**ТЕОРЕТИКО-ПРАКТИЧНІ ПИТАННЯ РОЗВИТКУ
ПРАВОВОЇ СИСТЕМИ УКРАЇНИ**

THEORETICAL AND PRACTICAL ISSUES OF
DEVELOPMENT OF THE LAW SYSTEM OF UKRAINE

ЕКОНОМІКА ТА ПРАВО
ECONOMICS AND LAW

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LEGAL NATURE OF A SMART-CONTRACT AND ISSUES OF ITS APPLICATION IN THE FIELD OF DIGITAL ASSETS

The article looks into the concept and legal nature of smart contracts, as well as the issues that arise during the use of smart contracts in the field of digital assets. The technical and legal aspects of the concept of a smart contract are considered. Models of use of smart contracts are described. Scientific and legislative approaches to determining the legal nature of smart contracts are presented. The dual legal nature of a legal smart contract is analyzed: as a form of transaction and an object of copyright. Some issues in the field of protection of the rights of smart contract parties are considered. Based on the findings, temporary solutions in the field of using smart contracts are proposed.

Definition of the problem. New realities of the modern world cause changes in all areas of social relations. Information technologies have a significant impact on social processes, introducing the achievements of information progress into the activities of the state and society. This leads to the fact that social relations acquire an electronic form. Contractual relations are also undergoing increasingly significant changes. In this context, smart contracts are of significant interest. Smart contracts have applications in a wide variety of fields, from government voting systems and healthcare to supply chain and financial services. However, the most effective use of the smart-contracts is in the field of digital assets as it is the easiest way to own and control digital data.

Smart contract technology changes traditional business processes, as it allows the terms of an agreement to be automatically fulfilled. Because of the application of this technology, the cost of administration and services can be reduced and the efficiency of business processes increases. Smart contracts also allow reducing risks with regard to the implementation of contractual terms. While smart contract technology can drive a wave of innovation in a company's business processes, businesses may find it difficult

to put smart contracts into practice. Many legal issues remain in the area of application of smart-contracts because of the great regulative uncertainty.

Analysis of recent research and publications. Smart contracts issues remain insufficiently researched, especially in Ukrainian science. Among the researchers of the problems of using smart contracts, we can mention F. Alabi, O. Baranov, N. Boyko, A. Tarasyuk, E. Kirillova et al. Among mentioned, findings of F. Alabi are of particular interest. The latter in her work looks into such important issues of smart-contracts, as the smart contract concept, comparative analysis of the elements of traditional legal contracts and smart contracts, practical challenges that may impede the deployment of the smart contract as an alternative to the natural language legal contracts [1]. Among Ukrainian researches, the deepest dive into smart contract legal issues can be found in papers of O. Baranov, who tries to answer the same questions: the definition of a smart contract, comparative analysis of traditional and smart contracts, legal issues of the theoretical and practical direction, which form a significant barrier to the use of smart contracts [2]. However, many issues in this area remain unresolved. In addition, there are practically no attempts to analyze a smart contract as a potential basis for the emergence of property rights, in particular, digital property, in Ukrainian research field.

Based on the above, the **purpose of this article** is an attempt to determine the legal nature of a smart contract and to analyze advantages and disadvantages of a smart contract in the field of digital assets.

Presenting key ideas. The cryptographer scholar Nick Szabo described the idea of smart contracts in 1994. The scientist described a smart contract as a computerized transaction protocol that fulfills the terms of the contract or as a digital representation of a set of obligations between the parties, which also includes a protocol for fulfilling these obligations [3].

To understand the legal nature of a smart contract, it is necessary to consider its technical and legal aspects.

From a technical side, a smart contract is a computer code that is able to operate automatically according to predetermined functions when certain conditions occur. This is a fragment of the program code that performs certain tasks in case of fulfillment of a pre-set condition in the program [4, p. 5-6.]. This code is able to be stored in a distributed ledger and record any changes to it [5, p. 53].

When using blockchain technology or other distributed ledgers, the smart contract is stored and duplicated in it; the algorithms of the smart contract are determined by its software code within the network of the distributed ledger. Therefore, anyone who has access to the distributed ledger can make sure that the smart contract functions according to the specified conditions, which ensures impossibility of any changes [6 p. 109].

The technical side of the smart contract is reflected in its definitions as a type of coding, a way of functioning of the blockchain, as a fragment of code that is implemented on the blockchain platform and is initiated by blockchain transactions, which ensues the recording of data into the database [7].

