

A smart contract is an autonomous contract.

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Abstract:

Technological advancement has led to a revolution in the world of communications, software, and computing, making technology tools perform human functions. One of the prominent aspects of this is known as smart contracts. These are contracts programmed automatically, encompassing all contract terms and having automatic execution. The role of the contracting parties is limited to their willingness and agreement to the contract, and thereafter, the contract itself, especially its execution, is performed automatically. Smart contracts are contracts based on computer programming, meaning they are formulated in the form of code within a computer program. This makes smart contracts self-contained, not requiring the legal formalities of traditional contracting.

Keywords: Contract, Intelligence, Software, Autonomous, Self-contained.

Introduction:

In recent years, the world has witnessed an unprecedented development, especially in the field of communications and modern technologies. As it is certain, every development gives rise to something new that becomes the language of the era. This is what contemporary technology has brought us,

leading to the emergence of what is known as artificial intelligence. Human intelligence has transitioned into artificial intelligence applied within software, performing human functions as programmed.

One of the most significant applications of artificial intelligence is what is known as smart contracts. Their function revolves around the execution of contractual tasks through programmed software according to specific terms. The appearance of smart contracts dates back to 1994 when the American scientist Nick Szabo proposed the inclusion of computer code in all valuable assets that can be digitally controlled to automate predefined actions based on pre-programmed information. However, the actual emergence of smart contracts was in 2008 with the appearance of cryptocurrencies, which adopted the blockchain system. Financial transactions on the internet began to rely on cryptocurrencies embodied in the form of automatically executable smart contracts, supported by a decentralized platform called blockchain.

Subsequently, smart contracts evolved to encompass all transactions, including insurance contracts, aviation, real estate, and more.

Dealing with smart contracts is of great importance in the present time as it contributes to the actualization of the concept of the digital economy. Smart contracts represent the third generation of legal contracts after the traditional and electronic contracts. Given the significance of smart contracts and their role in supporting transactions through artificial intelligence, our study aims to shed light on the independent aspects of the smart contract as a separate legal subject with its own mechanisms and procedures."

And since smart contracts rely on programmed applications with self-execution and automation, the following issues are raised: What are the implications of the independence of smart contracts, and what are their most important procedural mechanisms?

In addressing this topic, we will adopt a descriptive approach, where we will present the conceptual framework of smart contracts and delve into their

practical aspects. We will also utilize a descriptive-analytical approach by incorporating some analyses to highlight the aspects of the study subject.

To answer the following problem, we will rely on the following plan:

Axis 1: The Concept of Smart Contracts

First: Definition of a Smart Contract

Second: Characteristics of a Smart Contract

Axis 2: The Composition of a Smart Contract

First: Elements of a Smart Contract

Second: How a Smart Contract is Conducted

Third: The Functional Conditions of a Smart Contract

Axis 1: The Concept of a Smart Contract

The smart contract is considered one of the contemporary contracts that have appeared recently, it relies exclusively on artificial intelligence technology and the programming language. This is what necessitates the introduction of the concept of smart contracts in general and what distinguishes them in practice.

First: Definition of a Smart Contract:

According to Investopedia, a smart contract is a self-executing contract with the terms of the agreement between the buyer and the seller written directly in lines of code. The code and the agreements contained within it exist on a distributed and decentralized blockchain network. The code controls the execution, and transactions are traceable and irreversible.

Smart contracts allow for the execution of reliable transactions and agreements between diverse and anonymous parties without the need for a central authority, legal system, or external enforcement mechanism¹.

Indeed, you've provided an additional definition for smart contracts, which can be summarized as follows:

Smart contracts are agreements written in code that automatically perform

¹ - *Investopedia Website*<https://www.investopedia.com/terms/s/smart-contracts.asp>, accessed on February 26, 2022, at 11:00 AM.

programmed functions in response to specific conditions that have been fulfilled by the parties involved in the agreement. They operate as computer protocols, relying on mathematical algorithms translated into computer code, and execute operations independently with full control over their execution².

On the other hand, smart contracts are defined as a computer protocol aimed at facilitating, verifying, or digitally executing negotiations or contracts. According to Compliance Telecharts, a smart contract, also known as a cryptographic contract, is computer software that directly controls the transfer of digital currencies and assets between parties based on specific terms³.

The U.S. law defines a smart contract as an interactive computer program used for automating information and executed on a distributed, shared, and replicated ledger⁴.

