THE EFFICENCY OF USING ARBITRATION IN SMART CONTRACTS DISPUTES

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Abstract - Blockchain technology and smart contracts have significantly transformed the digital contractual environment by enabling the automated execution of contractual obligations without direct human intervention. This development has consequently led to the emergence of innovative dispute resolution mechanisms, most notably smart arbitration based on algorithms and decentralized justice systems.

This study aims to analyze the legal nature of smart arbitration and examine its compatibility with traditional international arbitration principles, particularly concerning the validity of arbitration agreements, procedural fairness guarantees, and the recognition and enforcement of arbitral awards within blockchain environments.

The research adopts a multidimensional legal methodology combining doctrinal analysis, comparative legal analysis, and critical legal analysis. It further incorporates practical and judicial applications related to smart contracts and digital assets. The study also relies on international reports issued by United Nations Commission on International Trade Law and recent legal literature concerning blockchain and digital arbitration.

The study concludes that smart arbitration represents an important evolution in digital dispute resolution mechanisms due to its efficiency, speed, and automation. However, its legal effectiveness still depends on the existence of a hybrid legal framework capable of balancing technological innovation with procedural justice safeguards and judicial supervision.

Keywords - Smart Contract, Arbitration, Blockchain, Digital Disputes, Smart Arbitration**,**New York Convention.

I. INTRODUCTION

Rapid technological advancements have brought about profound changes in the structure of legal transactions, particularly with the spread of blockchain technology, which has given rise to modern contractual models based on the automated fulfilment of obligations without direct human intervention. While this development has enhanced efficiency and accelerated transaction processing, it has also created challenges regarding how to regulate these relationships and resolve any disputes that may arise from them. The importance of this topic stems from its position at the intersection of law and technology, where issues related to smart contracts are no longer merely technical in nature but raise fundamental legal questions regarding the extent to which existing rules can accommodate these transformations. Its importance is also evident in the need to find effective means of dispute resolution within the digital environment, striking a balance between speed and efficiency on the one hand, and ensuring justice on the other (De Filippi & Wright, 2018)

The problem lies in the challenge posed by the differing foundations of digital systems—which rely on decentralization and automation—compared to traditional rules based on the existence of a competent authority, a specific location, and clear procedures. This disparity raises a fundamental question regarding the suitability of the current legal framework for addressing this emerging model, particularly concerning the validity of agreements, litigation safeguards, and mechanisms for enforcing decisions. Based on this, this research aims to analyze the legal aspects associated with smart arbitration, clarify its compatibility with established rules, examine its operational mechanisms in the digital environment, assess the challenges it poses, and propose solutions that contribute to the development of legal frameworks in this field. This topic raises a number of questions that the study seeks to answer, most notably: What is the legal nature of this model ?

1.1. Problem of the Study

The central issue of this study is to examine the effectiveness of using smart arbitration in smart contract disputes. This is achieved by examining the terms of smart arbitration, the legal basis on which it is founded, and the mechanisms for its application in the digital environment.

1.2 Methodology

This research is based on the use of several integrated scientific approaches to ensure that the subject is addressed with accuracy and depth, specifically the descriptive-analytical approach. The descriptive-analytical approach was used to present concepts related to arbitration in the digital environment and outline its characteristics, alongside the analytical approach, which aims to interpret legal rules and examine their applications in light of technological developments. The comparative approach was also employed to highlight the similarities and differences between traditional frameworks and modern models, thereby aiding in assessing their suitability for this field. This integration contributes to a balanced

scientific treatment that combines theoretical grounding with practical application.

1.3 Importance of the Study

This work is limited to addressing smart arbitration in smart contract disputes, focusing on its key elements, foremost among which are coded arbitration clauses and the legal basis upon which they rest, as well as the mechanisms for their application in the digital environment and the associated economic benefits and legal, procedural, and operational challenges. Its scope does not extend to all blockchain applications or various forms of digital dispute resolution, except to the extent that they directly serve the subject matter. Methodologically, it relies on a descriptive-analytical approach to present relevant concepts and outline their dimensions, alongside an analysis of their practical applications, utilizing legal comparison where necessary to highlight similarities and differences between various systems and assess their suitability.

In terms of the temporal framework, the focus is on the contemporary period, particularly the last decade, which has witnessed the emergence of smart contracts and the expansion of the use of decentralized digital platforms, without delving into distant historical aspects. With regard to the geographical scope, the topic is addressed from an international perspective, given the cross-border nature of the digital environment, drawing on the principles of international commercial arbitration and comparative trends, in addition to referencing relevant international conventions, particularly regarding the recognition of programmatic agreements and the enforcement of their effects.

II. THEORETICAL FRAMEWORK

Smart arbitration is closely connected to modern legal and technological theories. One of the most influential theories is the concept of “Code is Law,” proposed by Lessig, which argues that software code can function as a regulatory mechanism comparable to legal rules (Lessig, 2006).

