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Smart Legal Contracts and Their Implications in Digital Era

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Abstract: *The law in the new digital era is faced with many challenges and unknown legal figures. Smart legal contracts are a notion that needs to be defined in the legal fields of study. They are powered by blockchain technology, automate, and enforce contract terms through code. Also, these contracts offer benefits like efficiency, accuracy, transparency, and automation across sectors such as finance, supply chain, real estate, healthcare, and intellectual property. Despite their advantages, smart contracts face challenges including technical issues, legal recognition, security risks, and ethical implications. As technology advances and legal frameworks evolve, the adoption of smart legal contracts is expected to grow, transforming traditional contract practices, and integrating with emerging technologies like AI and IoT, ultimately shaping the future of digital transactions and legal agreements. In addition, the author traces how the traditional theoretical aspects of contracts can be applied to smart legal contracts. The researcher proves that the new technologies may influence the conventional legal order, which may be explained by the fact that individuals want to live in a more efficient digital era, than those in the conventional trade economy.*

1. INTRODUCTION

Digital transformation gives a new impetus to the development of many sectors. Many of the phenomena in the current factual reality remain beyond the scope of legal regulation. New legal forms are emerging that, on the one hand, facilitate commercial turnover, and on the other hand, overtake the already established legal order, from the point of view of legislative changes and adequate resolution of practical cases. The normative existence of law is related to the material and material existence of things (Stalev, 2022, p. 16), while in the 21st century the concepts of digital era, digital footprint, digital economy (Paskaleva, 2024, p. 26), digital transformation and the existence of facts and circumstances from the objective reality in the digital environment. Such is the case with smart contracts. They are a projection of what is happening in the digital environment and cannot go beyond the scope of legal theory and practice. Therefore, the present paper includes the following stages, which aim to clarify existing understandings about smart legal contracts, to compare this new form of contracts with traditional contracts, to give a universal definition of them, to propose their possible implications in commercial turnover and to highlight their importance in the digital age.

To achieve these goals, the author sets herself the following research tasks: to analyze the individual opinions on smart contracts, to highlight their features, to identify the main areas of contractual relationships where they would have the greatest application and to summarize their features and aspects of development and improvement.

In the present material, the author includes the use of both general scientific methods and specialized ones. Among them are the methods of analysis, synthesis, deduction, induction, systematic, normative, historical and comparative legal methods.

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2. SMART LEGAL CONTRACTS AS A LEGAL PHENOMENON

2.1. Justification of the Legal Phenomenon

Smart legal contracts as a new form of contractual relations in the 21st century can be defined as a new legal phenomenon. Despite the conservative attitude of the legal doctrine towards them, they are a fact and increasingly enter people's daily lives. That is why the need for their in-depth study arises. Each new legal concept is characterized by several basic elements that define and distinguish it from existing legal phenomena. Such key elements are firstly *legal novelty*, which often involves the creation or recognition of a new legal norm or principle that was not regulated or existed in previous legislation. At the moment, legal regulation of smart contracts in the countries of the European Union is almost absent. In some of the countries with a continental legal system, a conservative attitude towards smart contracts is observed, tending to their denial (Flores, 2023, p. 178). Pioneers in providing a legal appearance to smart contracts are the countries with a precedent legal system- United States and United Kingdom (Flores, 2023, p. 178). In 2019, Italy took a step forward by introducing into its national law the first legislative act to guarantee the validity and legal security of information and data provided through blockchain and other distributed ledger technologies (Durovic & Lech, 2019, p. 500). With this legislative amendment, the Italian Parliament laid the foundations for the recognition of the validity and enforceability of smart legal contracts.

