branches into a number of sub-questions, as follows:**

- 1- What is the relationship between smart contracts and blockchain technology?
- 2- What is the position of legal jurisprudence regarding the recognition of smart contracts?
- 3- What are the advantages offered by smart contracts, and what are the problems associated with dealing with them?
- 4- What are the similarities and differences between smart contracts and similar technologies?

### **Study methodology**

This study adopts a descriptive-analytical approach by outlining the legal and technical concepts of smart contracts of all types and blockchain technology, In addition to analyzing legal and jurisprudential opinions regarding the legal nature of smart contracts and the practical effects of real-world transactions involving them.

#### **1- The concept of a smart contract**

##### **1.1 The Smart Contract from the Perspective of Commentators**

Smart contracts emerged as a mere idea in 1994, conceived by the American scientist (**Nick Szabo**), Its implementation began in practice in 2013, making it the second application of blockchain technology after digital currencies, Its system relies on representing financial assets and private property in the form of digital codes uploaded to the blockchain platform. These assets are linked to their owners through encrypted accounts and digital wallets to enable them to be traded through the blockchain platform in the same way as digital currencies (1).

The smart contract was defined by Szabo, the proponent of the smart contract theory, as : "A computerized transaction protocol that implements the terms of the contract" (2), As defined by (**Vitalik Buterin**), the founder of the Ethereum network, it is: "A cryptocurrency box containing value that can only be opened when certain conditions are met on our platform." With much greater power than that provided by Bitcoin's programming"(3), while it has recently been defined as: "A computer program that automatically executes contractual obligations when the specified conditions are met" (4), it was also defined as: "A software-based digital legal instrument, implemented automatically via blockchain

technology, used to regulate economic and legal relationships without the need for traditional intermediaries” (5). Our review of the previous concepts shows that the concept of the smart contract has undergone gradual development. Transforming from a mere theoretical idea to a large-scale practical application, if we examine the latest definition of a smart contract, we find that it adds a legal dimension to the concept, compared to Szabo's definition, which focused on the purely technical aspect. This indicates that smart contracts are now viewed as an international legal instrument with a role in global trade and intellectual property. It is not just a piece of software code. It has been noted that the previous concepts linked the smart contract to blockchain technology, and this relationship will be examined in detail below.

## 1.2 Smart contract reliance on blockchain technology

The concept of blockchain emerged in 2008 when Satoshi Nakamoto published the Bitcoin white paper, which explained the idea of a decentralized digital currency, and **Satoshi's goal** behind it was to promote the principle of decentralization. **Satoshi's** aim was to promote the principle of decentralization. That is, removing the need for an intermediary such as banks or governments to manage financial transactions. In addition to preserving the privacy of individuals by enabling them to conduct financial transactions without revealing their identities. Likewise, trust is built through encryption to ensure security (6). What distinguishes Bitcoin is the discovery of blockchain as a supporting technology for its system. The latter is considered the seed from which Bitcoin and smart contracts emerged. Blockchain began to emerge as a network aimed at protecting and tracking activities and transactions using Bitcoin. This network quickly attracted the attention of those working in the financial and business sectors due to the trust and speed it provided to those dealing with it without the need for a third intermediary (7). It is important to note here that many countries and international organizations adopt a double standard regarding technology. It demonstrates an openness to blockchain as an upcoming technological revolution and a development that will change the face of the world, while they treat cryptocurrencies based on this same technology with caution or even rejection, this distinction reflects governments' desire to benefit from blockchain infrastructure without bearing the risks associated with financial volatility. Money laundering, or loss of control over monetary policies that may arise from the spread of cryptocurrencies (8). As for the definition of blockchain technology, the numerous jurisprudential definitions of this technique found in contemporary