Another important concept is Lex Cryptographia, which refers to a decentralized digital legal order governed primarily by blockchain protocols and smart contracts rather than traditional state-based legal systems (De Filippi & Wright, 2018).

However, several legal scholars argue that technological automation alone cannot replace procedural justice guarantees, since arbitration legitimacy depends on principles such as due process, transparency, judicial review, and the right to defense (Born, 2021).

III. THE NATURE OF SMART ARBITRATION

Defining the concept of smart arbitration is essential to understanding its legal nature and its place within the system of dispute resolution mechanisms. The proliferation of smart contracts has brought about a fundamental shift in the very function of arbitration; it is no longer merely a subsequent remedy invoked after a dispute arises, but has in many cases become a feature embedded in the contract’s structure, triggered automatically when certain conditions are met.

Smart arbitration is defined as a software protocol embedded in smart contracts, designed to resolve disputes within a decentralised network of arbitrators who adjudicate the matter in question using cryptographic techniques and crowdsourcing. The essence of this definition is that the system completely eliminates intermediaries and automatically executes contract terms without any human intervention .(Al-Barai,2020)

Legally, this system represents an innovative model in which the parties’ intentions converge in an encrypted code, from which a collective decision is issued by a decentralised body when a dispute arises.

The legitimacy of this system is based on the principle of freedom of contract; however, it redefines the concept of "consent", shifting it from its traditional physical form to a digital code. The essential feature of this system is that its decisions are binding on two parallel levels: legal and technical, in a practical embodiment of the saying “code is law", the effect of which may not be suspended except by an explicit counter-agreemen.(Al-Ajlouni,2002)

Smart arbitration systems are characterized by three key features that distinguish them from other dispute resolution systems:

- Complete decentralization: There is no central authority controlling the process; instead, it is governed by a distributed network community, unlike international chambers of commerce and similar institutions.
- Real-time enforcement via the blockchain: The decision does not require judicial recognition or an enforcement order; rather, it is automatically enforced as soon as voting concludes, with funds deposited in the escrow account immediately released to the winning party.
- Full transparency and immutability: Every action is recorded on the blockchain and is available for audit at any time, thereby establishing trust in the results.

Comparative Judicial and Practical Developments

Contemporary judicial trends demonstrate varying approaches toward blockchain disputes and digital assets.

In the United Arab Emirates, the case of Gate MENA DMCC v Tabarak Investment Capital Ltd illustrates the increasing flexibility of DIFC Courts in handling disputes involving digital assets and financial technologies.(DIFC CA 002/2023, 13 June 2024) Similarly, courts in Singapore have shown a progressive willingness to recognize crypto-assets

and blockchain-related disputes within arbitration frameworks.

Practical decentralized arbitration platforms have also emerged, including:

- Kleros
- Aragon Court,
- Jur,
- and OpenLaw.

These platforms represent practical examples of blockchain-based dispute resolution mechanisms operating through decentralized governance systems.(Kleros, 2023)

IV. THE LEGAL PROBLEMATIC OF SMART ARBITRATION

By its very nature—decentralized and automated—smart arbitration raises a range of legal issues that touch on the very core of arbitration theory and the principles of procedural justice. These issues fall into two main categories: procedural and substantive issues concerning litigation safeguards, the identity of the arbitrator, and the confidentiality of proceedings; and jurisdictional and enforcement issues concerning the seat of arbitration, the applicable law, and the extent of international recognition of awards.Due process is considered one of the inviolable principles of any justice system, encompassing the right to be heard, equal opportunity to present arguments, and equal treatment. However, smart arbitration raises two fundamental issues in this regard:

- Absence of oral arguments: All decisions are based solely on digital evidence, without the parties being given the opportunity to present their arguments orally before the arbitral tribunal, which violates the adversarial principle, a fundamental procedural pillar.
- Lack of reasoning: The decision is issued by an automated algorithm without any written legal justification, which deprives it of one of the most important conditions for the validity of an arbitral award and renders it subject to absolute nullity before national courts.
- Another legal issue arises from the fact that decentralized platforms rely on anonymous arbitrators selected at random, which raises two interrelated problems:
- Conflict between impartiality and the incentive mechanism: Arbitrators are financially incentivized to vote with the majority based on the "Schilling Point" mechanism, whereby those who agree with the majority are rewarded and those who dissent are penalized by having their share confiscated. This may lead to decisions that prioritize the majority over justice.
- Impossibility of challenging a conflict of interest: The anonymity of the arbitrator prevents the parties from exercising their fundamental right to challenge him or her on the grounds of a conflict of interest, which is fundamentally at odds with the requirements of the International Bar Association and the conditions for the validity of arbitration in all known legal systems.(Faraj,2017)

Another legal issue arises in that traditional arbitration proceedings are characterized by strict confidentiality as a safeguard for the parties, whereas the transparency of decentralized public ledgers in smart arbitration may lead to the disclosure of trade secrets and sensitive party data, creating a structural contradiction between the nature of the technology and the confidentiality requirements of arbitration.

