

Estado legal de los contratos inteligentes: características, papel, significado

Legal status of smart contracts: features, role, significance¹

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Resumen

Este artículo mediante el criterio metodológico del análisis crítico examina el estado legal de los contratos inteligentes, sus particularidades, características y la posibilidad de introducir esta categoría en el campo legal. El objetivo principal del estudio es determinar el estado legal de los contratos inteligentes, y la posibilidad de aplicación en el derecho civil. Durante el estudio se llegó a la conclusión de que el contrato inteligente es un código de programa, basado en la tecnología *blockchain*, la cual por sus características legales es un mensaje legalmente significativo escrito en un idioma (lenguaje artificial) y respaldado por la firma digital electrónica de cada una de las partes. Se ha demostrado como las interacciones multilaterales realizadas a través de contratos inteligentes permiten reducir los costos de la realización y control de las operaciones, aumentar la velocidad de las operaciones y reducir los riesgos asociados con las acciones desleales de las partes.

Palabras clave: Contrato inteligente; entorno digital; tecnología blockchain; intermediarios; mensajes legalmente significativos; relaciones legales.

Abstract

This article using critical analysis discusses the legal status of smart contracts, their features and characteristics, and the possibility of introducing this category into the legal field. The main goal of the study is to determine the legal status of smart contracts. The study concludes that a smart contract is a program code based on blockchain technology, which, by legal characteristics, is a legally significant message recorded in a language (artificial language) and sealed with an electronic digital signature of each of the parties (or certified with a special key). It is proved that the multilateral interactions implemented through smart contracts can reduce the costs of operations and control them, increase the speed of operations and reduce the risks associated with dishonest actions of the parties, minimize or completely exclude intermediaries from the transaction; therefore, legislation should provide for the possibility of using smart contracts along with existing contracts.

Keywords: Blockchain technology; digital environment; intermediaries; legal relationship; legally relevant messages; smart contract.



INTRODUCTION

Today, one can observe the development and implementation of completely new technologies that can change the world, as the Internet did in its time. The use of an automated registry in the financial sector necessitated the development of special mechanisms, algorithms, and programs to support each stage of a financial transaction (Giancaspro, 2017). One of these is a smart contract, which makes it possible to automatically fulfill the terms of the transaction in the blockchain registry.

A smart contract can be considered as an autonomous computer program located at a specific address on the blockchain, which can be restarted an infinite number of times and programmed for the most diverse needs of the business community (Hou, 2018). Thus, smart contracts can be used to conduct business accounting through a distributed registry, organize and conduct electronic voting (electronic election system), automate company management, and for many other purposes.

At the moment, a uniform approach to determining the legal nature of smart contracts has not yet been developed. According to scientists, the prospects for the use of smart contracts are not clear, and therefore their application remains in question (Allam and Dhunny, 2019). So far, mechanisms for the legal regulation of smart contracts have not been created and there is no judicial practice on this issue. The purpose of this study is to determine the legal status of smart contracts and the prospects for the legislative settlement of legal relations in the application of smart contracts.

DISCUSSION

The experts studied the doctrine and the problem of determining the legal status of smart contracts. Giancaspro (2017) investigated smart contracts from a legal point of view; Pacini, Andrews and Hillison (2002) dealt with legal issues that could arise when signing smart contracts; the difficult problem of preserving the

privacy of smart contracts was studied by Barinova and Zapechnikov (2017); Blackwax (2017) considered smart contracts and made the assumption that they would eventually replace lawyers; Iserlis (2017) made a reasonable conclusion in his work that smart contracts changed the way of doing business; Hazard and Hardjono (2016) considered the creation of a basis for smart contracts in future blockchains. Many other experts were also engaged in determining the legal nature and use of smart contracts; however, in these studies, the possibilities and status of smart contracts were not sufficiently investigated.

