

# SMART CONTRACTS AS AN INNOVATIVE MECHANISM FOR ARBITRATION IN THE BLOCKCHAIN ENVIRONMENT

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**Abstract:** *The study aims to examine dispute resolution using blockchain arbitration based on artificial intelligence and smart contracts to determine the terms, conditions, and procedures related to the dispute. When a dispute arises between the parties, the details of the dispute are recorded on the blockchain. Under smart contracts, the parties involved in the arbitration and the rules governing the proceedings can be specified. The advantage of blockchain arbitration is its transparency and the permanent and secure documentation of all details on the blockchain, making it difficult for parties to manipulate the record or falsify information. This helps to resolve disputes fairly through arbitration. The study concludes that, although blockchain arbitration is a promising technology, it is still in the development stages, and its success depends on the recognition of the process by the parties involved and the arbitrators. It is also important to consider local legislation and regulations that may affect the application of blockchain arbitration in various national and international laws.*

**Key words:** *arbitration, alternative methods, blockchain, smart contracts, artificial intelligence.*

## 1. Introduction

The world is witnessing imminent changes in the field of technology and communication, along with a shift towards more equitable principles in e-commerce contracts. Arbitration is a means used to settle and resolve disputes that have arisen or may arise between parties outside the traditional judicial system. The idea of arbitration is to settle the dispute through the mediation of a third party known as an arbitrator or wise man, who is independent and not affiliated with the judiciary. The parties to the dispute agree to accept the arbitration decision as final and binding.

With technological developments, it has become possible to conduct arbitration electronically. This type of arbitration is known as electronic arbitration or online arbitration, where electronic arbitration refers to the use of technology and electronic means to settle disputes and resolve differences between parties instead of resorting to

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traditional justice. Smart contracts are software that automatically executes the terms of a specific contract when a specific event occurs or a specific condition is met.

These contracts rely on blockchain technology to ensure security and transparency of execution. Blockchain technology is a distributed technology used primarily to record transactions securely and transparently to ensure the smooth running of the arbitration process. Although blockchain is primarily intended to reduce the need for a central intermediary or third party for verification and settlement, it can also be used in dispute arbitration processes and thus largely bypasses the recognition and enforcement procedures traditionally exercised by state courts, leading to the creation of self-enforcing arbitration systems. In the future, this phenomenon may allow arbitration to become completely self-sufficient, marginalising state courts.

Through this study, we aim to investigate the effectiveness and feasibility of using blockchain arbitration and smart contracts to resolve disputes.

How effective is the use of blockchain arbitration and smart contracts in resolving disputes?

### **1.1. Research methodology**

This study adopts a doctrinal legal research methodology based on a descriptive-analytical approach. The descriptive aspect focuses on defining the technical dimensions of blockchain and smart contracts. The analytical aspect examines the compatibility of these technologies with existing legal frameworks, particularly the New York Convention (1958) and the UNCITRAL Model Law. Additionally, the study utilizes a theoretical research approach to explore the shift from traditional state-centered arbitration to decentralised, self-executing systems.

## **2. Theoretical foundations of blockchain Arbitration and smart contracts**

Our current era is witnessing radical transformations in the field of technology, with blockchain and smart contracts representing an important development that is casting its shadow over several areas, including arbitration. The use of these technologies in dispute resolution opens up new horizons for modernising traditional arbitration models. The theoretical foundations of blockchain and smart contract arbitration are based on the adoption of a set of fundamental concepts and new ideas about how to achieve justice and effective arbitration processes.

In this paper, we discuss the theoretical foundations of blockchain and smart contract arbitration, the concept of smart contracts and their role in the arbitration process (the first part), and then review the potential benefits of using this technology in dispute resolution (the second part).

### **2.1. The Concept of smart contracts and their role in arbitration**

In a world of rapid technological advancement, smart contracts are one of the tangible innovations that have brought about a fundamental change in the field of transactions and contract management. Smart contracts are an advanced concept of traditional

contracts, as they automatically execute their terms when specific events occur, through digital technologies such as blockchain. In this requirement, we review the definition of smart contracts in the first part and then the role of smart contracts in the arbitration process in the second.