Some scholars, analyzing the technical aspects of smart contracts, pay attention first to the fulfillment of obligations. They emphasize that smart contracts are computer programs related to the fulfillment of obligations. They have two functions: the smart contract either directly executes or monitors the execution (violation) of the agreement [8, p. 15, 35].

A common definition of a smart contract from a legal perspective is its understanding as an agreement between the parties that exists in the form of a software code that functions in a distributed ledger and ensures the self-enforcement of the terms of such a contract upon the occurrence of predetermined circumstances [9 p. 41].

The understanding of smart contracts as self-executing contracts can be also found in European and American doctrines. Thus, F. Alabi notes that the contract, which is performed automatically, is a set of agreements of the parties, based on which the treaty between them is carried out [1].

A smart contract is also defined as a specific contractual structure, i.e. a contract concluded with the help of electronic or other technical means, the terms of which provide for the fulfillment of obligations arising from it, upon the occurrence of specified circumstances, without an obligation aimed at fulfillment separately expressed additional will of its parties, through the use of information technologies, determined by the terms of the contract [5].

Therefore, it is necessary to keep in mind that the concept of a smart contract embraces both a technical and a legal aspect. Some scholars even talk about the necessity to use two different terms: smart contract and legal smart contract. The first is a software code, the second covers terms of the

agreement formulated and automated with the help of the code. The need to distinguish between these two concepts is due to the fact that there are different models of using smart contracts. The first model assumes that the program code does not replace agreements, but only automates execution (the so-called external model). In the second model case, relations between the parties can develop in two ways: the code either completely replaces the contract, or is a component of a contract. This is the so-called built-in or internal model [5]. Sometimes the terms legal smart contract and smart contract code [4] are used to denote these models.

Regarding the legal nature of smart contracts, there are different positions. Smart contracts are offered to be considered an independent contract [9], a non-independent contractual structure [10], and a contract with a special (automated) method of performance or a method of performance of an obligation [11], a form of contract [6], evidence that confirms the fact of concluding a contract [12].

The approach to understanding a smart contract as a special type of a contract is quite common in legal sources. However, there is no clear answer to the question of what kind of contract a smart contract is. Some scholars note that smart contracts should be placed among non-independent contractual structures that reflect the peculiarities of conclusion or special legal consequences of any civil law contract, if it meets the characteristics specified in the law [10].

It is also common to understand a smart contract as a special form of contract. In such case a smart contract is defined as a type of written (electronic) form of a contract, the peculiarity of which is that the will of the subject is expressed using special technical means in the form of software code [6, p. 114]. Other scholars note that since the written form of contracts covers electronic documents, and an electronic document is recognized as information produced, sent, received or stored using electronic, magnetic, optical or similar means, and at the same time, software code is also kind of information, then it is logical to equate a smart contract with a written contract. Under such approach, a smart contract is understood as a special way of fulfilling obligations, that is, a smart contract is not a separate specific type of obligation, but a special way of fulfilling obligations arising from contracts [13, p. 24].

Some experts do not consider it necessary to qualify a smart contract as a type or form of cont-ract at all. Thus, O. Tyulkanov notes that a smart contract is a computer program recorded in a distributed ledger and aimed at ensuring the automatic fulfillment of contractual obligations. Therefore, it can be used only as evidence of reaching an agreement concluded orally [12]. There is also a position that a smart contract must be qualified as a legal category different from a classic contract in electronic form, since it is impossible to equate the software code with a civil law contract, which must meet certain requirements that cannot be fully taken into account in the software code alone. Therefore, a smart contract is proposed to be understood as a program code based on blockchain technology, which by its legal features is a legally significant message written in a programming language [14, p. 297].

Nowadays most jurisdictions around the world still lack a specific legal regulation of smart contracts. An international legal framework specifically designed for blockchain technologies and smart contracts does not exist [15, 16]. However, the topic is clearly under consideration at the legislative/regulatory level and at national/regional level, particularly in the US, some regulations have been or are going to be enacted [17].

Thus, under Arizona law, a record or contract that is secured through blockchain technology is considered to be in an electronic form and to be an electronic record. Therefore, a smart contract is recognized as an electronic form of a transaction. According to the definition, given in Arizona House Bill, a smart contract is an event-triggered program that operates on a distributed, decentralized, multi-user reproducible ledger and can manage and transfer assets on that ledger [17].

A similar definition of a smart contract can be found in Tennessee law. Here, the definition of a smart contract expands the scope of its application: in addition to the management and transfer of assets in the ledger, the possibility of creating and distributing assets in the ledger, synchronizing information and managing access rights to software products is added [18].

