Legal Nature of Smart Contracts: Contract or Program Code?

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blockchain,
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Abstract

Objective: due to the rapid technological changes, digital economy and contractual relations determine law transformation and legislation development towards adaptation to prospective spreading and application of smart contracts in civil and commercial turnover. In this regard, the study focuses on determining the legal essence of smart contracts as a fundamental step towards the development of their timely and clear regulation.

Methods: the research is based on the methodology of formal-legal and comparative legal analysis. It compares the current Bulgarian legislation with supranational legal sources and identifies the characteristic features of smart contracts as demanded instruments necessary for modern law and economy. The article also compares them with the classical understanding of contracts, making it possible to understand and define the nature of smart contracts more accurately.

Results: it was determined that a smart contract is a software code in which the parties predetermine conditions under which the contractual relationship between them is created, modified and terminated. The research proved that the contract execution does not depend on the action or inaction of its parties, but rather on the occurrence of a predetermined condition (a certain fact relevant to the parties) under which the contract must self-execute. It was substantiated that the will of the parties cannot be changed or replaced because of the special way in which the smart contract is recorded in a distributed ledger. It is found that the fundamental problem of transferring the will from the legal language to the program code of the smart contract persists: if the will of the parties is incorrectly transferred to the program code, the smart contract may self-execute, but its execution will not be the result that the parties counted on.

Scientific novelty: the analysis made it possible to compare the current national (Bulgarian) legislation and supranational (European) law. It revealed the vagueness of smart contracts regulation, both at the national and international level, and identified a number of issues in need of scientific and legal interpretation, which refer to the legal nature of smart contracts in view of the self-executing program code concept.

Practical significance: the study can serve as a basis for further development of legislation towards its adaptation to the prospects of smart contracts spreading and application in civil and commercial turnover. It also allows an in-depth analysis of the smart contracts practice referring to such unsolved problems as accurate transference of the parties' will to the program code (translation of specific terms from the legal language into the smart contract program code), electronic identification of subjects – parties to the transaction and many other issues.

For citation

Contents

Introduction

Smart contracts represent highly demanded tool necessary for modern law and economic. At the same time, despite its relevance and necessity there are still no clear regulation of smart contracts both on national and international level.

This study is intended to analyze the legal essence of smart contracts, their possible application in civil and commercial turnover. It is also aimed to provoke a broad discussion on the issues related to the manner of application of technologies and the need for their timely regulation. This study aims not only to give a legal definition of the term «smart contract», but to also reveal its characteristic features, interpreted in the light of the classical understanding of a contract, and from there to answer the question – Is smart contract, based on blockchain technology, is a contract itself?

In order to analyze the concept of a smart contract, we shall specify the features of blockchain technology and how it works, as well as what is the classical understanding of a contract underlying the civil law legal system. Only then we will be able to answer the question whether smart contracts may be considered a contract, does it give rise to rights and how shall the duties related thereto be performed. Last but not least, the features of smart contracts related to bringing the specific legal language into a program code will be analyzed.

1. Classic Contract Theory

The study of the legal nature of smart contracts requires an analysis of the contract theory and the manner in which contractual relations are created, developed and terminated. The etymology of the word «contract» reveals its main features. The word has a Latin origin «contractus» (noun), «contrahere» (verb) and means «to connect». A contract is often defined as a promise or group of promises that binds the parties in a civil transaction. This commitment is backed by state coercion, which is intended to ensure that the promise, the commitment in the contractual relationship, will be performed. Actions in Roman Law arose as a remedy for a wronged right. They are the procedural mechanism aimed at removing the consequences of the non-performe contract. A procedural opportunity for the parties, through the means of state coercion, to ensure the result that they pursued by entering into the contract.

