



THE SPECIFICITY OF CONSENT IN SMART CONTRACTS IN THE CONTEXT OF ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON CONSUMER PROTECTION: AN ANALYTICAL AND COMPARATIVE STUDY UNDER ALGERIAN LEGISLATION

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ABSTRACT

The field of electronic transactions is undergoing rapid development driven by the digital revolution and technological advancement, resulting in the emergence of new contractual models, among the most prominent of which are smart contracts based on blockchain technology. These contracts rely on the automatic execution of contractual obligations in accordance with predetermined programming commands. Despite the advantages they offer in terms of speed, efficiency, and transparency, smart contracts raise legal issues concerning the validity of consumer consent, given the particularities of their formation and execution mechanisms. They also present challenges relating to the provision of contractual information, the consumer's understanding of the legal and technical implications of the contract, and the adequacy of traditional legal rules in accommodating this emerging contractual model.

This study examines the legal issues associated with consumer consent in smart contracts by analyzing the nature of smart contracts and the legal framework governing them. It further assesses the adequacy of general legal rules and the rules governing electronic contracts in providing legal protection for consumers in the absence of specific legislative regulation, while drawing on selected comparative legislative experiences. The study adopts analytical and comparative approaches and concludes that the particularities of smart contracts require the development of the legal framework governing them in a manner that strengthens the protection of consumer consent, reinforces the obligation to provide information, and keeps pace with the rapid developments occurring in the digital environment.

INTRODUCTION

The digital revolution has brought about a profound transformation in the legal environment of transactions, driven by the rapid development of information and communication technologies and the increasing use of artificial intelligence and blockchain technologies across various fields, including contractual relations. This development has contributed to the emergence of smart contracts as a novel contractual model based on programming and the automated execution of obligations. As a result, smart contracts have reshaped several traditional concepts underlying contract theory, foremost among them consent as an essential element in contract formation.

Despite the advantages offered by smart contracts in terms of speed, efficiency, and transparency, their association with artificial intelligence technologies and automated execution raises legal issues concerning the validity of consumer consent. These issues are particularly significant given the reliance on digital means and software for the expression of contractual intent, as well as the challenges this may pose to the consumer's informed understanding of the content and effects of the

contract. They also raise questions concerning the adequacy of traditional legal rules in providing effective consumer protection within this emerging contractual model.

These concerns are further heightened by the absence of specific legal regulation of smart contracts in Algerian legislation, despite the regulation of certain aspects of electronic contracting. This raises questions as to the extent to which general legal rules and the rules governing electronic contracts can be applied to smart contracts, and whether such rules are capable of accommodating the particularities of consent in this type of contract.

The importance of this study stems from the novelty of the subject and the rapid development of its practical applications, which underscore the need for legislation to keep pace with technological developments in a manner that balances the promotion of digital innovation with the protection of consumers. Its significance also derives from the limited number of Arab legal studies addressing the particularities of consent in smart contracts in the context of artificial intelligence, particularly within the framework of Algerian legislation.

This study aims to analyze the particularities of consent in smart contracts in light of the

use of artificial intelligence technologies and to clarify their impact on consumer protection. It examines the extent to which traditional legal rules and the rules governing electronic contracts are adequate to accommodate the legal and technical characteristics of this contractual model. It also evaluates the position of the Algerian legislator in light of selected comparative legislation, with a view to proposing legal mechanisms that may contribute to strengthening the protection of consumer consent and keeping pace with developments in the field of digital contracting.

Based on the foregoing, the study raises the following research question:

To what extent do the particularities of consent in smart contracts, in light of the use of artificial intelligence technologies, affect consumer protection, and to what extent are the existing legal rules adequate to address the issues arising from them?

METHODOLOGY

To address the research question, this study adopts an analytical approach to examine the legal rules relevant to smart contracts, electronic contracting, and consumer protection, and to assess the extent to which the general rules of Algerian law are capable of accommodating the specific characteristics of smart contracts, particularly with regard to the expression of consent, automated contract performance, and the duty to provide information. The study also employs a comparative approach by examining selected legislative experiences, particularly those of the United States, Belarus, France, and the United Arab Emirates, in order to identify the similarities and differences between these approaches and the Algerian legal framework.

These jurisdictions were selected because they reflect diverse approaches to blockchain technology and smart contracts, ranging from the legal recognition of certain applications to the regulation of specific aspects without establishing a comprehensive legislative frame-

work. The comparison is conducted according to several principal criteria, namely the extent of legal recognition of electronic transactions and blockchain technology, the evidentiary value of electronic means, the capacity of general legal rules to accommodate the automated performance of contracts, and the adequacy of rules relating to transparency, information disclosure, and consumer protection. The study also adopts a descriptive approach when presenting the fundamental concepts and the technological and legal characteristics of smart contracts.

FINDINGS AND DISCUSSION

1. THE CONCEPTUAL AND LEGAL FRAMEWORK OF THE SMART CONTRACT IN THE ARTIFICIAL INTELLIGENCE ENVIRONMENT

The contemporary world is witnessing significant developments in the field of information technology, and the rapid advancement of digital technologies has led to the emergence of new contractual forms, among the most prominent of which is the smart contract. This contractual model relies on blockchain technology for the conclusion of contracts and the automatic execution of contractual obligations, thereby bringing about a transformation in traditional concepts of contracting.

Given the novelty of this type of contract and the legal issues it raises concerning its legal characterization and the adequacy of existing legislative regulation to accommodate it, it is necessary to examine the concept and characteristics of the smart contract. It is equally important to address the legal framework applicable to smart contracts in the absence of specific legislative regulation and to distinguish them from electronic contracts. These elements constitute the fundamental basis for examining issues related to the formation of consent and consumer protection in the digital environment.

1.1. The concept of the smart contract and its characteristics

The smart contract is one of the recently developed contractual models resulting from rapid technological advancement in the digital environment. It raises several legal issues that require, as a preliminary matter, an examination of its concept and the principal characteristics that distinguish it before addressing its impact on consumer consent. Such an examination is essential because these elements form the basis upon which the various legal effects of smart contracts are established and determine their implications for the formation of consent and consumer protection.

1.1.1. Definition of the smart contract

Given the relatively recent emergence of smart contracts and their highly technical nature, legal scholarship has not yet reached a universally accepted definition of the concept. Rather, a variety of definitions have been advanced, reflecting the diversity of smart-contract applications and their intersection with different technological and legal concepts. It is therefore necessary to examine the principal doctrinal and statutory definitions that have been proposed.