### **2.1.1. Definition of smart contracts**

Smart contracts, in short, are: “small programs that execute “if this happens, then do that” (de Graaf, 2019, p. 2)”. Research into the term smart contract reveals countless definitions, and no agreed-upon definition of smart contracts has yet been reached. More than twenty years ago, Zabo defined smart contracts as a computerised protocol that executes the terms of a contract’ He argued that the general objectives of smart contract design are to meet common contractual terms (such as payment terms, privileges, confidentiality and even enforcement), reduce both harmful and accidental exceptions, and reduce the need for trusted intermediaries. Related economic goals include reducing fraud losses, arbitration and enforcement costs, and other transactions (De Caria, 2019).

A smart contract is also defined as “a computer program with self-verification, self-execution, and tamper-proof characteristics. It is part of a program that is executed in a blockchain system that uses a consensus protocol to run a series of events. Smart contracts can be used in various fields to eliminate third-party transactions and automate systems. Consensus decision-making is a collective decision-making process in which group members evolve and agree to support a decision that is in everyone’s best interest. The goals of the consensus mechanism are to seek agreement, cooperation, collaboration, equality, inclusiveness, and participation (Kothari, 2020).”

The smart contract interacts with the blockchain, which is a time-stamped chain of immutable data records managed by a group of computers and not owned by any single entity. Each of these data blocks (i.e., blocks) takes several platforms such as Ethereum, which is a platform used to create a decentralised network of contracts with transparent transactions using ether as a cryptocurrency for transactions. It includes two types of accounts: externally owned accounts (EOA), through which users send transactions directly, and contract accounts, based on contract codes. If it needs to call another contract, it sends an internal transaction (Kothari, 2020).

They are programmes that are executed when certain criteria are met. They are filled in and stored on the blockchain. They are generally used for consensus computing so that all stakeholders are certain of the results immediately, without the need for intermediaries or wasting time. They can also automate the workload and initiate the next step:

when certain conditions are met. To make smart contracts work, simple if/when... then... “lines are written into the code on the blockchain. When certain conditions are met and verified, the operations are executed by a computer network” (Krichen, 2022).

Blockchain is likened to a ledger, which records the history of transactions or information in a transparent and secure manner, and in many cases, is accessible to everyone. Transactions are verified and then recorded in blocks, which are linked

together in chronological order, although some present it as a revolution (Francès, 2019).

The entire contracting process is automated, from drafting to the end of the contract, ensuring that the contractual process is documented. Smart arbitration is carried out through smart contracts concluded via the blockchain, where disputes that are expected to arise in the future between the two parties to the contract are included in the contract codes. Then a mechanism is put in place to resolve those disputes. This means that if one party expects the other to breach one of the obligations contained in the smart contract, such as paying the agreed price or failing to deliver, for example (Al-Bab, 2023).

### **2.1.2. The Role of Smart Contracts in Arbitration**

The world's first smart contract-based arbitration proceedings have been conducted by Datarella, whose clients include Intel, **Siemens**, Daimler, and others.

The start-up says it conducted a mock arbitration in a simple environment to showcase its project called Code Elégit. They say: "The parties agree to conduct the business specified in the smart contract, which includes our arbitration library. In parallel, the parties enter into a legal contract that includes an arbitration clause referring to the blockchain arbitration rules" (Trustnodes, 2017). According to what appears to still be under development, the arbitration clause states: Any dispute, controversy or claim arising out of or relating to this contract, or its breach, termination or invalidity, shall be settled by arbitration in accordance with the Blockchain Arbitration Rules.

Arbitration in Bitcoin, for example, is self-enforcing based on multi-signature addresses and their implications for recognition and enforcement. A multi-signature address can function similarly to a lock with two keyholes. It requires two keys to open, and legal transactions are executed when both keys are used. This design can be used in trade arbitration, where funds are securely locked until obligations are fulfilled.

In the event of a dispute, both parties can request arbitration from a private judge who reviews the facts and makes a decision on the dispute. This allows the parties to resolve the dispute without the need to involve traditional authorities.