What Are Smart Contracts on the Blockchain and How They Work

The Algerian legislator has not provided an explicit provision for smart contracts. Instead, reference is made to electronic contracts under Article 6/2 of the Electronic Commerce Law 18/05, which states the following: "The contract, within the meaning of Law No. 04-02 dated 5 Jumada al-Ula in the year 1425 corresponding to June 23, 2004, which determines the rules applied to commercial practices and is concluded remotely without the actual and simultaneous presence of the parties through the exclusive use of electronic communication⁵ technology"⁵. Therefore, even if we intend to extend the definition of electronic contracts to smart contracts, this can only be done through one common element, which is that both smart and electronic contracts

² - Valodymyr Marchinko, Alla Dambrowska, On Determining the Legal Nature of Smart Contracts, Atlantis Press, Ukraine, Volume 170, 2021, page 176.

³ - Mohamed Ahmed Al-Afandi, Introduction to Islamic Endowment Economics, without edition, Academic Book Center for Publishing, no place of publication, no year of publication, page 59.

⁴ - Mohamed Bouzidi Chitour, Integration of Smart Contracts into the Traditional Contract System: Reality or Assumption?, Research Journal on Contracts and Business Law, University of Mentouri Constantine, Issue 02, Algeria, 2022, page 134.

⁵ - Law No. 18-05 on Electronic Commerce, issued on 24 Sha'ban 1439, corresponding to 10 May 2018, in the Official Gazette of the Algerian Republic, Issue No. 28, published on 30 Sha'ban 1439, corresponding to 16 May 2018,

are concluded remotely. This is the common factor between smart and electronic contracts.

It is evident from the above definitions that smart contracts are complex contracts because they rely on encryption technology and are translated into computer code. Therefore, a smart contract can be considered as contractual terms translated into code embodied in a computer program, where the computer program itself performs the functions of the contract parties without their direct intervention through automatic contract execution.

Secondly: Characteristics of Smart Contracts

From the previous definitions, it is clear that contracts possess a set of distinguishing features from other contracts, and these features are manifested in the self-execution of the contract. These characteristics include the following:

1. Automation in Smart Contracts:

Smart contracts are automated contracts, meaning that their most distinctive feature is their automaticity. The term "automation" refers to the application of machines to tasks executed once or repeatedly by humans. Automation is used in the field of information technology, where machines are integrated into the automated control system. It is a technology concerned with executing a process through programmed commands with automatic control of feedback to ensure proper execution of instructions. The main advantage of automation systems lies in their ability to automate storage and retrieval systems⁶.

From this definition, we can see that the most important characteristic of smart contracts, and the reason they are called "smart," is their automation. A smart contract is created by humans but is designed to carry out its function by executing programmed commands by the contract creator directly and automatically once the contract's conditions are met.

2. Smart Contracts Are Written in Code or Script:

⁶ - Hala Salah Al-Hadithi, "Smart Contracts," Journal of the College of Law for Legal and Political Sciences, Volume 10, Issue 38, 2021, page 330.

Smart contracts are not written in the traditional language but are expressed in the form of code. This ensures that the execution or performance can be automated, reflecting concepts like "if (X) occurs, then do (Y)." It's important for (X) to happen for the contractual obligations in (Y) to be fulfilled. For example, the transfer of ownership (Y) occurs automatically when (X) receives their cash value⁷.

The writing style in smart contracts is not done in the conventional language but comes in an encrypted or specific code format. This is what makes the contract automated. For instance, in a property transfer contract, ownership automatically transfers from (A) to (B) if (B) transfers the agreed payment to (A)⁸.

3. Decentralization in Smart Contracts:

The most distinguishing feature of smart contracts is their decentralization, in contrast to traditional contracts that require central authority for validation and confirmation. Smart contracts are executed directly through blockchain technology.

Blockchain, or the "blockchain," is a type of distributed ledger technology where sets of confirmed and verified transactions are stored in interconnected blocks. It operates in the face of unauthorized interference. Blockchain relies on the concept of distributed and decentralized storage to record transactions across multiple network nodes⁹.

The decentralization as a feature in the execution of smart contracts is highlighted by the fact that any operation on the blockchain requires the consent of the participants who own the blockchain chains within the system. They confirm and approve the transaction. Therefore, smart contracts are based on decentralized contracting, operating on a direct horizontal contractual system,

⁷ - https://www.ifegypt.org/NewsDetails.aspx?Page_ID=1244&PageDetailID=1374, accessed on 30/02/2022, at 20:00.