Some scholars define a smart contract as “a piece of computer code stored on a blockchain network and used to execute transactions or agreements automatically upon the fulfilment of specified conditions. This type of contract does not require human supervision or the involvement of an external enforcement authority, since the programmed instructions are executed as soon as the relevant conditions are satisfied, thereby reducing costs and limiting potential disputes between the parties”.¹

Other scholars define a smart contract as “computer code operating on a blockchain and containing a set of rules pursuant to which the

parties to the contract have agreed to interact with one another; once the predetermined rules are satisfied, the agreement is automatically executed”.² A smart contract has also been defined as a computer program consisting of a set of codes incorporating the terms and particulars agreed upon by the contracting parties, which is automatically executed upon the fulfilment of predetermined conditions through the use of dedicated technological platforms, such as the Ethereum platform.³

The foregoing definitions are notably focused on the technical dimension of smart contracts, particularly their reliance on blockchain technology and their automatic execution once predetermined conditions have been fulfilled. This technical dimension, however, is not sufficient on its own to identify the distinctive legal characteristics of smart contracts, especially where one of the contracting parties is a consumer. In such circumstances, particular questions arise concerning the clarity of the terms to which the consumer gives consent and the extent to which the consumer understands the legal consequences arising from those terms.

Accordingly, for this study, a smart contract may be understood as a computer program based on blockchain technology that incorporates predetermined programmed terms and automatically performs the obligations agreed upon once the relevant conditions are satisfied, thereby giving rise to particular legal considerations concerning consumer consent and consumer protection.

Certain comparative legal systems have sought to establish statutory definitions of smart contracts. In the United States, Arizona House Bill 2417 of 2017, concerning blockchain technology, defines a smart contract as an event-driven program that operates on a dis-

1 Ben Tria, M. (2019). Smart contracts integrated into blockchain. *Journal of Law, Kuwait International Law School*, 1(4), 482.

2 Hassan, H. M. M. (2023). Smart contracts concluded through blockchain technology. *The Legal Journal (A Specialized Journal in Legal Studies and Research)*, 16(1), Egypt, 10. https://jlw.journals.ekb.eg/article_297185.html.

3 Bourgueda, N. M. (2017). *Contracts concluded through modern systems* (Doctoral dissertation). Faculty of Law, University of Algiers, 3.

tributed, decentralized, shared, and replicated ledger and that is capable of taking custody of assets and issuing instructions for their transfer. Likewise, Decree No. 8 of 2017 on the Development of the Digital Economy in the Republic of Belarus defines a smart contract as software code designed to operate on a blockchain or another distributed information system for the automated execution of transactions or other legally significant acts.⁴

An examination of the substance of these statutory definitions reveals that they focus primarily on the programmatic nature of smart contracts, their connection with blockchain technology, and their capacity for automated execution. They do not, however, specifically address the issue of consumer consent or the extent to which consumers understand the terms that are implemented through computer code. This omission highlights the importance of examining the distinctive features of consent in smart contracts concluded with consumers.

1.1.2. Characteristics of smart contracts

Smart contracts possess several characteristics that distinguish them from other forms of contracts, whether traditional or electronic. The most important of these characteristics are as follows:

- **Electronic nature:** A smart contract is distinguished from a paper-based contract by the fact that it is concluded exclusively through electronic means. It consists of symbols or codes representing the obligations of the parties in preparation for their subsequent execution. The parties are bound by a digital agreement designed to execute the contractual terms or obligations, provided that the conditions required for execution are fulfilled.⁵

- **Self-Verification:** One of the most important characteristics of a smart contract is its ability to automatically verify whether the contractual conditions agreed upon in advance have been fulfilled. This verification is carried out through the blockchain network and its consensus mechanisms, without requiring intervention by the contracting parties or a centralized authority to verify compliance with those conditions.⁶
- **Conditional Nature:** A smart contract operates on the basis of predetermined conditions that are translated into computer code according to conditional logic. Thus, once a particular condition is satisfied, the corresponding predetermined outcome is automatically executed. In this way, certain contractual provisions are converted into executable programming instructions. For example, a contractual provision may require the payment of compensation in the event of a breach of an obligation, and such a provision may be automatically executed once the specified condition is met.⁷ In this respect, smart contracts provide a distinctive mechanism, as they operate from the outset according to predefined conditions. For instance, ownership is not transferred to the new purchaser until the price and other relevant conditions have been agreed upon and incorporated in detail into the smart contract.⁸
- **Self-Execution:** Smart contracts are regarded as self-executing contracts because the contractual terms are directly incorporated into lines of computer code.

4 Arizona Revised Statutes, § 44-7061, added by House Bill 2417 of 2017 (Arizona, United States) ; Decree of the President of the Republic of Belarus No. 8 of 21 December 2017, "On Development of Digital Economy". [in English]

5 Hewett, N., Lehmacher, W., Wang, Y. (2019). Inclusive deployment of blockchain for supply chains: Part 1 –

Introduction. Geneva: World Economic Forum, 13.
6 Mekki, M. (2018). The contract as the object of smart contracts (Part 1). Dalloz IP/IT: Intellectual Property and Digital Law, No. 7, 410.

7 Bouandel, W. (2024). Artificial intelligence as a contracting party. Journal of Social Sciences, 9(3), 513.

8 Ali, S. H. M. (2024). Artificial intelligence and its role in concluding commercial contracts. Journal of Legal and Economic Research, 14(90), 818.

Consequently, the contract automatically executes the relevant provisions once the predetermined conditions have been satisfied, thereby reducing or eliminating the need for intermediaries.⁹

- The fundamental role of a smart contract lies in utilizing blockchain technology to automate certain stages of the contractual relationship, particularly the performance of contractual obligations. Accordingly, smart contracts contribute to simplifying the execution process and ensuring that obligations are performed in accordance with the conditions agreed upon in advance. They may also reduce the likelihood of breaches of contractual obligations and enhance the effectiveness of contractual performance.¹⁰
- This characteristic is particularly significant in contracts concluded with consumers, since the performance of certain obligations becomes directly linked to programmed conditions. This raises questions as to the extent to which consumers are aware of, and have consented to, the consequences of such automated execution at the time the contract is concluded.
- **Immutability:** A smart contract is characterized by the difficulty of modifying its computer code once it has been deployed and recorded on the blockchain network. This may limit its flexibility in responding to circumstances that arise after the contract has been concluded. Consequently, this characteristic may constitute an obstacle for contracting

parties when they need to amend contractual terms or adapt them to changing circumstances.¹¹

1.2. Legal Regulation of the smart contract and its distinction from the electronic contract

The legal framework governing smart contracts constitutes a complex and evolving field at the intersection of technology and legal regulation. The absence of specific legal regulation of smart contracts in Algerian legislation raises questions concerning the legal rules applicable to them and the extent to which the provisions governing electronic contracting are adequate to accommodate their technical and legal particularities. It is therefore necessary to examine the legal rules that may serve as a basis for regulating smart contracts and to determine the extent to which the rules governing electronic commerce may be extended to this emerging form of contracting.