Next, is the *social necessity*, presupposed by the rate of development of the society. The new legal phenomenon is the result of social changes or new socio-economic realities. This means that it reflects the need to adapt the legal system to new social conditions, problems or trends, which are actually one of the main priorities in the European Union. The European Parliament and the European Commission are working hard to introduce digital transformation (Szczepański, 2021, p. 2) by 2030. The emergence of digital platforms, the Internet of Things, Artificial Intelligence (Kissinger et al., 2021, p. 57) and various cloud services. They are *interconnected* with many economic sectors such as telecommunications, banking services, transport, facilitating business processes for small and medium enterprises. All this determines the need for legal regulation of smart legal contracts since the entire process of digitization reflects on people's lives. With the policy at the European level regarding the digitization process of the individual sectors, it makes clear in the third place that the institutions at the European level recognize the need for an adequate legal framework in order for the rights of the citizens to be protected. Such examples are several acts at the EU level- the Artificial Intelligence Act (Regulation (EU) 2024/1689) and the Electronic Identification and Trust Services Act (Regulation (EU) No 910/2014), which set the legal basis for the development of smart contracts.

Fourthly, the presence of the phenomenon of smart legal contracts is also proven by the *emergence of new legal entities* (such as new types of legal entities) or new types of legal relations (such as those that arise with new technologies - for example, cryptocurrency contracts, digital money).

Fifthly, the fact that smart legal contracts arise as a result of interaction between different areas of law (for example, contract law and international private law) or between law and other sciences such as economics, and social sciences and last but not least technology can be deduced. Last but not least, this constant process of digitization also prompts the evolution of existing legal institutes such as the general doctrine of contracts and the theories on which it is based on the autonomy of the will by Windscheid and Kant. This is why the emergence of smart legal contracts can represent a radical change or new direction in law that significantly changes the way existing norms are applied and interpreted.

Based on the above criteria, the need to clarify the concept of smart legal contracts is justified. The prerequisites for defining them as a phenomenon in 21st-century legal science are derived from the presence of six characteristic elements. Smart legal contracts represent a legal novelty. They are almost not legally regulated in most of the legal acts at the EU level and at the Member States level and they are applied in various sectors of the civil and commercial turnover. The institutions recognize the need for legal regulation because they create new forms of contractual relations between different legal entities. Also, intelligent contracts are related to various scientific fields such as economics and technology and are important for social development. Smart legal contracts happen to be the basis for the existing traditional legal institutes to evolve and acquire a new revolutionary appearance.

2.2. Different Opinions on the Topic

When private administration of the Internet network was allowed in the United States in 1993, there are a growth of e-commerce, e-contracting and electronic payment methods. So now with the emergence of the new blockchain technology new challenges have arisen that need to be addressed, too. Explaining smart contracts cannot be done without introducing what blockchain technology actually is (Louati et al., 2024, p. 2140). They operate on the *distributed ledger technology* mechanism and build a digital database with cryptography. The so-called *blockchain* (Nakamoto, 2008) has two classifications: private (not permitted) and public (permitted). In the doctrine, it is defined as a platform that provides a decentralized record of information stored in the form of transactions grouped into blocks.

The prevailing opinion in the doctrine is that blockchain can be defined as a set of technologies that, through the use of cryptographic techniques, create a distributed network ledger of information without the need for central validation by a specific authority. This system is peer-to-peer (P2P). It allows verified transactions to be carried out without intermediaries by reaching a consensus between the participants, and the network itself guarantees that the information has not been changed in any way. It is in such a technological network that smart legal contracts find their place.

The concept of *smart contracts* was introduced by Nick Szabo in 1994. He describes the concept as a new way to automate and execute contracts in a digital environment (Szabo, 1997). He defines smart contracts as computer protocols that facilitate, verify, or enforce contractual terms automatically. Its idea is to use technology to improve traditional contract processes through automation and higher security. Szabo's concept was inspired by the practice of automated vending machines- devices that automatically fulfill pre-set conditions (for example, when a coin is inserted, the machine dispenses a drink). Although the idea did not initially gain widespread support, it became particularly popular after the advent of blockchain technology in 2009 and the introduction of platforms such as Ethereum in 2015, which enable the decentralized execution of smart contracts. Szabo sees smart contracts as a tool that can automate not only simple financial transactions but also complex business processes, which significantly reduces trust costs and ensures greater transparency and security.