At the beginning of the 19th century, the theory of autonomy of the will began to gain popularity. It is based on the understanding that contract as such is a consequence of the coordinated will of the parties to the legal transaction. Subjects are free to enter into contractual relations voluntarily, negotiating the parameters of the contract themselves as a counterpoint to obligations imposed by law or obligations arising from tort, asserted through the special sanction of the state. According to this theory, the role of the contract is to «facilitate the freedom of the parties to create their own private law». Although the theory of the autonomy of the will has certain deficiencies, it impacts the development of modern contract law and is expressed in the current legal norms – the principle of freedom of contract.

Private law relations and contract law in particular is the place where the principle of the autonomy of the human will is most clearly manifested. Subjects, upon mutual consent, in accordance with the principle of the autonomy of human will, are free to determine the content of the legal relationship they wish to enter into. Namely because the will of the parties is conclusive, the court – when interpreting the contracts – is obliged to look for their actual common will, and when interpreting the contract it shall be guided by it. The principle of the autonomy of the human will should not be considered absolute, which is why a number of legislations, including the Bulgarian one, have mitigated its application by introducing restrictions and applying other factors to protect both the interests of the parties and

the public interest. Thus, according to Article 9 of the Bulgarian Obligations and Contracts Act, the parties may freely determine the content of the contract, but this content shall not contradict the imperative legal provisions and good morals. Thus, the Supreme Court of Cassation of the Republic of Bulgaria, in its interpretive case law, defines good manners as moral norms to which the law has assigned legal significance, because the legal consequence of their violation is made equal to the conflict of the contract with the law. Good manners are not written, systematized and specified rules; they rather exist as general principles or originate from such, and the court monitors the compliance therewith ex officio. Therefore, either party is free to decide whether or not to enter into a specific contractual relationship, taking into account the imperative (mandatory) legal norms and good manners. Once an agreement is reached, the parties may decide what will be the content of the contract to be made (scope of rights and obligations) and when to conclude it. Parties can themselves choose whether and in what form to conclude the contract (Yossifova, 2019). Even tacitly expressed will can bind the parties, and the contract will be considered concluded unless the legislature has a requirement of form. The requirement of form is a requirement ad solemnitatem. The lack of form entails the nullity of the contract. Even if the parties have drafted a document, if it is not in the form prescribed by law, it will not produce the legal effect sought by the parties. Generally, the Bulgarian legislator adheres to the notion that most contracts are informal. Only when the objective is to guarantee legal certainty, the legislator has provided that certain contracts must be in writing or in a qualified form (notarized authentication or notarial deed). It should be noted that according to Bulgarian law, the written form requirement is considered complied with if an electronic document is generated containing a verbal statement, i.e. when the legislator requires certain contracts to be drafted in writing, it will be considered complied with if an electronic document that contains a verbal statement has been drawn up.

2. Blockchain and the concept of the smart contract

The idea of smart contracts is not new (Sala-Climent, 2021; Ferreira, 2021, Fiorentino & Bartolucci, 2021; Eenmaa-Dimitrieva & Schmidt-Kessen, 2019). The world of computer science and cryptography noticed it as early as 1996, when the computer engineer Nick Szabo presented his idea for self-executing program code. At the heart of Szabo's idea is a computer code where the will of the parties is implemented and which code executes itself when certain conditions occur so as to produce the outcome desired by the parties. The terms of the contract are written directly in code lines, i.e. the contract as such constitutes a program code. To better illustrate his idea, Szabo gives an example with a vending machine. The purchaser of a beverage from a vending machine has many implied consumer rights, and in practice the purchase of a beverage from a vending machine is an informal contract that, by means of a program code, provides each consumer with a selected

item for a specified price. Thus, the fact that a contract is represented only in a code, as in the case of smart contracts, does not constitute a particular obstacle to the conclusion of an informal contract, the execution of which is automated through a program code. Although revolutionary, Szabo's idea was ahead of its time because the technologies had not reached a level to allow for its mass application.