According to Nevada law, a smart contract is a program that is triggered by certain events, displays a certain state, executes on a distributed, decentralized, and shared ledger, and is capable of controlling and initiating assets held on such a ledger transmission [19].

There is no legal definition of a smart contract in the legislation of Great Britain and France. But

understanding of smart contracts as computer code dominates the doctrine and legal developments. For example, the UK Law Reform Program defines smart contracts as self-executing contracts written using computer code [20, 6]. Recently the UK Law Commission has started a new project to modernize English Law with regard to smart contracts. The Law Commission defines smart contracts as contracts that are performed automatically by computer code without human input. According to the UK Law Commission, smart contracts may be entirely made up of computer code, a combination of an ordinary contract and computer code, or an ordinary contract that is performed by computer code [21].

In the French doctrine, the approach to understanding smart contracts as computer programs rather than civil law contracts prevails. Smart contracts are most often defined as computer programs, the purpose of which is the automatic execution of any contract [22].

Despite significant differences in the understanding of the legal nature of smart contracts, there is still a tendency to introduce them into the legal field as part of contract law. Today, there are two main models for including smart contracts in contract law: as an independent contract and a hybrid model. In the first case, the existence of a contract in traditional written form is assumed. In addition, part of the terms of such a contract will be included in the smart contract. In the second case, a part of the contract in traditional written form and a part of the contract that can be automated and written in one of the programming languages are combined. At the same time, the part of the contract written in the programming language will be automatically executed [6, p. 109].

Analyzing the approaches to the legal nature of smart contracts, as well as the approaches to the legislative definitions of this concept, we can conclude that it is necessary to distinguish the concept of a smart contract as a technical phenomenon (computer program) and a legal one. For this purpose, it is worth to introduce two terms into the legal field, which will allow distinguishing different models of the use of smart contracts. If a smart contract does not replace agreements, but only automates execution, it is appropriate to talk about "contract code". If the terms of an agreement are fully written in a smart contract in a way, the latter can replace the agreement in whole or in part, it is appropriate to use the term "legal smart contract". The latter, by its legal nature, can be considered as an analogue of a written transaction, a type of electronic transaction or a digital transaction (which should be distinguished as a kind of electronic transaction).

It should also be considered a fact that a legal smart contract can have a dual legal nature and be simultaneously a digital form of a transaction and an object of copyright. After all, in its essence, a smart contract is a computer program. At the same time, computer programs are subject to copyright. Thus, in accordance with Part 4 of Art. 433 of the Civil Code of Ukraine, computer programs are protected as literary works. According to Art. 20 of the Law of Ukraine "On Copyright and Related Rights" dated December 23.12.1993 protection is given to the form of the computer program. Thus, copyright laws will protect a legal smart contract and any attempts to use the code without author's permission may cause a copyright infringement claim.

There is an opinion that the copyright protection provisions for smart contracts will not apply in all cases. An analogy is drawn here with the texts of traditional treaties. The objection to the granting of copyright protection to the texts of contracts boils down to the fact that the main value of contracts lies in their content, not in the form of expression. As a prove of this idea, the American concept of "merger" is mentioned, according to which if there is one or more ways of expressing a certain idea, no one can get exclusive rights to that form of expression. There is a reason to assume that having the same set of facts and the same provisions governing disputed relations, two qualified lawyers will prepare approximately same documents [23].

Indeed, such a case is not so easy to solve. On the one hand, the code of smart contracts is a computer program and an object of legal protection. On the other hand, in some cases similar legal relations cannot be settled with a high degree of originality and differences. This can lead to certain issues in practice, since if typical legal relationships are regulated by approximately the same code, a dispute may arise between the authors of the codes, and it may be impossible to regulate the relationships in another way. Nonetheless, the current situation is as follows: legal protection extends only to the form of expression of the computer code and does not extend to any ideas and principles, which constitute any element of a computer program (Art. 20 of the Law of Ukraine "On Copyright and Related Rights"). Based on

this, any smart contract code will be able to receive legal protection. This will be a difference between smart contracts and the texts of traditional contracts, which are usually not protected by copyright due to the insufficient level of originality.

Talking about practical aspects of the application of smart contracts, we can simultaneously highlight both pros and cons. One of the main areas of application of smart contracts is the acquisition and transfer of property (both real and digital). Most often nowadays, smart contracts are used to transfer rights to tokens and cryptocurrencies, which are digital assets. However, the concept of "asset tokens" is becoming more and more widespread. Such tokens can be records about real property made on a distributed ledger. The latter also include investment (corporate) tokens, which, for example, can confirm a share in the company's future profits. From an economic point of view, such tokens are similar to shares, bonds and derivatives. In this case, smart contracts can be used for so-called "digitized" assets. Digitized asset is an asset (which can be a security or a physical asset) whose ownership is represented in an electronic record [24].