⁸ - Najia Maaddawi, "Smart Contracts and Blockchain," *Al-Mufakkir Journal of Legal and Political Studies*, Volume 4, Issue 2, 2021, page 63.

⁹ - Valodymyr Marchinko, Alla Dambrovska, Loc.cit.

ensuring bilateral transactions without intermediaries. The contractual operations, in terms of their validity, confirmation, and approval, are conducted through this system, eliminating the need for third-party intermediaries or government entities responsible for certifying transactions and contracts, relying on the peer-to-peer principle¹⁰.

Therefore, the decentralization feature in smart contracts is derived from the blockchain system. The blockchain has opened up new possibilities for the creation and execution of contracts within a regulated digital environment that is subject to oversight by the participants within the system, eliminating the need for the traditional intermediaries commonly found in traditional contracts.

The second axis: Configuring the smart contract

Smart contracts, due to their uniqueness and reliance on artificial intelligence, have a distinctive contractual structure. The smart contract is formed from a set of elements (firstly), and the smart contract operates according to a specific mechanism (secondly). All of this makes the smart contract subject to evaluation and review of its functions and effectiveness (thirdly).

Firstly: Elements of the smart contract

The smart contract includes a set of elements represented as follows:

1. Contracting Parties:

They are the parties interested in executing the contract to achieve its effects and reap its benefits under specific conditions. They are anonymous, in case the blockchain is of the open type. Even within this technology, some technicians have pointed out that the identity of the parties can be known through tracking and tracing, meaning that knowledge of the parties' identity may come later in the contract.

2. Contract Subject:

¹⁰ - Mohammed Erfan Al-Khatib, "Honest and Methodological Smart Contracts," Kuwait International Law College Journal, Issue 2, 2020, page 169.

It is the object and matter that the contract is made about, and it is what the program does to be able to restrict all matters related to the subject for technical handling.

3. Contract Terms:

These represent a precise series of operations that all participants must sign to express their consent and approval. The achievement of the smart contract depends on how the parties confirm the contractual terms and agree to them; then, the contract is executed automatically.

4. Decentralized Digital Platform:

The smart contract is deployed through the blockchain system and made available among the platform's contracts. All the previously mentioned elements rely on the existence of the smart contract within the blockchain platform to ensure its automatic execution¹¹. The Ethereum blockchain platform, for example, is renowned for hosting more than 2.5 million smart contracts in 2021, making it the most common platform alongside others like Solana (SOL), Polkadot (DOT), and BNB Chain¹².

Second: How to Execute a Smart Contract

The protocols used in smart contracts, based on mathematics and known as encryption protocols, build the fundamental components that execute the optimized operations of observation, verification, privacy, and execution in smart contracts. This is done through the following stages:

1. Encoding Stage:

When writing the contract by one of the contracting parties, the smart contract translates the objectives of the contracting parties through programming operations, which are based on conditional codes, between input and output until the contract is achieved. Smart contracts distinguish themselves from other

¹¹- Ayyashi Sadiq Al-Fadad, "Smart Contracts," International Islamic Jurisprudence Assembly Conference, Organization of Islamic Cooperation, Dubai, 2019.

¹²- How to Create a Smart Contract on Ethereum, Real Vision, June 15 2022, Article Available In the site: <https://www.realvision.com/blog/how-to-create-a-smart-contract-on-ethereum>, See It On 07/09/2023, Time 23:03.

contracts with a specific written language during contract creation, using various programming languages such as C++, JavaScript, Python, and Solidity¹³.

2. Sending Stage:

After writing the contract, it is encrypted and represented as codes, then sent to the computer of the second party in the contract through distributed ledgers. The encryption process can be carried out entirely through the blockchain, similar to how Bitcoin is encrypted. Alternatively, it can be done through a mixed external platform. This stage involves deploying the smart contract on decentralized platforms that enable automatic execution of the contract¹⁴.

3. Execution and Processing Stage:

After smart contracts are deployed, the contractual terms are monitored and evaluated. Once the contractual conditions are met, the contractual procedures are executed automatically. The smart contract consists of a series of logically linked phrases, where the execution of one phrase is automatically followed by the next. This is the secret to automatic execution¹⁵.

Of course, what is observed in the way the smart contract is executed is the availability of the presumed willpower principle in the general theory of contracts. Even if the contract is smart and created in a somewhat complex manner, the party who writes and publishes it is considered the offeror (promisor). Its contractual terms are embodied in an Internet protocol containing programmed codes to be published through a smart contracting platform. The second party can issue acceptance of the contract through the platform with their full will. They can issue acceptance, thereby embodying the terms of the contract automatically, and withdrawal is not possible thereafter.