METHODOLOGY

General Description (basic principles and methods, description and characteristics)

The object of the study is the legal status of smart contracts that are used in hybrid contract models. The study used the following methods: collection and study of isolated facts; generalizations; methods of scientific abstraction; methods of behavior cognition.

The method of objectivity made it possible to truly reflect the legal characteristics and capabilities of smart contracts as electronic legally significant messages. Using the principle of objectivity, the legal characteristics of smart contracts, such as observability, verifiability, and self-fulfillment, were determined.

The method of concreteness made it possible to take into account all the conditions for using smart contracts in hybrid contract models.

The comparison method made it possible to examine the object of study from various angles and identify various properties of smart contracts as legally relevant electronic messages.

Algorithm

The pluralistic approach to the knowledge of the legal status of smart contracts made it possible to create the most optimal sys-

tem of knowledge, which reflected objective data about the importance and possibility of using “smart contracts” as evidence in court.

At the stage of collection and study of individual facts, methods of interpretation of the law were used, with the help of which the legal nature and main characteristics of smart contracts were clarified.

The prognostic method made it possible to make scientifically based forecasts on the application of certain requirements to smart contracts and to develop recommendations for law enforcement practice. The authors also used logical-semantic analysis in conjunction with the above methods, which allowed considering in detail the features of smart contracts in a hybrid model of contracts.

Flow Chart

The study was conducted using certain research algorithms, due to which the results were obtained. The research algorithm is presented in Figure 1.

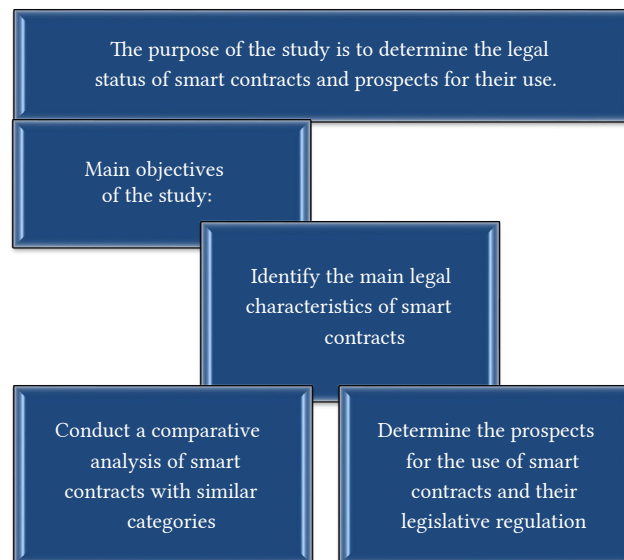


Figure 1. The research algorithm.

RESULTS-DISCUSSION

Digitalization and the introduction of financial technologies fundamentally transform the principles and tools existing in the financial markets of the economies of the majority of countries. Due to innovation and modern infrastructure, many operations that previously required a personal presence and took a lot of time can now be accessed “in one click” and can be completed in just a few minutes (Sullivan, 2018).

The principles of functioning of a number of innovations were laid down several decades ago. The idea of a *smart contract* was first proposed in 1994 by Nick Szabo (USA), a scientist in the field of computer science, cryptography and law. He described the smart contract as “a digital representation of a set of obligations between the parties, including a protocol for the fulfillment of these obligations” (Szabo, 1994).

The idea of a smart contract has been preceded by the creation of a vending coffee machine – the process of purchasing goods in it embodies an agreement, according to which anyone can buy a product at a predetermined price, while the security mechanisms of the machine are designed so that the cost of hacking is higher than the cost of products and automatic cash accumulations (Pacini, Andrews and Hillison, 2002).

A modern example of the idea of a smart contract is the work format of Uber and Yandex.Taxi. Aggregators play the role of intermediaries and arbiters, which ensure the implementation of the agreement between the taxi driver and the client. The client agrees to pay for the trip at a cost predetermined by the intermediary system (aggregator), and the driver, in turn, agrees to perform the service of transporting the client to a predetermined place.