In 2008, Satoshi Nakamoto presented his idea for a decentralized blockchain network, and in 2014, Vitalik Buterin published Ethereum: A Next-Generation Smart Contract and Decentralized Application Platform, which revived the concept of self-executing program code (Zhou et al., 2020). A smart contract is an automated program code that is not in itself a technology for creating an artificial intelligence (Gallese, 2022). The self-execution of the smart contract is not related to automated data processing of data so as to make the most correct decision when certain situation arises. It involves automated execution – when event X occurs, an action Y is performed, without an option for the smart contract to assess, through data analysis, whether to proceed with execution or not. A smart contract is intended to reduce costs and skip the "trust" factor in contracting. Essentially, its objectives are speed, substantial cost reduction, avoiding intermediaries and overcoming the lack of trust between the parties. Execution of smart contracts is direct, without any additional action/ omission on behalf of the contracting parties being needed; it suffices that the condition preset in the program code occurs, and the consequences will occur immediately in the legal sphere of the parties. A major advantage, but also a disadvantage, of blockchain technology is that it does not allow any data modification. The block itself, and the block chain, is a cryptographic method of storing data in a decentralized environment. The smart contract is stored in the decentralized, blockchain ledger, which is why no separate device is needed for its storage, nor is it necessary for the parties thereto to keep a record on a local or other technical means (Compagnucci et al., 2021). Transactions in it are chronologically connected, allowing records to be traced from the last to the first block on the chain (genesis block). Once recorded in a block of the blockchain chain, it cannot be changed (altered) or deleted (Aleksieva et al., 2019), because each block of the blockchain chain has integrity, and each transaction is authenticated in time – each block of the chain contains a record of transactions and timestamp information of the proceeding block (Krumov & Atanasov, 2019). This actually ensures the chronological connectivity of the information in the blockchain and enables traceability back to the first genesis block. What does this mean? Deletion or alteration (modification) in the block would break the blockchain chain, which would affect the block verification process. Once the contract in the form of a smart contract is concluded, the will of the parties cannot be changed or altered, i.e. if subsequently their relationship undergoes a change, the parties will have to enter into a new smart contract, through which they will terminate the effect of the already existing one and rearrange their relationship. This, in turn, raises many questions to science and practice.

3. Legal language vs. program code

From the standpoint of science and practice, one of the underlying questions is how to transfer («translate») the specific terms from the legal language into the program code of the smart contract. When using smart contracts, we must account for the specific legal terms used in legal provisions and their correct implementation in the program code of the smart contract (Rizos, 2022). This is because, as stated, an alteration or deletion of the entry in the decentralized ledger is impossible, and the exact transfer of the will of the parties into a program code is of utmost significant, insofar as the program code must reflect the actual will of the parties. If the will of the parties is incorrectly transferred into the program code, the smart contract may self-execute, but its execution would not be the result intended by the parties. In such a situation, the only possible solution would be to materialize the actual will of the parties in a new record, in the form of a new smart contract, because the original record cannot be edited or deleted. The new entry is subject to whether the parties would agree to do so. It is possible that one of the parties has benefited from its incorrectly implemented will in the program code, and therefore prefers to preserve the consequences as they have occurred, although this is a result different from the one agreed between the parties. In this hypothesis, court intervention is necessary, which, by interpreting the will of the parties, would reveal what their actual will is, taking into account their pre-contractual relations. However, such an error in the will of the parties is also conceivable in classic contractual relations, which arise, develop and live their own life in the form of a conventional, written document.