1.2.1 The legal framework of the smart contract

Smart contracts have given rise to numerous legal issues, particularly because they are concluded within a digital environment and therefore depart, in certain respects, from some of the rules traditionally associated with the general theory of contract. This has led legal scholars to draw attention to the existence of a legislative gap concerning their legal regulation. Consequently, there is an increasingly pressing need to establish a legal framework governing smart contracts with sufficient flexibility to enable their adaptation to the evolving contractual environment.¹²

9 Al-Mahasneh, Y. O. M. (2024). The legal nature of smart contracts programmed using blockchain technology. *International Journal of Legal Research and Legal Studies*, 3(4), 16.

10 Dondero, B. (2017). Smart contracts. In *Civil law in the digital age: Proceedings of the conference of the Master 2 in General Private Law and the Civil Law Laboratory* – Paris II, 21 April 2017. LexisNexis, 20.

11 Hassan, H. E. H. A. (2023). Smart contracts: A comparative analytical study. *Security and Law Journal*, 31(1), 464.

12 Homsj, M. (2025). Rules governing distance contracting in light of recent legal transformations (Doctoral dissertation). Faculty of Law and Political Science, University of 8 May 1945 Guelma, 43.

Although legal scholarship has highlighted the existence of a legislative lacuna in the field of smart contracts, most legal systems have yet to establish a comprehensive regulatory framework specifically governing them. Nevertheless, some jurisdictions have moved towards recognising smart contracts and regulating certain aspects of their operation. In this context, several U.S. states have recognised blockchain technology and smart contracts. In 2016, the State of Vermont recognised the legal validity of commercial records incorporating blockchain technology. Subsequently, in 2018, the State of Arizona introduced amendments to its legislation governing electronic commercial transactions, thereby recognising the lawful use of blockchain technology and smart contracts and providing that a contract may not be denied legal effect or enforceability solely on the ground that it was concluded in electronic form.¹³

It may be observed that this legislative approach is primarily based on recognizing the legal validity and evidentiary effect of the technologies underlying smart contracts, without establishing a specific and comprehensive legal regime governing such contracts.

This approach is broadly comparable to that adopted by the Algerian legislature, which has likewise refrained from establishing a specific legal framework for smart contracts. Nevertheless, smart contracts may potentially be accommodated within the general rules governing electronic contracting, as will be demonstrated through an examination of the relevant Algerian legal provisions.

French law may also be regarded as one of the early legislative frameworks to recognize blockchain technology. The first manifestation of such recognition appeared in 2016 within the context of corporate and financial law. Ordinance No. 2016-520 of April 2016 concerning *bons de caisse* introduced a new category of such instruments known as Minibons. The Ordinance authorized the issuance and transfer of these instruments through a shared electronic

recording system capable of recording transactions in accordance with the conditions and requirements prescribed by the competent authorities.¹⁴ Subsequently, Decree No. 2018-1226 of 24 December 2018 was enacted to establish the implementing provisions necessary for the application of this regulatory framework.¹⁵ French legal scholarship further indicates that a smart contract remains essentially a reflection of the terms predetermined within its underlying program, thereby limiting its capacity to accommodate unforeseen circumstances arising in the course of automated execution.¹⁶

The United Arab Emirates is among the Arab States that moved at an early stage towards regulating blockchain technology and smart contracts through the development of legislative and regulatory provisions concerning these emerging technologies. UAE governmental authorities have also adopted blockchain technology in a number of official transactions, reflecting an institutional policy directed towards employing this technology in the recording, authentication, and verification of transactions and contracts.¹⁷

The Algerian legislature has not enacted specific legislation governing smart contracts. Nevertheless, such contracts may arguably be subject to the legal rules governing electronic contracting contained in Law No. 18-05 on Electronic Commerce, given that smart contracts are concluded within a digital environment and rely on electronic means. The provisions of the Electronic Commerce Law were drafted in suf-

13 Vermont Statutes, Title 12, § 1913, added by Act No. 157 of 2016 (Vermont, United States). [in English]

14 Ordinance No. 2016-520 of April 28, 2016, concerning cash vouchers, Official Journal of the French Republic, No. 0101, April 29, 2016 (France).

15 Decree No. 2018-1226 of 24 December 2018, concerning the use of a shared electronic recording system for the representation and transfer of financial securities and for the issuance and transfer of minibonds. Official Journal of the French Republic, No. 0298.

16 Lasmoles, O. (2018). The difficult apprehension of blockchains by law. *International Review of Economic Law*, 2018/4, Vol. XXXII, 463. <https://doi.org/10.3917/ride.324.0453>.

17 United Arab Emirates Government. (2018). UAE Blockchain Strategy 2021, launched on 11 April 2018. <https://u.ae/en/about-the-uae/digital-uae/uae-blockchain-strategy-2021>.

ficiently general and flexible terms to permit their scope of application to extend to various modern forms of contract concluded through contemporary digital technologies. This may be inferred from the legislature's reliance on general concepts such as "transactions concluded at a distance" and "electronic communications".¹⁸

The Algerian legislature has defined electronic communications as encompassing various processes involving the transmission, exchange, and receipt of signals, writings, images, sounds, data, and information by wire, optical fibre, or electromagnetic means.¹⁹ This provision demonstrates that the legislature adopted a broad conception of electronic communications without confining the concept to any particular technological medium. Such an approach affords a degree of flexibility to legal rules applicable in the digital and technological sphere, thereby enabling them to accommodate emerging technologies, including smart contracts based on blockchain technology and automated execution.

The Algerian legislature has also recognized the evidentiary value of electronic writing pursuant to Article 323 bis 1 of the Civil Code, irrespective of the medium on which it is recorded or the means by which it is transmitted.²⁰ This reflects the legislature's adoption, to a certain extent, of the principle of technological neutrality, whereby legal rules are formulated in a manner capable of accommodating continuous technological and technical development.

By contrast, the Algerian legislature has

adopted a more restrictive approach towards certain applications associated with blockchain technology. Article 117 of the Finance Law for 2018 prohibited dealings in virtual currencies, including their purchase, sale, use, and possession.²¹

A comparison between these approaches and Algerian legislation reveals a degree of convergence in the reliance on general legal rules to accommodate certain legal effects arising from blockchain-based technologies. The principal difference, however, lies in the extent of legal recognition and regulatory development. Whereas some comparative legal systems have moved toward granting legal validity to blockchain applications and adopting more specific rules governing their use, the Algerian legislature has not introduced a dedicated legal framework for smart contracts, instead leaving open the possibility of subjecting them to the general rules governing electronic contracting.