Legal and technical science define smart contracts differently. Concerning the legal aspect of smart contracts there are several understandings.

Smart legal contracts are of considerable interest among legal theorists because they represent an innovative approach to the execution of contracts that differs from traditional legal constructions.

Several legal theories analyze the nature, legal substance, and settlement possibilities of smart contracts. The first is introduced by Kevin Werbach (Werbach, 2018, p. 504) and presents smart contracts as automated mechanisms and examines them in the context of their legal enforceability. He believes that smart contracts are not contracts in the traditional legal viewpoint, but rather automated tools that fulfill certain conditions under pre-set rules. They are computer code that automatically executes instructions without the possibility of human intervention after completion. In the course of developing this theory the question arises as to whether the smart contract itself is legally binding or whether it must be supported by a traditional contract to be legally binding. This theory emphasizes that smart contracts are a technical rather than a legal tool. In support of this understanding is one of the opinions appearing in the law doctrine, which supports that it comes very close to their technical explanation. According to this point of view, smart contracts represent only one type of algorithm that only facilitates the execution process of a contract (Smith & Jones, 2021, p. 45). This is also the basis of the authors who believe that smart contracts are not legal contracts, although they recognize that in some countries there is a legal framework for them both at the national and international level (Sevalnev & Truntsevsky, 2020, pp. 118-147).

Next is the theory of smart contracts as traditional contracts (Clack et al., 2016, pp. 1-15). These authors consider smart contracts as an analogue of traditional contracts implemented in a new technological way. According to this theory, smart contracts can be seen as true contracts in the legal sense as they include elements such as offer, acceptance, mutual consent and intention to be legally bound. They are simply a new form of traditional contracts but with digital implications. In this sense is the notion that smart contracts can exist in three forms. There are essentially three forms in which they can take, depending on the role played by the code. This is a natural language contract, or *purely code contract*, *strong* and *weak* smart contract. The second form is where code is merely a technological tool used by one or both parties to fulfill obligations that are articulated by the natural language contract. At the opposite end of the spectrum are contracts that are entirely algorithm-based (Law Commission, 2021). The last form of smart contracts is the most difficult to reconcile with the principles of traditional contract law *(contracting freedom)*, since such contracts do not exist in natural language, and it is difficult to interpret the actual will of the parties at the time of the contract conclusion. Therefore, the need to translate the relevant contract from natural language to technical language and *vice versa* is identified. In this sense, according to (Filipenko, 2020, pp. 245-253) smart contracts represent both a new type of contract, a new form of it, and a method of its execution. Here, the question of how legal principles of contract law (such as consent and intention to bind) apply in the context of smart contracts is addressed. This theory proposes that smart contracts should be regulated and interpreted within existing contract law.

Thirdly, there is the view of smart contracts as partially enforceable contracts (Raskin, 2017, pp. 305-346). According to Raskin, smart contracts can fulfill part of the conditions automatically, while other aspects may need traditional legal regulation. The theory views smart contracts as a combination of automated and traditional contractual elements, while others may require traditional legal enforcement mechanisms. Some contract aspects can be directly enforced through technology, others may require judicial intervention if there is a dispute or breach.

Fourthly, there is a slightly more radical theory, according to which smart contracts are defined as "Code is Law" (Lessig, 1999). In this book, Lessig introduces the concept where it looks at how computer code can be considered a form of law and how this relates to smart contracts. It suggests that the code on which the smart contract is based plays the role of law all conditions and ensures their automatic compliance, which eliminates the need for traditional law enforcement. This raises

the question of whether technology can replace laws and courts as a means of regulating human behavior. According to this theory, legal rules can be programmed to be followed automatically. This theory is currently isolated.