Thirdly: Functional Conditions for Executing the Smart Contract

The execution of a smart contract, like all other contracts, requires conditions

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¹⁴ - Hanah Mohammad Hilal Al-Haniti, The Nature of Smart Contracts, International Islamic Fiqh Conference, Organization of Islamic Cooperation, Dubai, 2019.

¹⁵ - Dawood Mansour, Smart Contracts and Their Role in Establishing Trust in Contractual Relations, Legal and Economic Research Journal, Volume 04, Issue 02, Page 82."

to be met for its execution. It requires the signing of parties. The smart contract is subject to a flexible but restrictive rule for contract execution, which is the payment of money to fulfill the contract term. The execution of the smart contract can also depend on an external condition associated with the contract execution.

1. Multi-Signature Smart Contract:

In physical legal contracts, parties typically know each other and sign them with handwritten/digital signatures, depending on the form and legal requirements of the contract. Contracts are fixed, and a lot of paperwork is needed to accomplish matters. However, regarding smart contracts, how do parties sign and verify them? How can party B show their consent to commit to the smart contract of party A?

Smart contracts rely on a mechanism called signature delegation for the contract, where the contract is subject to approval from other unknown parties who confirm the transaction related to the contract using their private keys through the smart contract-supporting platform. The execution of the smart contract can be linked to their confirmation via the platform¹⁶.

Multisig contracts are smart contracts that require multiple valid signatures to execute a transaction. This is extremely useful in avoiding single points of failure for contracts containing significant amounts of Ether or other digital assets. Multisigs also distribute responsibility for contract execution and key management among multiple parties, preventing the loss of a single private key from resulting in irreversible loss of funds. For these reasons, multisig contracts can be used to manage simple DAOs (Decentralized Autonomous Organizations).

Multisigs typically require N out of M accepted signatures (where $N \geq M$, and $M > 1$) for execution. $N = 3$, $M = 5$, and $N = 4$, $M = 7$ are commonly used

¹⁶- Xiong W, Hu Y. Delegate contract signing mechanism based on smart contract. PLoS One, 2022 Aug 19; 17(8):e0273424. doi: 10.1371/journal.pone.0273424. PMID: 35984834; PMCID: PMC9390900, Page 07.

values. A 4/7 multisig, for example, would require four out of seven possible valid signatures. This means that funds can still be recovered even if three signatures are lost. In this case, it also means that a majority of key holders must agree and sign for the contract to be executed¹⁷.

It is worth noting that the signing of the smart contract is subject to the confirmation rule through the blockchain. A blockchain platform includes multiple users, and the signing and confirmation of the contract rely on them. However, the signatories remain anonymous, ensuring the principles of trust and transparency in the execution of the smart contract. The role of the signatory is to confirm the validity of the transaction, and confirmation can be achieved with the majority of signatories. For example, if 10 signatures are required to confirm the transaction's validity, and 7 of them are obtained, the confirmation and execution of the contract proceed.

2.The smart contracts are closely tied to cryptocurrencies:

Smart contracts are only executable using cryptocurrencies as a means of payment. Cryptocurrency serves as the payment method for executing smart contracts. One of the most significant cryptocurrencies for this purpose is Bitcoin (BITCOIN), but this doesn't mean it's the only currency for smart contract transactions. There are several cryptocurrencies associated with decentralized platforms that support smart contracts, such as Ethereum's cryptocurrency (Ethereum) and Solana's cryptocurrency (Solana)¹⁸.

3. External verification as a guarantee for smart contract execution:

Smart contracts, by definition, are conditional contracts whose execution is contingent on a future event, which may be linked to the will of one or both parties or to external circumstances. In the latter case, an important question arises: how can these software programs, which are concerned with such

¹⁷ - Corwin Smith, Introduction To Smart Contracts, July 31, 2023, Article Available In The Site: <https://ethereum.org/en/developers/docs/smart-contracts/>, See It On 08/09/2023, 00/31.

¹⁸ - Al-Ayashi Sadiq Faddad, Smart Contracts, Peace Journal for Islamic Economics, Al Salam Bank Algeria, Issue 01, Algeria, December 2021, page 181.

execution, verify the occurrence of these external events? Are they capable of autonomously interacting with the external world to confirm whether the conditional event has occurred or not? An example of this is smart contracts for insurance. The embedded and executed program of the smart contract cannot know when the triggering event causing damage occurs. That's why this system is connected to specific software that links it to the real world and inputs the necessary data for execution within the blockchain system. This technology is known as Oracle software, and its function is to bridge the blockchain system on which smart contracts rely with the real world. In this way, the Oracle system becomes a third party in the smart contract, also referred to as the guarantor in smart contracts¹⁹.