Consequently, although the Algerian legal framework is, in principle, capable of accommodating smart contracts within the broader concept of electronic contracting, it remains less equipped to address the distinctive features of the automated performance of contractual obligations. This is particularly evident with regard to ensuring that consumers are adequately informed of programmed contractual terms and of the legal consequences resulting from their automated execution. Comparative legal approaches may therefore provide useful guidance for the further development of Algerian law, not necessarily through the replication of a foreign regulatory model, but rather through the adoption of specific rules designed to ensure the transparency of programmed terms and to inform consumers of the mechanisms and consequences of automated execution, while preserving the application of general rules intended to protect the weaker contracting party.

18 Law No. 18-05 of 10 May 2018, relating to electronic commerce, Articles 5 and 6, Official Gazette of the People's Democratic Republic of Algeria, No. 28, issued on 16 May 2018.

19 Law No. 18-04 of 10 May 2018, laying down the general rules relating to postal services and electronic communications, Article 10, Official Gazette of the People's Democratic Republic of Algeria, No. 27, issued on 13 May 2018.

20 Law No. 05-10 of 20 June 2005, amending and supplementing Ordinance No. 75-58 of 26 September 1975 containing the Civil Code, as amended and supplemented, Official Gazette of the People's Democratic Republic of Algeria, No. 44, dated 26 June 2005.

21 Law No. 17-11 of 27 December 2017, containing the Finance Law for 2018, Article 117, Official Gazette of the People's Democratic Republic of Algeria, No. 76, dated 28 December 2017.

In this context, comparative approaches to consumer protection also display important differences. Within the European legal framework, particular emphasis is placed on consumer protection and the scrutiny of contractual terms, whereas certain strands of legal scholarship in the United States place greater emphasis on freedom of contract and economic efficiency. This divergence, however, remains the subject of continuing academic debate.²²

1.2.2 Distinguishing between smart contracts and electronic contracts

A distinction must be drawn between electronic contracts and smart contracts because of the frequent confusion between the two concepts in legal and technical discourse. Electronic contracts are concluded through modern digital means and technologies, such as computers, smartphones, and tablets, and may be formed through various online communication channels, including electronic mail and text, audio, or video communications. In this sense, electronic contracts encompass a broad range of transactions concluded by electronic means.

By contrast, a smart contract is a specific form of digital contracting that relies on blockchain technology and is characterized by self-executing code that determines the conditions and reciprocal obligations of the parties without requiring the intervention of a third party. This form of contracting also enables parties who may be unknown to one another to conduct commercial transactions and perform financial or legal operations in an automated and secure manner.²³

The distinctive nature of the smart contract lies in the fact that its difference from an electronic contract is not confined merely to the means by which the contract is concluded,

but extends to the mechanism through which contractual obligations are performed. An electronic contract may be concluded by electronic means without necessarily being performed automatically, whereas a smart contract is characterised by the prior programming of the conditions governing its execution. This gives rise to particular legal concerns regarding the clarity and intelligibility of those conditions and the extent to which the consumer understands the consequences of consenting to them.

Electronic contracts are broader in scope than smart contracts. In smart contracts, pre-determined procedures and conditions must be established and accepted by the parties, and once those conditions are fulfilled, execution occurs automatically. Accordingly, smart contracts are concluded and executed electronically. Electronic contracts, by contrast, are concluded electronically, while their execution may take place either electronically or through traditional means outside the digital environment. Thus, the scope of a smart contract extends to both conclusion and execution, whereas an electronic contract necessarily involves electronic conclusion but may or may not involve electronic execution, depending on the nature of the transaction and the subject matter of the contract.²⁴

An electronic contract differs from a smart contract in terms of both the manner in which contractual intent is expressed and the nature of performance. Although both operate within an electronic environment, the smart contract is characterised by more complex technological features, as the parties' intentions and the contractual terms are translated into executable computer code capable of automatic performance. This distinguishes the smart contract from the conventional electronic contract with respect to the mechanism through which its legal effects are implemented.²⁵

22 Maugeri, M. (2022). Smart contracts, consumer protection, and competing European narratives of private law. *German Law Journal*, 23(6), 904-905. <https://doi.org/10.1017/glj.2022.58>.

23 Belkaidi, F. Z., Zougar, A. (2025). Between technology and law: The future of smart contracts in the age of artificial intelligence. *Algerian and Comparative Public Law Journal*, 11(2), 637.

24 Ali, S. H. M., op. cit., 826.

25 Daoud, M., & Zerqin, A. (2022). Smart contracts integrated into blockchain: The beginning and end of traditional contracts. *Algerian Journal of Legal and Political Sciences*, 59(1), p. 527. [in Arabic]

From a functional perspective, the distinction between an electronic contract and a smart contract lies in the extent to which technology intervenes in the contractual relationship. Whereas electronic contracts generally involve the use of electronic means for the conclusion of the contract, smart contracts allow for a greater degree of automation, as computer code may, in many cases, perform the contractual obligations, while the underlying legal agreement has been concluded in natural language. In this sense, technology in a smart contract moves beyond serving merely as a means of contract formation and becomes an instrument that contributes to the performance and implementation of the contract's legal effects.²⁶

2. LEGAL ISSUES RELATED TO CONSUMER CONSENT IN SMART CONTRACTS

If defining the conceptual framework of smart contracts constitutes the necessary starting point for understanding this emerging form of contracting, their practical significance lies in examining the impact of their distinctive characteristics on the formation and protection of consumer consent. The reliance of smart contracts on artificial intelligence technologies, blockchain, and automated execution gives rise to legal challenges that extend beyond the traditional rules governing consent, particularly with regard to the manner in which contractual will is expressed and the adequacy of the safeguards established to protect consumers in the digital environment. Accordingly, this section examines the impact of artificial intelligence on the formation of consent, identifies the principal legal challenges raised by smart contracts in relation to consumer consent, and assesses the adequacy of the existing legal rules in providing the required level of protection.

2.1. The role of artificial intelligence in the formation of consumer consent in smart contracts

Artificial intelligence represents one of the most significant technological developments contributing to the evolution of smart contracts. Its role is no longer limited to providing a digital environment for the conclusion of contracts, but has extended to supporting negotiation processes, analysing data, and making certain decisions related to the performance of the contractual relationship. This development has affected the manner in which consumer consent is formed and expressed. It therefore becomes necessary to examine the role of artificial intelligence in the conclusion of smart contracts and to determine the extent to which intelligent systems and algorithms may influence the freedom and informed nature of the consumer's consent.