However, in the event of a dispute, neither party can independently access the coins (Ortolani, 2019, p. 434). This mechanism reflects an attempt to improve arbitration and security in Bitcoin transactions and highlights the ability of decentralised technology to provide a solution to legal issues and disputes in the world of digital currencies.

## **3. Review the potential benefits of using this technology in dispute resolution**

Smart contracts have the following advantages over traditional contracts:

- Risk reduction: Due to the immutability of the blockchain, smart contracts cannot be arbitrarily changed once they are issued. Furthermore, all transactions stored and replicated throughout the fully distributed blockchain system are traceable and auditable. As a result, harmful behaviours such as financial fraud can be greatly mitigated.
- Reduced management and service costs blockchains ensure the trustworthiness of the entire system through distributed consensus mechanisms without going through a

centralised intermediary or broker. Smart contracts stored on the blockchain can be executed automatically in a decentralised manner, thereby significantly reducing the management and service costs associated with third-party intervention.

- Improving business process efficiency: Eliminating reliance on intermediaries can significantly improve business process efficiency, such as: in the supply chain mentioned above as an example, financial settlement will be completed automatically on a peer-to-peer basis once the predefined condition is met (e.g., the buyer confirms receipt of the products), and as a result, delivery time can be significantly reduced (Zheng, 2020).

#### **4. The effectiveness of blockchain arbitration and smart contracts in dispute resolution**

In a world of rapid technological development, blockchain and smart contract technologies are attracting considerable interest in various fields, particularly in the area of dispute resolution. Blockchain and smart contracts are leading tools in this context, offering an innovative solution to arbitration and dispute resolution in ways that differ from traditional methods. This research examines the effectiveness of using blockchain and smart contracts in dispute resolution and arbitration.

Through this study, we shed light on the effectiveness of blockchain and smart contracts in dispute resolution, blockchain technologies and litigation before courts first, and, secondly, we analysed the challenges and potential problems in using this technology in arbitration.

##### **4.1. Blockchain technologies and litigation before courts**

Decentralisation and discontent Analysis conducted to date suggests that blockchain technologies will lead to the emergence of self-sufficient private judicial systems (Ortolani, 2019), where arbitration awards can be enforced without relying on the support of state courts. This, in turn, suggests that, as technology-based self-enforcement gains momentum, it may become increasingly difficult for national courts to scrutinise the contents of dispute resolution outcomes. However, this assessment looks to the future rather than the current situation. At present, blockchain technologies have not yet succeeded in marginalising state courts, but have in fact triggered a significant number of lawsuits, particularly in the United States, linked to the emergence of initial coin offerings (ICOs). Over the past two years, initial coin offerings (ICOs) have radically changed the landscape of venture capital, financial markets, and corporate finance law, but they have also led to some high-profile, high-value cases before the courts. These cases raise some fascinating questions that have yet to be answered, particularly with regard to jurisdiction. In order to understand the impact that blockchain technologies have had on dispute resolution, it is first necessary to briefly summarise what initial coin offerings (ICOs) are (Ortolani, 2019).

##### **4.2. Analysis of potential challenges and problems in using this technology in arbitration**

Blockchain and smart contracts stand out among the prominent technologies, and

many expect these technologies to play an important role in improving arbitration processes. However, this development is accompanied by challenges and problems related to laws, security, and trade, which necessitates highlighting these aspects to ensure the effective use of these technologies in the field of arbitration. In this section, we review potential disputes during the application of blockchain technology and smart contracts to arbitration and potential disputes when implementing arbitration awards using blockchain technology and smart contracts.

#### **4.2.1. Potential disputes during the application of blockchain technology and smart contracts to arbitration**

Since smart contracts are self-executing, some tend to believe that there will be no litigation in this area, even though smart contracts can offer, depending on their characteristics, many advantages such as automating certain tasks, enhancing security, or reducing costs. However, disputes are inevitable, and without claiming to provide an exhaustive list, it is not difficult to predict the development of potential disputes over the validity of the contract (i.e., legal capacity) or even its non-execution.