The advantages over traditional contracts in this area are, in particular, the absence of intermediaries, automatic execution, strict regulation and interpretation of terms, the impossibility of interfering with a predetermined code, etc. In an ideal version, smart contracts should not only contribute to reducing the costs of concluding transactions, but also reduce the number of legal disputes [13]. However, most of the advantages of smart contracts are also its disadvantages.

Thus, the biggest problem of smart contracts is considered the impossibility of encoding a significant part of the agreements between the parties, because they do not fit into the "if-then" scheme, but are covered by abstract concepts such as legality, fairness, "reasonable term", protection of the weaker party, etc. [9 13].

The next disadvantage of smart contracts is binding to the real world and the need to obtain data from outside the system. To receive data that is located outside the blockchain or other distributed ledger, the smart contract must consult so-called oracles. Oracle programs are specialized services aimed at ensuring the binding of the digital world to the real world and providing smart contracts with initial data for their execution [25, p. 45]. The use of oracles means bringing a third party into such an agreement with all the risks that follow, in

particular, the question of the reliability of data obtained from such a source. Hackers, who will change its code, causing it to provide unreliable data, can attack the oracle program. Alternatively, the information that comes to the oracle can be replaced or modified [25, p. 46]. Because of such manipulations, the information entering the smart contract will be unreliable, which will determine unfair execution of the agreement in advance.

The automatic execution of a smart contract also creates certain problems. In particular, if there are objective conditions for stopping execution or changing the agreement, it is impossible to change the smart contract, just as it is impossible to suspend its execution.

Problems can also be related to the fact that the program code may contain an error, or an error may be made when entering data into the system. At the same time, as already mentioned, the smart contract cannot be changed, and besides, there is no answer as to who should be responsible for such mistakes: the parties, the program developer, or someone else. That is, unlike traditional contracts, smart contracts have almost no flexibility.

Another problem of smart contracts is the absence of a legal field, i.e., nowadays there is practically no legal regulation of the procedure for concluding and executing smart contracts. There are also issues related to the choice of law that applies to smart contracts that are transnational in nature, and ways to protect rights arising with regard to the conclusion of smart contracts.

If the counterparties are located in different countries, the problem of determining the law applicable to such relations may arise. In this case, difficulties may arise with the application of the regular provisions of international private law. For example, in the case of smart contracts, conflict bindings such as "place of performance of the contract", "place of conclusion of the contract", "the law with which the legal relationship is most closely related" lose their meaning. To solve this problem, it is suggested to immediately determine which law should be applied to such relations. However, it is quite difficult to determine this in the program as it is not clear how to formulate it correctly and whether the program will be able to properly use such a term [25, p. 26]. Therefore, in such cases, it is more expedient to fix some terms on paper.

One of the most important issues associated with the use of smart contracts is the problem of

protecting the rights of its participants. In the case of the application of smart contracts, some traditional categories of contract law should be considered from a different perspective. For example, there is an opinion that the category of improper performance of an obligation cannot be applied to smart contracts. The smart contract is aimed at ensuring the proper fulfillment of an obligation, so in fact, thanks to the use of smart contracts, the risks of bad faith of the parties to the contract are eliminated [26, p. 396; 27, p. 43].

However, defaults on smart contract obligations can also happen. However, the reason for this is most often a technical error. If the obligation was fulfilled with a mistake, bilateral restitution should be applied. A reverse transaction mechanism, which can be provided in the smart contract, will enable bilateral restitution under the smart contract. It can be applied in those cases when performance was carried out, but an error in the contractual terms was discovered [11].

Liability for breach of obligations from smart contracts also have specificity. It is believed that in this case only non-contractual measures of liability can be applied, since the obligation can only be performed properly, so a possibility of intentional non-performance is not considered [28]. The features of automated execution are that the obliged party does not influence the execution and cannot be held responsible for software failures and errors in the execution of the obligation. In such a case, either a case where liability does not arise is possible, or the tortious liability of the party for intentionally making changes to the operation of technical devices.