2.1.1. Mechanisms for concluding smart contracts based on artificial intelligence

The use of artificial intelligence in commercial contracting has recently expanded, and legal systems have differed in the terminology used to describe the role of artificial intelligence in contracting. Some have referred to it as an electronic agent, defined as "a program or electronic system of a computer that can act or respond to an act independently, totally or partially, without supervision or intervention from any other person".²⁷

Smart contracts are based on computer programs that translate the obligations agreed upon by the parties into programmable instructions, including the consequences arising from non-performance or breach. These obligations are then performed automatically through blockchain technology once the predetermined conditions are satisfied. Examples include smart contracts used in flood insurance, under which the insured amount is paid automatically upon the occurrence of a flood, and smart con-

26 Durovic, M., Willett, C. (2023). A legal framework for using smart contracts in consumer contracts: Machines as servants, not masters. *The Modern Law Review*, 86(6), 1398-1399. <https://doi.org/10.1111/1468-2230.12817>.

27 Ali, S. H. M., op. cit., 811.

tracts used in air transport, where compensation is automatically disbursed in the event of a flight delay.²⁸

In a smart contract, the offer, acceptance, and contractual terms may be incorporated into the computer code itself, so that the contract is automatically executed once the predetermined conditions are fulfilled. This mechanism, however, raises concerns regarding the parties' ability to negotiate or amend the contractual terms after the contract has been deployed on the blockchain. It therefore gives rise to questions as to the extent to which these technical characteristics are compatible with the requirements of contractual consent.²⁹

2.1.2. The effect of algorithms and smart systems on the freedom and awareness of consumer consent

Artificial intelligence provides an exceptional ability to understand the emerging needs and desires expressed by consumers through the internet. Personalization is considered one of the most prominent applications of artificial intelligence in online retail. Artificial intelligence algorithms analyze consumer data to create personalized shopping experiences, whereby artificial intelligence positively influences consumers' purchase intentions through tailored recommendations and targeted marketing messages. AI-supported personalization also leads to higher levels of consumer satisfaction and stronger loyalty, which reinforces the importance of artificial intelligence in creating attractive and personalized shopping experiences.³⁰

The impact of artificial intelligence is not limited to the analysis of consumer data; it also

extends to the use of such data to personalise contractual terms and the manner in which they are presented in accordance with the consumer's behaviour and preferences. This may, in turn, affect the consumer's understanding of the substance of the contract and the decision whether to accept it. Accordingly, although algorithmic personalisation may enhance efficiency and relevance, it may also undermine the autonomy of contractual decision-making where it is used to steer consumers toward terms or options that they might not have accepted had the information been presented in a neutral manner.³¹

Recommendation systems in e-commerce consist of sophisticated algorithms that employ machine-learning techniques and data analytics to provide users with personalised product recommendations. These systems analyse large volumes of user data, including browsing history, purchasing patterns, and preferences, to predict and anticipate individual consumer preferences with a high degree of accuracy.³²

The effects of algorithmic personalisation are not limited to facilitating consumer choice. Artificial intelligence may also personalise the information and contractual terms presented to consumers on the basis of their data, characteristics, and behaviour, thereby potentially influencing their decisions or exploiting particular vulnerabilities. This is especially the case where techniques are deliberately designed to steer consumers towards choices that they might not otherwise have made.³³ These effects may further extend to the use of AI-enabled tools designed to influence users' behaviour and choices without their full awareness, thereby giving rise to additional concerns regarding

28 Makki, Z. D. (2025). Legal challenges of smart contracts under blockchain technology. *Al-Zaytoonah University of Jordan Journal for Legal Studies*, 6(2), 55.

29 Al-Mahasneh, Y. O. M., op. cit., 16-17.

30 Ahmed, Y. A. S. (2025). The impact of using artificial intelligence technologies on consumers' purchasing decisions: An application to Amazon customers (A study of Amazon Egypt's AI-supported shopping experience). *Scientific Journal of Business Research*, No. 3 (Part 1), 295-296.

31 Scattarreggia, E. (2025). AI-driven smart contracts: Enhancing consumer protection or exacerbating consumer protection challenges? *Journal of Law, Market & Innovation*, 4(3), 610. <https://doi.org/10.13135/2785-7867/12837>.

32 Jabbar, M. S. (2025). E-commerce in the age of artificial intelligence: Digital transformation and its impact on consumer behavior. *Gulf Economics Journal*, No. 63, 224.

33 Scattarreggia, E., op. cit., 610.

the autonomy and freedom of decision-making.³⁴

The particular significance of consumer consent becomes even more pronounced in AI-enabled smart contracts where the contractual terms are predetermined by the trader and the consumer's role is limited to accepting them, thereby bringing such arrangements closer to contracts of adhesion. Artificial intelligence systems may also be used to influence consumer behaviour and induce consumers to accept particular terms by drawing upon analyses of their personal characteristics and behavioural patterns. This raises questions as to whether such acceptance genuinely reflects an informed and freely formed intention, particularly where the process of conscious deliberation over the contractual terms is effectively bypassed.³⁵ This challenge becomes particularly acute where contractual terms are expressed in the form of computer code that the parties may find difficult to understand directly, thereby potentially limiting their awareness of the contract's content and legal effects.³⁶

Given the complexity of algorithms, their reliance on data analysis, and their indirect influence on consumer choices, AI-enabled smart contracts also raise difficulties in verifying whether the contracting parties possess the requisite capacity. This concerns not only legal capacity in its traditional sense, but also what may be described as informational capacity, namely the party's ability to understand the technical and economic implications of the contract within the digital environment.

For a contract, or the parties' consent thereto, to be valid, the contracting parties must possess the requisite legal capacity to act. In other

words, they must have sufficient discernment and understanding. Verifying such capacity presupposes, in the first place, that the names and identities of the parties are known. This requirement is not always satisfied in contracts concluded through blockchain networks, since such contracts are often entered into by parties using pseudonyms, with the result that their true identities remain unknown. Consequently, it may be impossible to ascertain whether they possess the legal capacity required to contract.³⁷

Furthermore, one of the contracting parties may act under a mistake as to the identity of the other party, as may occur, for example, in cases of impersonation.³⁸ In light of these challenges, some scholars have proposed the establishment of a digital civil registry linked to blockchain platforms, in which information concerning the legal capacity of contracting parties could be recorded and verified before smart contracts are executed. Although such a solution remains technically difficult to implement at present, it may nevertheless constitute an important step towards ensuring the legal compliance of smart contracts and preventing their use by persons who lack the requisite legal capacity.³⁹

2.2. Legal challenges raised by smart contracts regarding consumer consent

The particularity of smart contracts raises a number of legal challenges that go beyond the traditional rules governing the formation of consent. While the expression of will in smart

34 López Rodríguez, A. M. (2025). Consumer protection in blockchain-based metaverses: A comparative study of cross-border legal gaps and platform governance. *Frontiers in Blockchain*, 8, Article 1675735, 4. <https://doi.org/10.3389/fbloc.2025.1675735>.

