CUESTIONES POLÍTICAS

**Instituto de Estudios Políticos y Derecho Público "Dr. Humberto J. La Roche"
de la Facultad de Ciencias Jurídicas y Políticas de la Universidad del Zulia
Maracaibo, Venezuela**

Vol.39 | *N° 70*

2021

Smart contracts in the context of digitalization: the legal realities of world experience

DOI: https://doi.org/10.46398/cuestpol.3970.51

Olga Klepikova *
Oleksandr Harahonych **
Iryna Antoshyna ***

Abstract

The development of digital technologies is forcing lawyers to analyze phenomena that have recently looked fantastic. This means that a phenomenon like smart contracts has ceased to be a theoretical idea of improving commodity monetary transactions and now needs a legal justification. In this article, we have analyzed smart contracts in terms of their belonging to digital technologies and the legal field, that is, how they can be equated with legal agreements, if they are their analogues, what application can it find given the legislation in the field of civil (contractual) law. The purpose of our study was to establish a link between smart contacts and their legal regulation, with the feature of smart contract implementation perspectives. The methodology used are systemic and formal-legal methods, as well as methods of analysis and synthesis. The results found highlight that a smart contract is a computer code that is entered into a blockchain network to execute a transaction, the usual expression of which is an agreement between the parties. From a legal point of view, smart contracts are only a part of ordinary agreements (contracts) under the practice of international and national law.

Keywords: smart contracts; digitization; digital technologies; blockchain; digital assets.

---

* Doctor of Legal Sciences, Associate Professor of Department of Economic Law and Procedure of Institute of Law, Taras Shevchenko National University of Kyiv, Ukraine. ORCID ID: https://orcid.org/0000-0001-5166-215X. Email: klepikova@ukr.net

** Doctor of Legal Sciences, Associate Professor, Associate Professor of the Department of Economic Law and Economic Process, Institute of Law, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine. ORCID ID: https://orcid.org/0000-0002-8984-2399. Email: o.harahonych@gmail.com

*** Candidate of Juridical Sciences, Associate Professor of the Department of General Theoretical Jurisprudence of National University «Odesa Law Academy», Ukraine. ORCID ID: https://orcid.org/0000-0002-5950-9907. Email: irinavivalmarine@gmail.com

Contratos inteligentes en el contexto de la digitalización: las realidades legales de la experiencia mundial

Resumen

El desarrollo de las tecnologías digitales está obligando a los abogados a analizar fenómenos que recientemente se han visto fantásticos. Esto significa que un fenómeno como los contratos inteligentes ha dejado de ser una idea teórica de mejorar las transacciones monetarias de productos básicos y ahora necesita una justificación legal. En este artículo, hemos analizado los contratos inteligentes en términos de su pertenencia a las tecnologías digitales y al campo legal, es decir, cómo se pueden equiparar a los acuerdos legales, si son sus análogos, qué aplicación puede encontrar dada la legislación en el campo del derecho civil (contractual). El propósito de nuestro estudio fue establecer un vínculo entre los contactos inteligentes y su regulación legal, con la característica de perspectivas de implementación de contratos inteligentes. La metodología utilizada son métodos sistémicos y formal-legales, así como métodos de análisis y síntesis. Los resultados encontrados destacan que un contrato inteligente es un código de computadora que se ingresa en una red blockchain para ejecutar una transacción, cuya expresión habitual es un acuerdo entre las partes. Desde un punto de vista legal, los contratos inteligentes son solo una parte de los acuerdos ordinarios (contratos) bajo la práctica del derecho internacional y nacional.

Palabras clave: contratos inteligentes; digitalización; tecnologías digitales; blockchain; activos digitales.

Introduction

In modern conditions, along with digitalization, there is a need to consider how it affects various areas of human life. One of them, and not the last, is jurisprudence. The use of such technology as blockchain and cryptocurrency circulation promotes the emergence of new forms of commodity-money exchange, which increases the speed, efficiency, and convenience of such operations.