literature. They essentially converge on the view that blockchain technology is a digital system based on a distributed and immutable ledger. It is used to document and verify transactions in a secure and transparent manner. This enhances trust between the parties without the need for a central mediator. It can be said that these definitions, too. Despite the difference in their wording, it has been agreed that blockchain is an innovative mechanism to ensure integrity and reliability in digital transactions (9). The numerous jurisprudential definitions, few legislations have addressed the definition of this technology from a legal perspective. Among them was the American legislator, A special law was created for this technology called the Blockchain Technology Act (BTA). That came into effect in (January 2020) (10), as for Arab legislation, none of it addresses the definition of blockchain technology. It merely focused on studying this technology and ways to utilize it in governmental and economic fields. Among the most prominent is the United Arab Emirates. It developed strategies such as the "UAE Digital Transactions Strategy" ,it aims to improve the efficiency of government services and enhance transparency using blockchain technology (11). After all that, we can summarize the relationship between smart contracts and blockchain technology as a complementary one. It is impossible to speak of smart contracts without blockchain, and vice versa, bearing in mind that smart contracts are much narrower than blockchain. Furthermore, blockchain has contributed to the completion of smart contracts by providing a platform that stores, encrypts, and publishes contracts in full detail, making them accessible to all individuals. Therefore, it can be said that a smart contract is a new type of agreement that is concluded automatically. It is implemented automatically via blockchain technology with the aim of regulating legal and economic relationships without the need for an intermediary.

## **2. The legal nature of the smart contract**

### **2.1 Legal recognition of the smart contract**

Modern jurisprudence differs on whether a smart contract is considered a contract in the true sense of the word, requiring special legal regulation, or whether it is not considered such and therefore does not need to be governed by independent rules. We can divide the opinions of jurists regarding this issue into three categories; the first category considered the smart contract to be a computer program, while the second category considered the smart contract to be a type of artificial intelligence technology. The third section considered the smart contract to be a contract in the legal sense.

### Section One: The smart contract is a computer program (12)

Those who hold this view believe that what is called a smart contract is not a contract in the jurisprudential sense. It is simply a computer program that executes pre-defined instructions. A legally valid contract is based on fundamental elements such as offer and acceptance. The **meeting of the two** wills in the contracting council, and the presence of two human parties who bear the obligations and rights, while a smart contract relies on software code that is executed automatically when certain conditions are met, Without showing any explicit exchange of wills or flexibility in negotiation or amendment, This makes it more of a technical tool for automated execution than a contract that creates obligations.

Accordingly, these jurists who hold this view consider that smart contracts do not create new contracts in and of themselves rather, it is used only to execute what has been previously agreed upon outside the software system; it is more like a technical tool that translates human agreements into commands that can be executed automatically. However, it does not replace the legal contract, which remains the basis for creating obligations. This trend reflects a keenness to protect the foundations of the legal contract and to ensure that conscious human will is the basis of obligation. The approach taken by US courts in this regard is considered a practical model of a legislative view that sees smart contracts as nothing more than computer programs used as a technological means to implement existing agreements, while the smart contract is left only with the role of mechanical execution, the approach taken by US courts in this regard is considered a practical model of a legislative view that sees smart contracts as nothing more than computer programs used as a technological means to implement existing agreements, it is not a new type of contract in the legal sense, and this has been clearly demonstrated in the cases brought before the American courts. The courts discussed cases in which smart contracts were used to execute financial transactions via blockchain.

She emphasized that legal recognition of it depends on the availability of elements of a traditional contract such as :Offer and acceptance, in one of the issues addressed by the reference, the court ruled that simply writing code on the blockchain is not enough to create a new legal obligation, rather, there must be a prior agreement between the parties that can be proven. The smart contract becomes merely a software tool for automatically executing this agreement. This practical example clearly demonstrates that technological innovation does not

change the essence of the contract. Rather, it is used as a means to facilitate implementation within the existing legislative framework (13).

### **Section Two: The smart contract is a type of artificial intelligence technology (14)**

Those in this field view smart contracts as part of artificial intelligence technology. They are not merely rigid computer programs; smart contracts have been described as interacting closely with artificial intelligence through what are known as "AI Oracles," making them part of the artificial intelligence system. They also considered smart contracts in the financial sector as a practical application of artificial intelligence that enhances transparency and efficiency in transactions. However, this trend remains limited in scope compared to the view that sees smart contracts as mere protocols or computer programs. Traditional legal and technical literature still clearly distinguishes between smart contracts and artificial intelligence. The former is considered more of a blockchain-related implementation tool than a direct application of artificial intelligence. Therefore, considering smart contracts as part of artificial intelligence is a less common view.