Smart contracts can save one from procure-to-pay gaps. As soon as the goods arrive at the warehouse and are registered, the smart contract is able to instantly send confirmation requests.

Upon receiving them, it will immediately transfer the funds from the buyer to the seller. In this case, sellers will receive payments faster, they will not have to remind customers to pay, and buyers will save on banking operations (Low and Teo, 2018). All of this can reduce working capital requirements and simplify financial transactions for both parties. As for compulsory execution, a smart contract can be programmed in such a way that it would block access to assets connected via the Internet (for example, access to the content) until payment is received.

The environment for launching and supporting the execution of smart contracts provides a reliable verification mechanism that provides transparency in terms of confirming the correctness and authenticity of transactions, the moment of obligation occurrence, and at the same time, minimizes data disclosure to the verifier and third parties (Allam and Dhunny, 2019). When using the blockchain technology, a smart contract is stored and duplicated in a decentralized registry. The smart contract algorithms are determined by its executable program code (legally relevant information) within the blockchain network. Having access to a common blockchain, all participants can check at what point the smart contract is functioning. Such contracts are concluded in a decentralized environment using a specific protocol (for example, the Ethereum platform), which allows the exchange of assets without intermediaries (Barinova and Zapechnikov, 2017).

Despite the fact that the idea of a smart contract later became widespread in the wake of the growing popularity of cryptocurrencies, smart contracts do not have to be associated with the blockchain technology, digital currencies or the absence of an intermediary.

Thus, in terms of consumption, the key values of smart contracts should be highlighted:

1. Observability of the contract – the ability to monitor the execution of the contract at all stages and independently verify that the counterparty has completed its part of the transaction.

Lack of observability at the stage of entering in a transaction leads to the risk of hidden knowledge, where one of the parties may enter into a transaction that is obviously unfavorable for the second party (Bradbury, 2013). Lack of observability at the stage of transaction execution leads to the risk of hidden action. The risk of hidden action arises when one of the parties conceals a conflict of interest with obligations, for example, if the same event leads to a violation of the terms of the contract and the insured event, while the insurance payment is more than the remuneration under the contract (Yuanfeng and Dan, 2016).

To use smart contracts in retail products and services, a form of visualization of significant transaction provisions may be required, which is similar to labeling nutritional facts. For professional work with smart contracts that carry a material risk above a certain value, a professional certification scheme may be required, similar to the certification of auditors, investors and financial engineers. Such a certificate of membership in the professional community related to the creation and operation of smart contracts will guarantee a level of technical and economic knowledge sufficient to adequately assess the possible behavior of a smart contract (Ye and Liang, 2016). One example of such certification is consulting companies conducting an audit of ICO projects, which includes an assessment of both the business component of the proposed project and the related technological infrastructure, including the assessment of the correctness and security of the smart contract code.

2. Verifiability and the existence of a mechanism for enforcement of the smart contract provisions. Verifiability makes it possible to determine the participant in a smart contract and the chronological sequence of its actions, thereby forming an audit trail (Luu et al., 2016). This ensures its integrity and does not allow the unilateral change of the agreement terms.

One example of an algorithm embedded in a smart contract is the asset accounting and operations with assets in accordance with a set of conditions established in a smart contract. The algorithm in accordance with the rules of the smart contract confirms the fulfillment of the terms of the contract and automatically determines whether the specified asset should go to one of the participants in the transaction or stay with the current participant.

The following types of smart contracts can be distinguished (Figure 2):



Figure 2. Types of smart contracts.

A smart contract can be integrated into the existing system of contract law in two ways: as an addition to the main legal contract – a hybrid model; or as an independent legal contract.

The hybrid model involves a mixture of a classic contract and a smart contract. A smart contract can be recognized as a way to fulfill an obligation only in cases where the transfer of an asset takes place in a virtual, rather than the real world. Since it often seems impossible to digitize a certain asset, much less work or service, the direct fulfillment of an obligation will occur in the real world, and the smart contract will act as an addition that ensures the fulfillment of the main obligation (Annalect, 2017).