35 Ibid., 612.

36 Bassan, F., Rabitti, M. (2024). From smart legal contracts to contracts on blockchain: An empirical investigation. *Computer Law & Security Review*, 55, Article 106035, 18. <https://doi.org/10.1016/j.clsr.2024.106035>.

37 Al-Zayat, A. S. K. H. (2025). Expression of intent in contracts concluded through artificial intelligence. *Journal of Law for Legal and Economic Research*, 2(1), 16.

38 Al-Dabbous, A. M. (2020). Legal issues concerning the conclusion of smart commercial contracts by an intelligent agent in the blockchain era: Kuwait and the United Arab Emirates as a model—A comparative analytical study. *Journal of the Kuwait International Law School*, 8th year, Special Supplement, No. 8, 396.

39 Makki, Z. D., op. cit., 50.

contracts, which is based on programming code and blockchain technology, introduces new mechanisms for forming consent, it may also give rise to issues affecting the validity of such consent, particularly in terms of the consumer's awareness of its content and the possibility of proving defects that may affect it. This raises questions regarding the adequacy of the legal guarantees established to protect consumer consent in light of the technical characteristics of this form of contracting. Accordingly, this section examines the most significant of these challenges and evaluates the adequacy of the obligation to inform as a means of protecting consumer consent in smart contracts.

2.2.1. The particularity of expressing the will in smart contracts

Blockchain technology has produced a new contractual model represented by smart contracts, which are based on converting contractual terms into programming code that is executed automatically once the previously specified conditions are met. This contributes to the automation of contractual performance and limits the intervention of intermediaries. However, this technical particularity raises a number of legal challenges that may affect the validity of consumer consent, particularly regarding the extent to which the programming code corresponds to the true will of the contracting parties and the consumer's awareness of the legal effects resulting from the automatic execution of the contract. Additional challenges arise from the difficulty of modifying the contract or withdrawing from it once it has been recorded on the blockchain, as well as from the legal consequences that may result from programming errors or security vulnerabilities affecting the stability of the contractual relationship and the protection of consumers.⁴⁰

Smart contracts raise difficulties concerning the identification of the parties to the contrac-

tual relationship and the verification of their intention and legal capacity, particularly within a decentralized environment in which contracting parties may use pseudonyms and are not physically present in a single contractual setting. This makes it more difficult to verify their identities and to ascertain whether the legal requirements necessary for valid consent have been satisfied. The difficulty becomes more pronounced where the contract is performed automatically without direct intervention by the parties, thereby raising questions as to whether the technical mechanisms employed are sufficient to establish the identity of the contracting parties and verify their legal capacity.⁴¹

Some legal scholars take the view that the software used in smart contracts constitutes merely a means through which the user expresses contractual intention, in much the same way as any other technological instrument used in distance contracting, such as the telephone. Proponents of this view rely on the existence of a legal presumption that, where a person uses and relies upon smart software in forming a decision that subsequently takes the form of an offer or an acceptance, that person is deemed to have expressed an intention to contract and to have accepted responsibility for the acts and transactions generated by the software. Accordingly, the user may be held accountable for those acts as though they had been personally performed by him or her, by virtue of such legal presumption.⁴²

Acceptance in a smart contract may be expressed by assenting to the offer, including through the signing of a transaction by means of the contracting party's private key. For example, where a smart contract provides that a digital copy of a work is to be transmitted to the purchaser upon payment of a predetermined price, the purchaser's transfer of the agreed consideration and signing of the transaction may constitute acceptance. Once the relevant condition is satisfied, the smart contract may then automatically perform the corresponding

40 Al-Shahrani, A. A. H. (2026). Artificial intelligence and the legal characterization of electronic contracts in Islamic jurisprudence. *Al-Andalus Journal for Humanities and Social Sciences*, 150(13), 147.

41 Al-Dabbous, A. M., op. cit., 395.

42 Ali, S. H. M., op. cit., 836.

obligation without any direct intervention by the other party.⁴³ Autonomous artificial intelligence systems may independently undertake certain stages of the contracting process. They may be programmed to determine whether a contract should be concluded, when it should be concluded, with which party, and on what terms. As a result, the outcomes generated by such systems may, in certain circumstances, operate independently of the user's subsequent will and may be difficult to predict, thereby creating challenges in attributing the contractual expression to the direct intention of the contracting party.⁴⁴

The expression of contractual intention in smart contracts also raises the problem of the limited capacity of programming code to convey legal language. Smart contracts are drafted in programming languages, such as Solidity, which are not understood by the majority of contracting parties or legal professionals and may therefore prevent a full understanding of the content and legal effects of the contract. Programming code is primarily designed to execute instructions rather than to articulate, explain, or interpret contractual obligations. This may give rise to legal disputes resulting from programming errors or ambiguities and may limit the court's ability to interpret the contract without the assistance of a technical expert. These difficulties underscore the need for a clear legal framework governing smart contracts and ensuring adequate protection for the parties involved.⁴⁵

A recent study further indicates that offer and acceptance in smart contracts may be effected through mechanisms programmed on the blockchain, whereby the terms of the offer

and the corresponding acceptance are recorded and automated performance begins once the specified conditions are satisfied. This method, however, raises concerns regarding the genuineness of consent, the possibility of coding errors, and the absence of meaningful scope for negotiation. These characteristics may, in certain circumstances, bring smart contracts closer to contracts of adhesion.⁴⁶

In our view, although blockchain technology in smart contracts may provide evidentiary proof that a contract has been concluded, it does not establish that the intention of the contracting parties was free from defects of consent.

It follows from the foregoing that the distinctive character of the expression of intention in smart contracts does not lie merely in its electronic form, but rather in its connection with computer code that automatically performs what has been expressed. Accordingly, the technical formation of offer and acceptance and their recording on the blockchain do not necessarily resolve the question whether the electronic expression corresponds to the consumer's true intention, nor do they, in themselves, guarantee that the consumer's consent is conscious and informed.

On this basis, the application of the general rules governing electronic contracts to the expression of intention in smart contracts remains possible in principle. Nevertheless, the specific characteristics of programming and automated performance require those general rules to be supplemented by safeguards capable of ensuring the clarity and intelligibility of contractual terms, enabling consumers to understand those terms before expressing acceptance, and providing appropriate mechanisms for verifying their identity and intention, thereby ensuring effective protection of consumer consent in the digital environment.