Another material feature of smart contracts is that they are subject to the general rules of how the law regulates public relations in terms of the various types of transactions. When choosing certain contractual relations to be set forth in a smart contract, the parties must observe whether there is a requirement for contractual form, and whether this requirement is for its validity or for its proof. Thus, if a real estate is to be disposed of, the transaction will be subject to the general rules and in order for such transaction to be valid, it will have to be performed in accordance with the requirement for form - a notarial deed (according to the Bulgarian law). The execution of a transaction for disposition with real estate, in the form of a smart contract, will be null and void, as long as the requirement for a form – a notarial deed – has not been complied with. It is possible, in such a hypothesis, to think about the conversion of the smart contract and viewing it as a preliminary contract for the purchase and sale of real estate. Such a conversion depends on the particularities of the applicable law and on the interpretations given in binding case law. From the point of view of Bulgarian law, it is possible to apply conversion of the smart contract with subject-matter purchase and sale of real property, taking into account art. 3, paragraph 2 of the Electronic Document and Electronic Certification Services Act, setting forth that the written form of the smart contract would be deemed complied with only if the smart contract contains, in addition to program code, a verbal statement of the parties (Varbanova, 2020a).

4. Smart contract as a legal contract

From current legal framework standpoint, there is no impediment for the contractual relations for which there is no requirement for a form (including a qualified one) to be concluded in the form of a smart contract (Rühl, 2021). According to Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EO[1] means any content stored in electronic form, in particular text or sound, visual or audiovisual recording. The list in the Regulation is not exhaustive. Quite logically, the legislator has considered that booming of technologies would result in the emergence of new technological solutions and the concept of an electronic document would have an even wider scope (Varbanova, 2020b). The regulation expressly binds the courts and obliges them to accept electronic documents in their court proceedings. The court cannot ignore the existence of the electronic document, although at first sight the electronic document cannot be perceived by the court as it would perceive the classic, written document. Analyzing Article 3, item 35 of the Regulation, we can conclude that the smart contract should be perceived as an electronic document, even though it exists in the form of a program code. Thus, in the example of a real estate transaction above, this property can be tokenized, but not for the purpose of selling, but for example only for the purpose of renting the property – a rental relationship. Lease contract is an informal contract. From this point of view, proving such contract would be much easier if it exists in the form of a smart contract and a tokenized real asset. The parameters of the rental relationship will be set forth in the smart contract – rental price, method of payment, term, etc. By combining IoT and blockchain technology, payment under the contract can be done automatically, while in the absence of receipt of the rental price into the owner's electronic wallet, the access to the dwelling can be automatically restricted by locking it using Internet of Things technological solutions. In the Internet of Things, end devices interact with each other through the global network – the Internet. The application of blockchain and IoT depends on the will of the parties and how that will would be implemented in the smart contract of the tokenized real asset.

Another problem that can arise with the use of smart contracts is that the case law is hard in responding to technological achievements. Courts often perceive as document only the conventional document materializing the will of the parties on paper, while the smart contract is a program code that exists as an entry in a decentralized ledger. This, however, cannot be an obstacle to respecting the will of the parties, who, especially in informal contractual relations, are free to choose how to conclude a contract and what technological solutions to use in this regard.

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[1] Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 On electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC. https://clck.ru/36r5fJ

Identification (Dimitrov et al., 2020) of the subjects – parties to the transaction, can also be an issue when using smart contracts based on blockchain technology. So long as there is no uniform legal framework regarding electronic identification, at this stage the solution of issues related to the identification of parties will be determined by the applicable law and the way in which the parties wish to benefit from the blockchain technology. Thus, when creating an electronic wallet, some providers of the service require the wallet owner to verify his personal data (Zahariev, 2021), including by providing a copy of an identity document in order to establish who is the person, who owns the relevant electronic wallet. It is essential that every single transaction from and to a given wallet is traceable and easily ascertainable.

In order to achieve the objectives of the contract, and also in view of the fact that its performance may depend on the occurrence of some event beyond the will of the parties, the technology allows the use of external sources – «oracles» (Bomprezzi, 2021). The oracle is an independent source of information that resides outside the smart contract blockchain (Basilan & Padilla, 2023). In the field of insurance law, the use of oracles would be essential when information is needed which is relevant to the insurance contract and the insured event occurring under it – temperature, natural disaster, etc. The application of oracles is also conceivable when blockchain technology and the smart contract are used to secure a claim (Gromova, 2018) – e.g., blocking a certain digital asset that can be released only upon provision of external information from an oracle, e.g., for a payment made on a claim secured by digital asset (Nascimento & Martins, 2022). A problem that could arise is when the oracle provides the wrong information and the smart contract executes itself in accordance with its embedded algorithm. In these cases, court intervention will be necessary, but court intervention will be required whenever one of the parties' defaults, and the smart contract actually eliminates such a possibility. Whenever the event embedded in the program code occurs, the smart contract executes the algorithm embedded in it, without such execution depending on the will of the parties.