It is worth noting that coding errors can lead to unexpected problems at runtime. What happens if the contract no longer reflects the agreement between the parties? The contract may not be executed by the parties to the extent that it no longer reflects the initial agreement. In this case, who would be liable for the damage, given that the decentralised nature of the blockchain can, in some cases, destroy the chain of liability? The technological risks inherent in blockchain technology, for example in relation to cybersecurity, also raise new questions regarding liability. Furthermore, given the difficulty of codifying certain legal concepts such as reasonable efforts or good faith, the interpretation of smart contracts can give rise to difficulties (Koray, 2023).

#### **4.2.2. Potential conflicts when enforcing arbitration awards using blockchain technology and smart contracts**

In order to fully understand the impact of this set of technologies on private justice, it is particularly useful to consider their effects on the traditional concepts of recognition and enforcement. Referring to Algerian civil and administrative procedural law, we find that it stipulates that an arbitration award can only produce legal effects in a specific national legal system once it has been recognised. The law governing recognition allows natural and legal persons to resort to international commercial arbitration through the provisions of Articles 1006 and 1039 of the Civil and Administrative Procedure Code, thereby enshrining the principle of freedom of contract and, consequently, the contract (arbitration agreement) resulting in a ruling (Code of Civil and Administrative Procedure (amended and supplemented, 2008).

However, this ruling differs from a judicial ruling in terms of its authority and enforcement procedures due to its specific nature and the arbitrator's lack of command authority, which requires the intervention of the judiciary to confer authority and enforce the international arbitration award in its enforceable form so that it becomes enforceable in accordance with the provisions of Article 600 of the Algerian Code of Civil and Administrative Procedure and the provisions of the New York Convention on the

Recognition and Enforcement of Foreign Arbitral Awards (Code of Civil and Administrative Procedure (amended and supplemented, 2008).

In particular, in the context of international arbitration, Article V of the 1958 New York Convention states that: "Recognition and enforcement of an award may be refused, on the application of the party against whom the award is invoked, only if that party submits to the competent authority to which recognition and enforcement is sought evidence that" (Nations, 1958).

However, it should be noted that the mechanisms provided for in the New York Convention also extend to domestic arbitral awards under Articles 35 and 36 of the UNCITRAL Model Law on International Commercial Arbitration, thereby retaining a certain function of oversight for states over decisions issued by arbitral tribunals. In contrast, in the case of multi-signatory title-based arbitration, this filtering factor is completely bypassed, even though the award issued by a private judge may be refused recognition by state courts and may not even be considered a form of arbitration at all (Ortolani, 2019).

### **4.3. Legal Challenges and Analytical Perspectives**

#### **4.3.1. Enforcement under the New York Convention (1958)**

The core challenge lies in reconciling the "writing requirement" of **Article II** with digital smart contracts. In the light of the principle of **functional equivalence**, as recognized by the **Algerian Civil Code (Article 323 bis 1)**, digital records can satisfy the writing requirement. However, the move toward **self-enforcing awards** bypasses the traditional judicial "Exequatur" required under **Article 600 of the Algerian CCP**. This raises a critical question: how can we maintain the state's right to oversight as enshrined in international treaties? (Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York Convention, 1958).

#### **4.3.2 Due Process Guarantees in Automated Arbitration**

A major concern in automated arbitration is the guarantee of a fair trial. Analytically, we must ensure that the "Right to be Heard" is not sacrificed for speed. The system must guarantee that parties are properly notified and given a "fair opportunity" to present their case digitally before the smart contract executes. This is essential to avoid violating the principle of adversarial proceedings, which is a pillar of judicial justice (Raheem 2020, 14).

#### **4.3.3. Public Policy Exceptions**

Smart contracts execute logic without regard to legal nuances like **Public Policy**. An award might be technically correct according to the code but violate the **international public policy** of the enforcing state. Therefore, it is necessary to consider the "Hybrid System" where a judicial intervention can halt the execution if it contradicts core legal values (El-Haddad, 2010, 5)

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