43 Eissa, H. A-S. A. (2021). Concluding smart contracts through blockchain technology. *Journal of Legal and Economic Studies*, 7(2), 51.

44 Gaeta, M. C., Aulino, L., Troisi, E. (2023). The possible relationships between law and ethics in the context of artificial intelligence regulation. *Humana. Mente*, No. 44, 186.

45 Al-Sheikh, M. A. (2026). Smart contracts and the documentation of legal transactions through blockchain technology: A critical analytical study. *Journal of Legal and Social Sciences*, 11(1), 553.

46 Althabhwaji, N. M., Aburoub, R. F., Abd Rahman, M. R., Mihna, F. K. H., Sallal, H. A. (2025). Mutual consent in the age of smart contracts: A mixed-methods analysis of legal challenges. *IEEE Access*, 13. <https://doi.org/10.1109/ACCESS.2025.3619202>.

2.2.2. *The extent of the sufficiency of the obligation to inform for protecting consumer consent in smart contracts*

The Algerian legislature has established a framework for consumer protection by requiring traders to provide consumers with essential information concerning the product or service and the applicable contractual terms, thereby enabling them to form an informed intention before entering into the contract. This duty is regulated by Law No. 09-03 on Consumer Protection and the Suppression of Fraud, particularly Articles 17 and 18 thereof.⁴⁷ In addition, Article 8 of Law No. 04-02 laying down the rules applicable to commercial practices requires the seller, prior to the completion of the sale, to provide the consumer with “fair and truthful information concerning the characteristics of the product or service, the applicable conditions of sale, and the foreseeable limits of contractual liability arising from the sale or service”.⁴⁸

The concept of consumer information has also been extended to the digital environment through Executive Decree No. 13-378 laying down the conditions and procedures relating to consumer information. The Decree defines information relating to a product as any information addressed to the consumer on a label or in any document, “including by means of modern technological methods or through oral communication”.⁴⁹ This demonstrates that the legislature has not confined the provision of informa-

tion to any particular traditional form, thereby allowing, in principle, the duty to inform to extend to transactions concluded through digital means. Comparative studies emphasize⁵⁰ the importance of enabling consumers, prior to the conclusion of a smart contract, to review all of its terms and to understand its operational mechanisms and the consequences of its execution, particularly in light of the difficulty of reading and comprehending complex contractual terms in the digital environment.

Rapid technological development has, however, given rise to new forms of contracting, among the most significant of which are smart contracts based on blockchain technology and characterized by the automated execution and enforcement of contractual obligations. An examination of the foregoing provisions indicates that, although the Algerian legislature has not enacted specific rules governing smart contracts, the provisions relating to the protection of electronic consumers have been formulated in sufficiently broad and flexible terms to accommodate subsequent technological developments. The legislature has also expanded the permissible means through which information may be provided without prescribing a single method of disclosure.

Nevertheless, the application of the duty to provide information in the context of smart contracts gives rise to practical difficulties and a number of legal issues concerning the adequacy of existing electronic consumer-protection rules in addressing the risks arising from the technical nature of smart contracts. Contractual terms expressed in programming language may render both the content of the contract and its economic consequences difficult for the average consumer to understand. Providing consumers merely with conventional information concerning the relevant product or service may therefore be insufficient, in itself, to ensure informed consent, given the technical nature of smart contracts and their reliance on computer code

47 Articles 17 and 18 of Law No. 09-03 of 25 February 2009, relating to consumer protection and the suppression of fraud, Official Gazette of the People’s Democratic Republic of Algeria, No. 15, issued on 8 March 2009, as amended and supplemented by Law No. 18-09 of June 10, 2018, Official Gazette, No. 35, June 13, 2018;

48 Law No. 04-02 of 23 June 2004, laying down the rules applicable to commercial practices, Official Gazette of the People’s Democratic Republic of Algeria, No. 41, issued on 27 June 2004, as amended and supplemented by Law No. 10-06 of 15 August 2010, Official Gazette, No. 46, issued on 18 August 2010.

49 Executive Decree No. 13-378 of 9 November 2013, laying down the conditions and procedures relating to consumer information, Official Gazette of the People’s Democratic Republic of Algeria, No. 58, dated 9 November 2013.

50 Kasatkina, M. (2021). Consumer protection in the light of smart contracts. *ELTE Law Journal*, 2021(1), 98. <https://doi.org/10.54148/ELTELJ.2021.1.95>.

and automated execution. A consumer may have access to the essential information and data relating to the contract without necessarily being able to understand or appreciate the legal consequences arising from the smart contract before its conclusion.

In this context, the duty to provide information acquires particular significance in relation to smart contracts. It is not sufficient merely to enable the consumer to access the contractual terms; information relating to the smart contract should be made available in advance, in clear and intelligible natural language, to enable the consumer to understand its content, its mechanism of execution, and its legal effects before entering into the contract. Consumer protection therefore requires that programmed contractual terms be accompanied by an understandable translation and explanation, in order to ensure that the technical nature of the smart contract does not become an obstacle to the formation of conscious and informed consent.⁵¹ In this regard, it has been proposed that consumers should be provided with a version of the contract expressed in clear and comprehensible natural language, and that such a version should prevail in the event of any inconsistency with the underlying code. This approach would enhance the transparency and intelligibility of the contractual terms before execution.⁵²

A comparison with certain European legislative approaches shows that the issue is not confined to recognizing the possibility of concluding contracts electronically, but extends to the suitability of existing legal rules for the particular characteristics of smart contracts. In France, although Article 1366 of the Civil Code recognizes electronic writing, the application to smart contracts of requirements relating to

contractual clarity and the clear expression of contractual intention gives rise to particular difficulties where contractual terms are expressed in computer code. These concerns are especially important in consumer contracts, which are subject to a more stringent protective regime.⁵³ AI-enabled smart contracts may also take the form of contracts of adhesion, where the trader predetermines both the contractual terms and the code through which the contract operates, while the consumer's role is essentially limited to accepting them. This necessitates subjecting such contracts to more exacting requirements of transparency and protection of contractual autonomy.⁵⁴

This comparison reveals that, although the Algerian legal framework permits, in principle, the application of information duties to electronic contracting, it does not contain specific provisions requiring traders to inform consumers of the technical characteristics of smart contracts, the mechanism of their automated execution, or the consequences arising from programmed terms. Accordingly, the development of the duty to provide information under Algerian law should not be confined to broadening the means through which information is communicated. It should also extend to the substantive content of the information itself, to ensure that consumers understand the nature of the smart contract, its terms, and the effects of its execution before expressing their acceptance.