### **Section Three: A smart contract is a contract in the legal sense.**

Proponents of this view argue that smart contracts are considered real contracts in the legal sense, because it fulfills the main elements of a traditional contract, such as Satisfaction, location, and reason.

And that automated implementation via software does not deprive it of its legal nature. Rather, it strengthens commitment and transparency.

Furthermore, comparative studies have shown that smart contracts achieve the same functions as traditional contracts, with the addition of technical features such as security, clarity, and conflict reduction.

Despite challenges related to ambiguity in the wording and a lack of judicial precedents. The academic and international legal trend tends to consider them binding and enforceable contracts. With the need to develop clearer legislative frameworks to ensure practical implementation (15).

Some legislations have explicitly recognized the binding force of these contracts. This makes it enforceable in court. One of the most prominent examples of such legislation is the Italian Civil Code. This is achieved by integrating them into the existing legal framework for electronic contracts. Meanwhile, the European

Union adopted direct legislative regulation for smart contracts through data law **(Data Act)**.

Which came into effect in September 2025, it is considered the first direct European regulation of smart contracts, which it defined as a computer program used for the automated execution of an agreement or part thereof using a sequence of electronic records. In addition, this law requires Internet of Things (IoT) device providers to share data with users or third parties via smart contracts (16).

That is, contracts do not necessarily have to be built specifically on blockchain, One of the advantages of technical neutrality is that it allows for greater flexibility in application. Smart contracts can be used in diverse technological environments such as traditional databases or Internet of Things platforms.

Without obligating the parties to use a specific technology,

it is based on its essential function in achieving the automated implementation of agreements, which enhances the comprehensiveness of the organization and reduces the risks associated with relying on a single technology, Modern jurisprudential and legislative trends show a divergence in the characterization of smart contracts, Some consider them to be merely computer programs, nothing more than technical tools for implementing agreements. (17) .

This is a trend that diminishes its legal value and makes it subject to traditional rules without any inherent distinctiveness. This view is criticized for ignoring the innovative nature of smart contracts and their potential to transform contracting mechanisms. In contrast, some have linked it to developments in artificial intelligence, considering it to be a self-executing mechanism that may make independent decisions. This is a trend that overestimates the role of technology and raises concerns about assigning legal authority to non-human systems. This could threaten the principle of informed consent of the parties.

As for the third trend, he believes that smart contracts are indeed contracts in the legal sense. The software code embodies the will of the parties and creates enforceable obligations.

This is a more balanced approach because it gives smart contracts the necessary legal recognition while preserving the elements of a traditional contract. However, this view remains general because it considered all contracts executed automatically to be smart contracts without regard to the mechanism by which they were concluded, which warrants caution. A distinction must be made

between contracts that are entered into consciously and those that are executed entirely automatically. And between mere technical instructions that are executed automatically without expressing a genuine agreement of wills. In order for us as researchers to formulate a clear position regarding the legal recognition of smart contracts.

It is necessary to distinguish between its types, the term "smart contract" is widely used to encompass all forms of contracts executed through automation.

Whether the contract was concluded between the two parties in advance and the machine's role was limited to execution, or it was concluded and executed entirely by the machine. Therefore, we will explain the nature of the partial smart contract and then the complete smart contract (18).

### **1- Partial smart contract:**

This type of contract is drafted and concluded with the knowledge of the parties involved. However, it is implemented automatically in a manner that suits the circumstances of its parties. The designation of it as a smart contract was established through the parties' recourse to the machine to implement its terms and conditions, which they had previously formulated, whether in writing or orally.

### **2- Complete smart contract**

This contract is concluded and executed automatically in all its stages. It is in fact the central focus of this study, because this contract does not involve any intervention by the parties in its conclusion or even its execution. Despite the availability of traditional elements in it, their presence is not determined according to the traditional approach desired in traditional contracts. After this clarification and differentiation between the two types of smart contracts, we have concluded that the legal nature of a partial smart contract does not deviate from the nature of a traditional contract. It is simply a traditional contract executed electronically, but as for the fully-fledged smart contract.