Talking about responsibility for violations of terms and errors in smart contracts, it is worth to take into account the following factors. First, if poor performance under a smart contract is due to an error in the software code, the question arises as to who should be held responsible for such an error. It is believed that the responsibility for such errors should rest with the party that undertook the task of preparing the smart contract. For example, if a smart contract is developed to the order of the debtor, he must bear the risk of an error in the smart contract, which will lead to improper execution. If the creditor undertakes the development of a smart contract, he must be responsible for the alleged non-fulfillment of such a contract. It is clear that in each case, the party that assumes the risk of non-performance of the smart contract due to technical errors has the right to sue the developer with whom the contract for the development of the software was concluded. As part of this lawsuit, it is possible to claim compensation for damages caused by non-fulfillment of such a contract. Secondly, the specificity of smart contracts is that the responsibility for its violation can be assigned to a third party who intervened in the program code, which led to the improper fulfillment of the obligation. Such responsibility will be implemented within the framework of tort law [29].

Conclusions. The analysis of the legal nature of smart contracts leads to the conclusion that it is necessary to distinguish between the concept of a smart contract as a technical phenomenon (computer program) and a legal one. For this purpose, it is worth to introduce two terms into the legal field, which will allow distinguishing different models of the use of smart contracts. If a smart contract does not replace agreements, but only automates execution, it is appropriate to talk about "program code" or "contract code". If the terms of the agreement are fully written in the smart contract in a way that it can replace it in completely or in part, it is appropriate to use the term "legal smart contract". The latter, by its legal nature, can be considered as an analogue of a written transaction, a type of electronic or digital transaction. A legal smart contract can have a dual legal nature, and act simultaneously as a digital form of transaction and as an object of copyright. As in its essence, a smart contract is a computer program, and computer programs are objects of copyright. Therefore, any attempts to copy the code without author's permission may cause a copyright infringement claim.

The problem of liability for violations of smart contracts caused by technical errors can be solved by making responsible for such errors the party that undertook the duty to prepare the smart contract. In such case, the party that takes the risk of non-execution of the smart contract due to technical errors has the right to file a lawsuit against the developer of the software. As part of this lawsuit, the compensation for damages caused by non-fulfillment of such a contract can be claimed. It should also be taken into account that due to the specifics of smart contracts, the responsibility for their violation may be assigned to a third party who intervened in the program code, which led to the improper fulfillment of the obligation. Such responsibility will be implemented within the framework of tort law.

In general, until the creation of a clear legal field for the existence of smart contracts, it is more appropriate to use a hybrid model of smart contracts, when part of the terms of the contract exists in the form of software code, and part is in traditional written form. It is also possible to draw up framework agreements, in which the parties will provide for the procedure for resolving disputes, the applicable law, the consequences of errors in the automated fulfillment of obligations, etc.

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ПРАВОВА ПРИРОДА СМАРТКОНТРАКТУ ТА ПРОБЛЕМИ ЙОГО ЗАСТОСУВАННЯ У СФЕРІ ЦИФРОВИХ АКТИВІВ

Досліджено поняття правової природи смартконтрактів, а також проблем, що виникають під час використання смартконтрактів у сфері цифрових активів. Оскільки сфери використання смартконтрактів є досить різноманітними, стаття фокусується на дослідженні приватно-правових аспектів смартконтрактів. Розглядаються технічний та юридичний аспекти поняття смартконтракту. Описуються моделі використання смартконтрактів. Наводяться наукові та законодавчі підходи до визначення правової природи смартконтрактів. Зокрема, аналізуються законодавчі визначення поняття смартконтрактів, що склались у США. У статті зроблено висновок, що під час використання смартконтрактів необхідно враховувати дві моделі. Перша модель — зовнішня, коли програмний код не замінює угоди, а лише автоматизує її виконання. Друга — внутрішня, коли код повністю або частково замінює умови угоди. Для визначення моделі використання смартконтракту пропонується вживати спеціальну термінологію: код контракту і юридичний смартконтракт. Аналізується подвійна правова природа юридичного смартконтракту як форми правочину та об'єкта авторського права. Зазначається, що запозичення коду без згоди автора можуть мати наслідком звернення з вимогою щодо захисту авторських прав. Серед проблем смартконтрактів у сфері цифрових активів виділяють насамперед неможливість зміни умов контракту та втручання в його роботу. Це не дозволяє врахувати об'єктивні обставини, що можуть вплинути на виконання угоди. Розглядається також проблема оракулів під час використання смартконтрактів. Зазначається, що використання оракулів фактично означає залучення третьої сторони до правочину з усіма ризиками, які з цього випливають. Розглянуті проблеми відсутності правового регулювання смартконтрактів, зокрема, пов'язані з його транснаціональним характером. Окремо проаналізована проблема захисту прав учасників смартконтракту, пов'язана з технічними помилками та стороннім втручанням. Запропоновано тимчасові рішення у сфері використання смартконтрактів.

Ключові слова: смартконтракт, цифрові активи, програмний код, договір, форма договору, правочин.