Conclusion:

Smart contracts are computer-programmed contracts built on computer algorithms. Smart contracts perform contractual functions on behalf of the contracting parties, transferring natural contractual intelligence to software and automated protocols. Therefore, smart contracts can be considered:

- * Self-contained: Smart contracts derive their existence from their features, and their self-sufficiency is evident through their ability to perform all contracting functions without the need for human intervention.
- * Independent: Even if created by the contracting parties themselves, the self-execution and automatic nature of smart contracts make them independent contracts that do not require legal formalities.
- * Embody the principle of inevitability in smart contracts, as there is no turning back once the smart contract is deployed on the blockchain system. Smart contracts cannot be terminated or modified, and any additions to the contract require the creation of a new contract specifically including those additions. This highlights the complete independence of smart contracts.

Given the flexibility and widespread use of transactions with the assistance of

¹⁹ - "Mohammed Erfan Al-Khatib, The previous reference, pages 185-186."

smart contracts, the following recommendations are important:

- * Smart contracts should be incorporated into clear legal texts, developed in accordance with legal contract theories, and aligned with legal nature without altering their essence.

- * It would be appropriate for international unified legislation to regulate smart contract transactions since these transactions tend to have an international rather than national character. Therefore, the existence of unified international legislation to regulate them, similar to the UNCITRAL Model Law on Electronic Commerce, is advisable.

- * The establishment of techno-legal forums that bring together computer programming and decentralized systems experts (blockchain) along with legal experts is essential to address legal gaps in such transactions and enhance their credibility.

Finally, it is recommended that the Algerian legislator regulate dealings with smart contracts and open up to the real digital economy, we call on the Algerian legislator to issue a cryptocurrency followed by an Algerian platform that supports smart contract transactions as part of the country's new direction towards the digital economy.

The references:

Laws:

- *Law No. 18-05, concerning electronic commerce, issued on 24 Sha'ban 1439 corresponding to May 10, 2018, in the Official Gazette of the People's Democratic Republic of Algeria, Issue No. 28, issued on 30 Sha'ban 1439 corresponding to May 16, 2018.

Books:

- *Mohammed Ahmed Al-Afandi, "Introduction to Islamic Endowment Economics," without edition, Academic Book Center for Publishing, without place of publication, without year of publication.

Articles:

*Mohammed Bouzidi Chitar, "Integration of Smart Contracts into the Traditional Contract System: Reality or Assumption?" Journal of Contracts and Business Law, Mentouri University Constantine, Issue 02, Algeria, 2022.

*Hala Salah Al-Hadithi, "Transformative Technology Contracts," College of Law Journal for Legal and Political Sciences, Volume 10, Issue 38, 2021.

*Nadia Maaddawi, "Smart Contracts and Blockchain," Al-Mufakir Journal for Legal and Political Studies, Volume 4, Issue 2, 2021.

*Daoud Mansour, "Smart Contracts and Their Role in Cementing Trust in Contractual Relationships," Journal of Legal and Economic Research, Volume 04, Issue 02, 2021.

*Corwin Smith, "Introduction To Smart Contracts," July 31, 2023, Article Available In The Site: <https://ethereum.org/en/developers/docs/smart-contracts/>.

*"How to Create a Smart Contract on Ethereum," Real Vision, June 15, 2022, Article Available In the site: <https://www.realvision.com/blog/how-to-create-a-smart-contract-on-ethereum>.

*Valodymyr Marchinko, Alla Dambrovska, "On Determining the Legal Nature of Smart Contracts," Atlantis Press, Ukraine, Volume 170, 2021.

Entries:

*Mohammed Ahmed Al-Afandi, "Introduction to Islamic Endowment Economics," without edition, Academic Book Center for Publishing, without place of publication, without year of publication.

*Hanaa Mohammed Hilal Al-Hanaiti, "The Nature of Smart Contracts," International Islamic Fiqh Assembly Conference, Organization of Islamic Cooperation, Dubai, 2019.

Websites:

*Investopedia website, <https://www.investopedia.com/terms/s/smart-contracts.asp>.

*Egyptian Insurance Federation website, https://www.ifegypt.org/NewsDetails.aspx?Page_ID=1244&PageDetailID=1374