Fifthly, smart contracts are presented as legal instruments in need of adaptation (De Filippi & Wright, 2018, pp. 1-312). The authors justify the need for adaptation of the existing legal framework and consider how they can be regulated in the context of traditional legal systems. Aaron Wright and Primavera de Filippi also discuss the idea that smart contracts minimize the need for legal enforcement through the use of automated code structures. This raises the question of liability and rights of parties in the event of a code error or misuse. Here, the possibilities for legal protection and enforcement are explored in cases where automation may fail. The idea is to create legal clarity and certainty by adopting new regulations that specifically address smart contracts, their enforceability, validity and regulation.

Sixth, some authors (Pronina & Buyanov, 2023, pp. 539-549) consider smart contracts as a new legal phenomenon that requires the development of new legal concepts and approaches to regulation. In this article, the author points out that smart contracts represent a completely new legal phenomenon that cannot be adequately understood in the context of existing contract law. They require the creation of new legal concepts and rules. According to this approach, smart contracts are so different from traditional ones that they require a rethinking of basic legal principles such as data protection, privacy and security.

In summary, all these theories highlight the need for further legal research and regulatory approaches to smart contracts to determine how they can fit in or evolve outside of the existing legal framework. The following conclusion can also be drawn, that it is possible to have both completely intelligent contracts, where the conclusion and execution is carried out entirely in an electronic environment, and those that have a hybrid dimension - some of them are carried out in a digital environment, the other part in the traditional way. In addition to the above, the author of this material adds that regardless of this possibility, the basic principles of contract law should serve as the basis for determining the admissibility and existence of such legal smart contracts, since they represent a new form of contractual relations.

2.3. Comparison and Definition

Smart legal contracts and traditional contracts are two different forms of contractual relations that are used to regulate legal relations between different civil law entities or persons. While traditional contracts have been a staple of the legal system for centuries, smart legal contracts are a relatively new phenomenon that emerged with the development of blockchain technology. A distinction between traditional contracts and smart contracts can be made based on several characteristics, as follows in Table 1.

Based on the comparison made, the following definition of a smart contract can be derived. It is a program code that automatically fulfills predetermined conditions and actions. It is usually stored on a blockchain network that provides immutability and transparency. It is executed automatically, without the need for human intervention, when predetermined conditions occur. A smart contract provides a high degree of security and transparency, due to its decentralized blockchain nature and use of cryptography, but limited flexibility, as any change requires reprogramming or a new agreement in the blockchain network. It provides a greater economy of execution costs, but its legal enforceability is not fully settled in many jurisdictions. While traditional contracts remain

the primary tool for regulating legal relationships, smart contracts offer innovations in automation, security, and performance efficiency. However, there is still no unified approach to regulating and recognizing smart contracts as legally binding.

Table 1. Comparison table between smart legal contracts and traditional contracts

Criteria	Smart contracts	Traditional contracts
Form	• Program code recorded on a blockchain	• Written, oral or electronic form
Conclusion	• Between absentees from a distance mediated by a platform	• Between present and/or between absent
Execution	• Automatic and self-applying via a preset algorithm	• Performance depends on the will of the parties; may require judicial enforcement
Transparency	• Publicly available and immutable (depending on the blockchain network whether it is public or not)	• Depends on the form chosen (can be public or private)
Irrevocability	• Once the algorithm is set, it cannot be canceled	• The contract is canceled by agreement of the parties or in the cases expressly provided by law
Security	• High degree of security provided by blockchain technology and cryptography	• Security depends on notarizations, witnesses and court procedures
Flexibility	• Limited; conditions are pre-programmed and difficult to change	• High; the conditions may be changed by a new agreement of the parties
Enforceability in the event of a dispute	• Subject to automatic enforcement, but in the event of errors or fraud there may be no legal enforcement	• Enforceable through the court system and legal mechanisms expressly provided for in the relevant legislation
Costs	• Reduced implementation and administration costs, but with code development costs	• Possible costs for legal services, certifications, court fees and more
Oversight and regulation	• Regulation is still evolving; legal standards are not fully established	• Subject to existing national and international legal regulations
Speed of execution	• Immediate execution when conditions are fulfilled	• May be slow due to the need for intermediaries and legal procedures
Reliability in case of technical errors	• There may be risks related to code errors or hacker attacks	• Depends on the legal framework and the ability to litigate disputes
Ability to adapt to new conditions	• Limited as changes require reprogramming and approval in the blockchain network	• Flexible as parties can renegotiate terms or amend the contract