Conclusions

Based on the analysis, we can define the Smart Contract – it is a program code where the parties have set in advance the conditions under which the contractual relationship between them is created, amended and terminated. The performance of the contract does not depend on an action or omission of the parties thereto, but rather on the occurrence of a pre-set condition (certain fact relevant to the parties) upon which the contract shall self-perform (self-executed). The will of the parties cannot be amended or replaced namely because of the specific manner of recording the smart contract in the decentralized ledger. Based on the analysis, we can conclude that certain types of contracts can be entered into in the form of a smart contract. When entering into a smart contract, the parties must comply

with the current legal framework, which may limit the performance of certain transactions in the form of a smart contract, especially when the legislator has set a requirement for form in entering into certain types of contracts. A serious challenge to legal science and practice is how to implement the will of the parties in the smart contract, with a correct understanding of legal concepts and their inclusion in the program code of the smart contract.

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Правовая природа смарт-контрактов: договор или программный код?

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цифровые технологии

Аннотация

Цель: цифровая экономика и договорные отношения, обусловленные стремительным изменением технологий, определяют трансформацию права и развитие законодательства в направлениях его адаптации к перспективам распространения и применения смарт-контрактов в гражданском и коммерческом обороте, в связи с чем нацеленность исследования на определение юридической сущности смарт-контрактов становится основополагающим этапом на пути к выработке своевременного и четкого их регулирования.

Методы: в основу исследования положена методология формально-юридического и сравнительно-правового анализа, позволяющая сопоставить нормы действующего болгарского законодательства и наднациональных источников права, а также выявить характерные черты смарт-контрактов как востребованных инструментов, необходимых для современного права и экономики, и сопоставить их с классическим пониманием контрактов, в сравнении с которым можно более точно понять и определить природу смарт-контрактов.

Результаты: определено, что смарт-контракт является программным кодом, в котором стороны заранее установили условия, при которых договорные отношения между ними создаются, изменяются и прекращаются; доказано, что исполнение контракта зависит не от действия или бездействия его сторон, а скорее от наступления заранее установленного условия (определенного факта, имеющего отношение к сторонам), при котором контракт должен самоисполняться; обосновано, что воля сторон не может быть изменена или заменена именно из-за особого способа записи смарт-контракта в децентрализованном реестре; выявлено, что основополагающей остается проблема передачи воли с юридического языка в программный код смарт-контракта – если воля сторон неправильно передана в программный код, смарт-контракт может самоисполниться, но его исполнение не будет тем результатом, на который рассчитывали стороны.

Научная новизна: проведенный анализ позволил сравнить современное национальное (болгарское) законодательство и наднациональное (европейское) право, выявив нечеткость регулирования смарт-контрактов как на национальном, так и на международном уровне, определив ряд нуждающихся в научной и правовой интерпретации вопросов о правовой природе смарт-контрактов в контексте концепции самоисполняющегося программного кода.

Практическая значимость: исследование может послужить основой для дальнейшего развития законодательства в направлениях его адаптации к перспективам распространения и применения смарт-контрактов в гражданском и коммерческом обороте, а также для углубленного анализа практики применения смарт-контрактов с точки зрения имеющихся неразрешенных проблем точной передачи воли сторон в программный код (перевода конкретных терминов с юридического языка в программный код смарт-контракта), электронной идентификации субъектов – сторон транзакции и многих других.

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