Furthermore, traditional international arbitration requires a connection to a specific geographic location, which facilitates the determination of the procedural law applicable to arbitration disputes and grants national courts the authority to review the award. However, smart arbitration takes place in a decentralized digital space with computers distributed around the world, resulting in what are called "floating arbitral awards" that are not tied to any specific country. This creates ambiguity in determining:

- The court of cassation competent to review the award.
- The substantive law applicable.
- The extent to which the decision is subject to the mandatory rules of states.

It is also worth noting that the New York Convention has established strict criteria for the recognition and enforcement of arbitral awards, most notably the "territorial criterion" set forth in Article I, which requires that the award be rendered within the territory of a specific state. The absence of this territorial link in smart arbitration creates a fundamental legal obstacle. In the United Arab Emirates, Federal Arbitration Law No. 6 of 2018 provides the legislative framework governing arbitration agreements, procedural safeguards, and the enforcement of arbitral awards. The Law may therefore serve as a legal basis for accommodating smart arbitration mechanisms within the UAE legal system, particularly where procedural fairness and party autonomy are preserved.(UAE Federal Arbitration Law No. 6 of 2018) , namely:

- The inability of national courts to automatically recognize decisions of decentralized platforms due to their lack of the required territorial link.
- The automatic enforcement mechanism conflicts with the Convention's requirements, which mandate the fulfillment of formal conditions such as a signature, the designation of the seat of arbitration, and the legal basis for the decision.(AL-Ajlouni,2002)

In the face of this impasse, practical reality has given rise to what is known as the "hybrid model," most notably exemplified by a Mexican case in 2021, where a human arbitrator referred the technical dispute to the Kleros platform for resolution, then

incorporated the algorithm's decision into a traditional arbitration award signed by him, thereby conferring upon the decision the legitimacy necessary for its enforcement under the New York Convention. This model reflects a fundamental reality: that smart arbitration, in its current stage, cannot do without a traditional legal framework that grants it enforceability outside the blockchain environment.

The issues discussed reveal that the gap between the logic of smart arbitration and that of traditional law remains wide, and that addressing it requires two parallel paths: an interpretive approach that expands the concepts of authorship, jurisdiction, and identity in existing texts, and a legislative approach that develops new legal frameworks capable of accommodating this new model without compromising the procedural justice safeguards upon which arbitration depends.

V. CONCLUSION

The current study has reached a number of findings, namely:

1. In light of the preceding analysis, it is clear that smart arbitration is not merely a technological extension of traditional arbitration, but rather raises a set of legal implications that reflect the complexity of the interaction between law and technology.
2. It appears that smart arbitration is not merely an evolution of e-arbitration but rather a self-contained model that relies on automation and software to manage dispute proceedings, render decisions, and enforce them, thereby giving it a dual nature that combines legal and technical dimensions.
3. The study revealed that the decentralized nature of smart arbitration makes it difficult to establish a clear seat of arbitration, which poses a challenge to traditional rules, particularly regarding the determination of the applicable law and the possibility of subjecting the award to judicial review.
4. It is evident that the effectiveness of smart arbitration varies depending on the nature of the dispute; it achieves high efficiency when dealing with digital assets within a blockchain environment, where enforcement occurs automatically, whereas it faces difficulties when enforcing awards in the physical world outside this environment.
5. The study revealed certain shortcomings in procedural safeguards within some smart arbitration applications, such as limited guarantees of the right to defense, weak reasoning in awards, and ambiguity regarding the identity of the entities or individuals adjudicating the dispute.
6. The findings highlight that adopting a hybrid model combining traditional arbitration with modern technologies may constitute a practical solution, as it strikes a balance between the advantages of automation and technical efficiency on the one hand, and the assurance of legal recognition and judicial enforcement on the other.

In light of the findings, and given the accelerating pace of digital transformation, the study has identified a number of recommendations, which we summarize below:

1. The need to adopt proactive legal reforms, particularly in the UAE, to develop laws on electronic transactions and arbitration that accommodate smart contracts, while recognizing the enforceability of arbitration clauses embedded in the code once the parties' intent is established, and supporting contract templates that are legally and technically readable.
2. The need to strengthen cross-border cooperation to harmonize rules, thereby facilitating the recognition and enforcement of awards.
3. The need to encourage arbitration centers to adopt models that combine traditional procedures with digital tools to strike a balance between efficiency and safeguards.
4. The need to establish digital platforms operating within clear regulatory frameworks and under the supervision of recognized authorities to enhance trust.
5. The need to provide technical and legal training to judges, arbitrators, and lawyers to efficiently handle smart contract disputes

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