Other problems include the difficulty of modifying contract terms, as well as cyber threats. However, the existence of these problems does not at all negate the results achieved by this type of smart contract. Which reflects the will of its parties exactly as traditional contracts do, but even better in terms of cost and time. Therefore, it is necessary to establish a specific legal framework for the fully-fledged smart contract that considers the legal and technical issues.

Implementation and protection of parties, this ensures its compatibility with the existing legal system and enhances confidence in its widespread use.

## 2.2 Implications related to the legal nature of the smart contract

Smart contracts provide an innovative framework for managing transactions automatically and securely without the need for intermediaries. Its importance lies in its ability to combine efficiency, transparency, and reliability. This makes it an effective tool in various fields. The following is a brief overview of the most important advantages of smart contracts as presented in modern academic literature (19):

1. **Saving time and costs:** Smart contracts reduce the need for intermediaries; this contributes to reducing expenses and speeding up the completion of transactions. This enhances economic efficiency in various sectors.
2. **Enhance security:** Thanks to its reliance on blockchain and encryption, transaction records become virtually impossible to hack. Manipulating the entire chain requires modifying it. This raises the level of protection.
3. **Trust and transparency:** The absence of an intermediary and the adoption of encrypted and unalterable records ensures the credibility of the data and enhances trust between the contracting parties. 1- Without the need for paperwork or correcting human errors, which raises the level of confidence and increases the speed of performance.
4. **Accuracy, speed and operational efficiency:** Contracts are executed immediately upon fulfillment of the specified conditions, without the need for paperwork or correction of human errors, which raises the level of confidence and increases the speed of performance.
5. **Real-time monitoring capability :** Thanks to the integration of smart contracts with smart devices and sensors, events can be recorded in real time and operations can be monitored in real time. This opens up prospects for advanced applications such as smart healthcare.

Although smart contracts are a promising technological innovation that offers many advantages, these advantages do not negate the existence of some associated disadvantages. Smart contracts are still in the experimental and development phase. This makes it vulnerable to technical flaws and software errors that may affect its reliability and security. Furthermore, the legal and regulatory framework surrounding it is not yet complete. This raises questions about its practical applicability in different environments. The following are the most prominent of those defects (20).

**1- Rigidity and inflexibility:** Smart contracts are difficult to modify after implementation, this makes it unsuitable in situations that require changes or renegotiation.

**2- Legal and regulatory problems:** There is no clear legal framework that defines how smart contracts should be dealt with in courts or traditional legal systems.

**3- Security vulnerabilities:** Any software error or vulnerability can lead to significant financial losses. Especially since the contract is executed automatically without human intervention.

**4- Technical complexity:** Using smart contracts requires global technical expertise, which may limit their adoption among small and medium-sized enterprises.

**5- Limited integration with traditional systems:** The difficulty in integrating smart contracts with existing administrative or financial systems reduces their practical effectiveness. To further explore the practical implications of real-world smart contract transactions, the relationship of this contract to related technologies is summarized in the table below. This table aims to highlight the similarities and differences between traditional contracts, electronic contracts, and smart contracts. In terms of definition, implementation mechanisms, flexibility, risks, and advantages, with a focus on the issue of legal framing in modern legislation (21):

Comparisons	Traditional contract	Electronic contract	Smart contract
<b>Definition</b>	A written or oral agreement between two parties according to traditional legal rules.	An agreement concluded via digital means using an electronic signature	A new type of agreement that is automatically concluded and executed via the blockchain network.
<b>Implementation mechanism</b>	It depends on human or judicial enforcement in case of breach	It requires human intervention or an electronic system to complete the implementation.	Automatic and self-executing when conditions are met without human intervention