Comparative scholarship further confirms that the application of existing consumer-protection rules to smart contracts is not without difficulty, given that traditional legal rules may not fully accommodate the technical and legal characteristics of such contracts. One recent study has shown that existing legal frameworks provide a general foundation for consumer protection in transactions based on smart contracts, yet do not adequately address their distinctive

51 van Erp, S., Hanzl, M. (Project Reporters). (2022). *ELI principles on blockchain technology, smart contracts and consumer protection: Council draft*. European Law Institute, 53-54.

52 Mendoza, S. C., Fandiño, M. B. (2022). *Vicissitudes of smart contracts in consumer law, with regard to the existence and validity of the contract*. *Anuario de Derecho Privado*, No. 4, 60. Universidad de los Andes. <https://doi.org/10.15425/2022.648>.

53 Vičius, V. (2025). *Legal challenges of harmonizing smart contract regulations within the European Union*. *Teisé*, 134, 165-166. <https://doi.org/10.15388/Teise.2025.134.13>.

54 Scattarreggia, E. (2025), *op. cit.*, 612.

characteristics, particularly with regard to the protection of consumer rights and mechanisms for dispute resolution. This points to the need to update and adapt those rules in light of technological developments and evolving consumer needs.

Technological development should therefore not result in the displacement of existing legal protections. Rather, those protections should be adapted to the particular nature of smart contracts and their mechanisms of automated execution, thereby enhancing the effectiveness of consumer protection in the digital environment. By analogy, Algerian rules governing the duty to provide information may constitute an initial basis for protecting consumers in smart-contract transactions. Their effectiveness, however, requires the substantive scope of those duties to be developed so as to encompass information concerning the mechanism of code-based execution and the legal consequences of programmed terms, thereby enabling consumers to make an informed contractual decision before automated execution produces its effects.⁵⁵

The application to smart contracts of consumer-protection rules developed for electronic contracts may prove insufficient in light of their automated and potentially immutable characteristics. This calls for an adaptation of the existing protective framework so that it can respond more effectively to the specific features of smart contracts.⁵⁶ Comparative analysis further indicates that automation and the irreversibility of certain effects of smart contracts may reduce the effectiveness of traditional protective mechanisms, thereby supporting the development of legal measures capable of suspending unlawful execution or remedying its consequences.⁵⁷

55 Sari, H. B., Thalib, E. F., Meinarni, N. P. S. (2024). Implementation of smart contracts in Indonesia: An analysis of financial regulation, taxation, and consumer protection. *Jurnal Notariil*, 9(2), 68. <https://doi.org/10.22225/jn.9.2.2024.65-70>.

56 Aksoy, P. Ç., (2022). Smart contracts: To regulate or not? Global perspectives. *Law and Financial Markets Review*, 16(3), 233. <https://doi.org/10.1080/17521440.2023.2298192>.

57 D'Adda, A. (2022). Fundamental issues regarding "smart contract" in contract law. *Osservatorio del*

CONCLUSION

The study has demonstrated that the rapid development of artificial intelligence and blockchain technology has given rise to a distinctive contractual model embodied in smart contracts, which operate by converting contractual obligations into computer code and executing them automatically once predetermined conditions are satisfied. It has also shown that the particular nature of consent in this type of contract does not entail a departure from the general principles governing contract formation. Rather, its specificity lies primarily in the technological environment within which contractual intent is formed and expressed, and in the additional requirements imposed by such an environment to ensure that consumer consent is both informed and conscious.

Furthermore, through an analysis of Algerian legislation and by drawing on comparative legal approaches, the study has established that the existing legal framework provides an initial basis for protection. Nevertheless, it does not fully address the specific legal challenges and characteristics arising from this technology.

Study Findings

- Consent in smart contracts possesses distinctive characteristics arising from the technological environment through which contractual intent is expressed and contractual obligations are performed, without departing from its fundamental legal basis, namely the concurrence of the parties' wills.
- Smart contracts and blockchain technology raise legal issues relating to automated execution, the immutability of code, and the evidentiary value of transactions. Artificial intelligence further introduces challenges concerning the degree of autonomy involved in information processing and decision-making, as well as the extent to which technological

diritto civile e commerciale, Special Issue, 113-114. <https://doi.org/10.4478/106702>.

outputs correspond to the consumer's genuine contractual intent.

- Merely converting contractual terms into computer code is insufficient to ensure informed consent. Consumers must be provided, prior to the conclusion of the contract, with clear and comprehensible information regarding the content of the contract, its execution mechanism, and its legal and practical consequences.
- Algerian legislation does not currently provide a specific and comprehensive legal framework governing smart contracts. Although certain general rules applicable to electronic contracts and consumer protection may provide an initial degree of protection, they remain insufficient to address all the novel legal issues arising from smart-contract technology.
- The mere recording of a transaction on a blockchain does not, in itself, establish the validity of a party's consent or prove that such consent is free from defects. Blockchain technology primarily contributes to establishing and documenting the existence of a transaction. It is therefore necessary to distinguish between proof of the transaction itself and proof of the validity and integrity of contractual consent.
- The comparative legal analysis has shown that, despite differences in the degree of recognition and regulation of smart contracts across legal systems, comparative legislation generally tends towards adapting consumer-protection rules to the specific characteristics of smart contracts. This is particularly evident in measures aimed at strengthening pre-contractual information duties, ensuring the comprehensibility of coded contractual terms, and establishing mechanisms to address the consequences of automated execution. Such approaches may provide useful guidance for the Algerian legislature, provided

that they are adapted to the particular characteristics of the Algerian legal system.

Study Recommendations

- Adopt specific legislation governing smart contracts that defines their concept, legal nature, and legal effects, and regulates the relationship between the contractual agreement and the underlying computer code, while drawing on comparative legal approaches in a manner consistent with the specific characteristics of Algerian legislation.
- Develop the legal rules governing the expression of contractual intent and pre-contractual information duties in a manner that takes into account the particularities of smart contracts and artificial intelligence. Professionals should be required, prior to the conclusion of the contract, to provide consumers with clear and comprehensible technical and legal information concerning coded contractual terms, the mechanism of execution, and its consequences.
- Strengthen consumer-protection safeguards by establishing legal mechanisms that enable consumers to request the suspension of automated execution or the correction of its consequences where a defect in consent is established or where programmed execution is inconsistent with the parties' contractual intent. Such mechanisms should seek to strike an appropriate balance between the distinctive nature of automated execution and the effectiveness of legal protection.
- Develop the rules of electronic evidence by clearly determining the legal evidentiary value of data recorded on blockchain networks, while drawing on comparative legal solutions in a manner compatible with the particular characteristics of Algerian legislation.

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