The practice of using smart contracts today is reduced mainly to partial automation of certain aspects of agreements, such as the exchange of digital assets, for example, the exchange of funds for property rights by agreement of the parties.

The definition of the legal status of smart contracts is controversial. According to some scholars, this term is used to refer to legal contracts (or their elements) concluded in an electronic form, and the fulfillment of an obligation is automated and provided by a computer program (Ashraf, Thongpapanl and Auh, 2014). From the perspective of other authors, smart contracts are either a way to secure obligations or a way to fulfill obligations (Underwood, 2016). Some authors in their studies define smart contracts as electronic contracts, the fulfillment of rights and obligations of which is carried out by automatically performing digital transactions in a distributed register of digital transactions in a strictly defined sequence (Lauslahti, Mattila and Seppälä, 2017).

As noted in science, a feature of an agreement in an electronic form is its conclusion using electronic means of communication that exclude direct interaction between the parties, with the participation of information intermediaries (providers) through the exchange of electronic information (Icertis, 2017).

Comparing the features of smart contracts and contracts concluded in an electronic form, it can be concluded that there are some similarities. Indeed, the conclusion of smart contracts, as well as electronic contracts, is also verified by the analog of an electronic digital signature. According to experts, the main element of a smart contract is a digital signature that confirms the actions of participants in the transaction. After concluding a smart contract, it is converted into an algorithm and an electronic token of the smart contract is created.

At the same time, a smart contract is a different legal category than a classic contract in an electronic form. In hybrid contract models, a smart contract serves as an additional agreement within the framework of an existing contract, and civil contracts concluded in an electronic form are an independent legal category. It ...

... is impossible to equate the program code with civil law contracts since any contract must meet a number of requirements that cannot be fully taken into account by using only the program code as a reflection of the will and intention of the parties. The program code complements the traditional textual contract and fulfills only certain provisions, such as, for example, the transfer of money by party A to party B. Therefore, it is not possible to identify smart contracts and civil contracts. Moreover, the scope of smart contracts has so far been limited to the blockchain registry, the legal status of which is also not defined.

In connection with the revealed impossibility of identifying smart contracts with electronic contracts, it is thought that at present smart contracts can be integrated into contract law as electronic legally significant messages (program codes). Two forms of contract are legally defined – oral and written. Moreover, the written form implies the exchange of “electronic documents transmitted via communication channels making it possible to reliably determine that the document comes from the party under the contract”. An electronic document recognizes “information prepared, sent, received or stored by electronic, magnetic, optical or similar means including the exchange of information in electronic form and e-mail” (Clack, Bakshi and Braine, 2016, p. 5). The question then arises whether or not the program code is the information. Of course, when concluding smart contracts, the program code is legally relevant information. Blockchain is a technology that allows counterparties to interact and create, share such legally relevant information. Therefore, it would be logical to equate a smart contract with electronic legally significant messages and thereby remove obstacles to their conclusion.

A smart contract can be considered as an electronic document signed by an unqualified enhanced electronic signature. A record in the blockchain corresponds to the signs of an unqualified enhanced electronic signature, which was obtained as a result of a cryptographic conversion of information using an electronic signature key. It makes it possible to identify the person who

signed the electronic document and detect the fact of changes to the electronic document from the moment of its signing (Rosic, 2016). Cryptographic encryption systems have identical operating principles for electronic signature and for making entries in the blockchain. “A signature that is protected by blockchain technology is considered to exist digitally and is a digital signature” (Habibzadeh, Nussbaum, Anjomshoa, Kantarci and Soyata, 2019).