<b>Flexibility</b>	Highly flexible, allowing for negotiation and judicial interpretation.	More flexible than a smart contract, contract terms can be modified or renegotiated electronically.	Limited, the programming code does not allow interpretation or modification.
<b>Risks</b>	Slow procedures, potential for legal disputes	Security risks such as forging electronic signatures	Software errors, lack of a clear legal framework
<b>Advantages</b>	Legal clarity, binding force, judicial protection	Simplicity of use, reduced administrative costs	Fast execution, transparency, no need for an intermediary
<b>Legal framing in legislation</b>	Fully framed within traditional civil and commercial legislation	Framed within modern legislation concerning electronic contracting and digital signatures, such as the UNCITRAL Model Laws	Not yet fully defined, it is being raised in legal discussions as part of the digital transformations that require updating legislation.

The official system and the taxes and fees it imposes, as well as overcoming the dominance of monopolistic companies that used to monopolize contract creation services in exchange for additional sums that burdened contractors. The preceding comparison demonstrates that the evolution of contractual instruments reflects a gradual shift from physical paper forms to automated digital formats. The traditional contract remains a fundamental reference point in terms of the clarity of its rules and procedures for proof. While the electronic contract provides flexibility and speed in concluding transactions via digital media, the smart contract adds a new dimension based on the self-execution of obligations according to predefined software. This transformation is not limited to the technical aspect alone, it also raises legal and ethical issues related to responsibility, oversight, and the protection of rights. Therefore, understanding these diverse patterns and developing a balanced legal framework is essential to

ensuring that practical application aligns with the requirements of justice and legal security. According to previous explanations regarding the smart contract based on blockchain technology, we can envision the philosophy behind these two techniques as being based on the principle of freedom of contract. This technology aims to provide a secure and reliable contractual environment without the need for an institutional or governmental intermediary. This allows the contracting parties to be free from oversight, this philosophy despite its liberal and decentralized nature, it remains, in its essence, a purely economic materialism. It focuses on maximizing direct economic benefits and simplifying technical procedures. However, it excludes the legal dimension related to the principles of contractual justice and consideration of emergency or exceptional circumstances that the parties may face. Consequently, this vision reflects a utilitarian approach that prioritizes economic efficiency over the human and legal considerations that constitute the essence of justice in contractual relationships.

### **Conclusion:**

In the midst of the accelerating technological revolution, the smart contract stands out as one of the most important legal and technological innovations that contribute to facilitating digital transactions and enhancing trust between parties without the need for a traditional intermediary, this study has shown that this type of contract is characterized by speed, trust, and transparency. This reduces the likelihood of conflict and enhances efficiency in fulfilling obligations. However, this use raises several legal issues, such as determining legal liability in the event of a technical malfunction. Proving the validity of the contract in court, and its compliance with national and international laws. The fundamental challenge remains establishing a comprehensive legislative and technical, A framework that ensures the clarity of legal rules and keeps pace with technological development. This achieves a balance between innovation and protecting the rights of parties involved in this type of contract.

### **Results:**

1- The concept of the smart contract has gradually evolved, and it is now viewed as an international legal instrument with a role in global trade, there is also a complementary relationship between smart contracts and blockchain technology; smart contracts are considered a new type of agreement recognized in modern legislation. Such as the Data Act adopted by the European Union, which is considered a direct legal regulation of smart contracts.

2- The partial smart contract is simply a traditional contract executed electronically. However, the fully-fledged smart contract, despite its accompanying legal and technical problems, it is considered a legal contract in the true sense of the word, and therefore requires legislative regulation that takes into account its specific nature.

3- The main goal of smart contracts concluded and executed via blockchain technology is to establish the principle of freedom of contract. The philosophy of these contracts is essentially purely materialistic and does not care about the extent to which contractual justice is achieved.

### **Recommendations:**

1- The need to establish a clear legal framework to regulate smart contracts, defining their terms and implementation mechanisms. It ensures its consistency with existing civil and commercial laws.

2- Developing mechanisms that allow the judiciary to recognize smart contracts as legal evidence, while establishing procedures to verify their technical validity.

3- Obliging smart contract platforms to provide clear information to users about risks, rights, and obligations in order to ensure the protection of less experienced parties.

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