Source: Own research

3. FUTURE RESEARCH DIRECTIONS-MANIFESTATIONS IN CIVIL AND COMMERCIAL TURNOVER

In today's digital age, smart contracts are entering various legal fields. Their importance for civil and commercial turnover is particularly important because they provide new opportunities for optimizing and ensuring commercial turnover in order to satisfy human needs. There is potential for smart contracts to be used in many specific contract types in civil and commercial law. Smart contracts can have a positive application in various economic spheres - e-commerce, insurance, finance, logistics and supply chain management. Of course, not all contracts can exist as smart contracts due to the existence of the principle of freedom of contract, the negotiation of complex terms between the parties and the possibility of the occurrence of unforeseen circumstances that could determine the existence of judicial discretion with a view to the amendment and termination of a contractual relationship. Smart contracts have the potential to transform civil and commercial relationships by introducing automation, transparency and security to many aspects of legal transactions. They can

be applied in different contexts while raising new legal issues and requiring adaptation of the existing legal framework. With the present study, it would not be possible to achieve an exhaustive listing of all possible manifestations of smart contracts in contract law, but some of them that already have practical applications can be indicated. Smart contracts can automate the execution of transactions for the purchase and sale of goods or services. Once predetermined conditions (such as payment or delivery) are met, the contract is automatically executed, and funds are transferred between the parties. Online commerce is where the smart contract monitors the delivery of the goods and automatically releases the payment to the seller after confirmation by the buyer.

They can automate the process of renting or leasing properties or belongings. They can automatically collect payments, control access to the property and even terminate the contract if conditions are not met. An apartment rental contract where the smart contract automatically withholds the rent each month and manages access to the property via electronic keys. Smart contracts can automate and optimize supply chains by tracking the movement of goods and automatically enforcing contractual terms between different actors. Introducing a smart contract for supply management that automatically confirms the acceptance of the goods and the fulfillment of the conditions by every party involved in the supply chain.

Smart insurance contracts can improve the efficiency of insurance contracts by automatically paying compensation when certain events occur (such as natural disasters, property damage, etc.) based on data from a trusted source (e.g., a weather agency). Smart contracts can automate and speed up financial transactions, including credit granting, loan repayment and credit management depending on agreed terms. Smart contracts can facilitate the licensing of intellectual property by automatically managing the distribution of revenue from the use of copyrighted works or patents. Music streaming platforms that use smart contracts to automatically distribute revenue to authors and artists based on the number of listens. Blockchain development and asset tokenization can facilitate the tokenization of physical and financial assets, such as stocks, real estate, and artwork, allowing for easier and more transparent transfer of ownership and management of these assets. In the field of automating judicial and arbitral proceedings, these contracts may find a place in the automation of certain aspects of judicial and arbitral proceedings, such as the settlement of disputes that can be resolved through pre-programmed rules. In family law, they can be used in some respects, such as prenuptial agreements or maintenance agreements upon divorce or separation. Smart contracts may be used to automate employment relationships, such as paying salaries, bonuses, or other compensation based on predetermined conditions upon achieving certain results or completing specific tasks.

The review made could not be exhaustive in view of the specifics of each case and the possibility of an agreement between the parties being turned into an algorithm.

4. CONCLUSION

Smart legal contracts can transform civil and commercial relationships by offering more efficient and transparent ways to manage contractual relationships. However, their legal integration requires careful regulation and adaptation of the existing legal frameworks in view of the specific case, in order to ensure the protection of the rights of the parties to them and guarantee legal certainty. Although there are different theories regarding their recognition in legal reality, a trend is emerging towards the legal introduction and confirmation of this new form of contractual relations. When assessing their validity in the relevant legal order, the specifics of the individual contractual relationship and the basic legal principles of contract law must be considered.

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