The definition of smart contracts in the hybrid model as legally relevant electronic messages does not cause heated debate. A study of the legal nature of legally significant communications allowed individual authors to recognize them as a special legal fact – a quasi-transaction aimed at the emergence, change and termination of the rights and obligations of the parties (Kirillova, Bogdan, Golovatskaya, Melnichenko and Ognev, 2018). Legally significant messages are acts of human communication (statements, notices, requirements, notifications), which, by virtue of the law or the terms of the transaction, entail certain civil law consequences.

A legally significant message should include the will to commit a unilateral transaction that requires perception. The main parameters of legally significant messages include the following parameters:

- Legally significant messages are the basis for the emergence, amendment, and termination of rights and obligations. Smart contracts consist of “if ... then ...” conditions, as a result of the execution of which there is a record of legally relevant information in a distributed registry leading to a change in its state and, accordingly, entailing civil law consequences. For example, when a sports team wins, a smart contract, according to pre-laid conditions, distributes income to the participants in the transaction who have made bets on it.
- The message must be addressed and delivered to the person or entity having the corresponding civil legal consequences, or to its representative. In the case of smart contracts, the message is sent to the participant or participants in the legal relationship.

- Messages determine the moment of civil law consequences. The moment of conclusion of a smart contract can be clearly defined since the program code is activated only at the moment of making the corresponding record of acceptance of the offer in the next block of records of the blockchain.

For legally significant messages, the law sets forth the requirements specific to unilateral transactions. The form of its execution (written form) and the content of the message (price and other conditions) should be brought to the attention of other participants. It is impossible to dispute, legally invalidate the message, apply the consequences of the invalidity of the transaction, as well as a smart contract, which after consultation with all participants cannot be changed. For example, a smart contract ensuring an ICO will provide an investment-attracting company with access to investor funds only when a certain total amount of investment is achieved. At the same time, smart contracts are created using programming languages, as a result of which the possibilities of discrepancies are minimized, while the range of possible contract rules is limited by the logic that lends itself to rigorous algorithmization at the level of program code.

A legally significant message is always aimed at generating legal consequences, but the implementation of these consequences depends on the specific type of civil legal relationship, in which the parties are included or are just about to enter. In addition, the multipurpose nature of legally significant messages, depending on the type of legal relationship, its state, the composition of participants, etc., gives reason to believe that legally significant messages are part of the civil protection mechanism. Protecting a smart contract implies restricting any actions of third parties in relation to the contract. The restriction applies to the processing of contract data, monitoring of the legally relevant content and execution of the contract, as well as active interference in the formation, signing or execution of the contract. The privacy of the contract isolates it from external influences, and liability is limited to the parties involved in the smart contract (Hackett, 2017).

The systematization of scientific approaches to the essence of both legally significant messages and the simplest smart contracts in hybrid contract models gives reason to believe that such smart contracts should be considered as a special case of legally significant messages.

CONCLUSION

Using the blockchain technology, smart contracts are automatically executed, which provides additional opportunities to reduce the expenditures of participants in relations arising from the conclusion of a transaction and the fulfillment of its conditions. Multilateral interactions implemented through smart contracts can reduce the costs of operations and control them, increase the speed of operations and reduce the risks associated with dishonest actions of the parties, and minimize or completely exclude intermediaries from the transaction. Legislation should provide for the possibility of using smart contracts with existing contracts. Thus, by using smart contracts, it is possible to make regular payments for rent, manage the delivery of goods, and pay loans.

A smart contract is a program code based on blockchain technology, which, by legal characteristics, is a legally significant message recorded in a language (artificial language) and sealed with an electronic digital signature of each of the parties (or certified with a special key).

The main advantages of a smart contract include its observability – the ability to monitor the execution of the contract at all stages and make sure that the counterparty completed its part of the transaction; verifiability and the existence of a mechanism for enforcement of the provisions of the smart contract.

Further research on the topic should consider the possibility of using smart contracts in contract law, the status of smart contracts as absolute evidence in court, and legislative regulation of the legal status of smart contracts at the international level.

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