But the legal status of these processes is not always defined at the legislative level. In addition, there are questions of a purely theoretical nature, for example, regarding the nature of smart-contracts, which are of particular interest to researchers in the field of contract law.

Are smart-contracts analogous to regular deals?

How can this technology be applied in real life?

Will it be available to ordinary citizens?

What does a lawyer need to know to master smart-contracts?

And aren't they just one type of performance guarantee and not a separate type (or form) of contract? These issues are relevant to legal science, so, in this article, we tried to understand what are smart-contracts as a form of legal interaction from a technical and legal point of view, what are their advantages, disadvantages, and prospects.

The purpose of our study is to analyze what are smart contracts as a form of legal interaction from a technical and legal point of view, what are their advantages, disadvantages, and prospects for application.

1. Theoretical Framework or Literature Review

Both domestic and foreign scientists were interested in the problem of legal support and practical application of smart contracts. Thus, Clack *et al.*, (2016) define smart-contracts as automated and effective agreements that can be executed on their own or with the addition of a human input factor. Their enforceability is guaranteed by the automation or legal status of the parties to the agreement. In their article, the authors consider how it is possible to standardize smart-contracts from a legal point of view.

Moreover, Kolvart *et al.,* (2016) believe that smart-contracts are not legal contracts but can become so if they meet the criteria that apply to contracts under contract law. From this point of view, smart-contracts are technical means, namely software code, which can be packed with certain contractual terms, but not always - the legal contract as a whole. In their publication, the authors also analyzed how smart-contracts are related to the smart-property phenomenon and what legal framework can be applied to smart-contracting.

Furthermore, Raskin (2017), in his study, proposes to divide smart-contracts into weak and strong. This means that weak agreements can be invalidated or amended by a court. Strong smart-contracts mean that the court cannot influence their execution, because it does not make sense, because they are concluded and executed at one time, so the result coincides with the conclusion of the agreement. In this case, the court cannot do anything and cannot influence the situation in any way, because everything has already happened. The author notes that special smart regulation requires strong smart-contracts because there is a need to protect the rights and interests of individuals and legal entities when concluding such agreements. The author also investigated what place can be allocated for smart-contracts in the contract law system.

The nature and the potential of smart contract were described by Levi and Lipton (2018). They stated that smart contracts" is a term used to describe computer code that automatically executes all or parts of an agreement and is stored on a blockchain-based platform. Finally, Zheng (2020), in their article, demonstrated the advantages of smart-contracts over conventional contracts. In addition, they analyzed the interaction of blockchain and smart-contracts, showed in simple words, what is a smart-contract, what is its scope and prospects for its implementation in everyday life. For example, for the world of finance and the Internet of Things, smart-contracts can significantly improve transactions and speed up work processes. It also compares blockchain platforms, analyzes the challenges and obstacles in the implementation of smart-contracts in everyday life.

Many scholars have paid attention to contractual obligations (Perezhniak *et al.*, 2021; Voloshyna *et al.,* 2019), but the topic of smart contracts is still little studied.

2. Methodology

We applied the system method to show the place of smart-contracts, firstly, in the information technology system (their connection with the blockchain), and secondly, to show their role in legal regulation, and more precisely – the perspective they have about contract law, business, etc. In this sense, we have considered smart-contracts as a new element in the interaction of the parties to the contractual process, its disadvantages, and advantages as a phenomenon of a more extensive system, in particular, information technology and contract law. It is advisable to start considering smart-contracts from the point of view of them as part of the digital technology system, which we did in the first half of the study. In the second half of the publication, you can find the legal implications of the implementation of smart-contracts as legal agreements.

We handled a formal legal method to demonstrate the structure and content of a smart-contract from a legal point of view. For example, like any legal contract, a smart-contract must be characterized by the following parts such as the subject of the contract, the parties, the essential terms. We detail this concept in the second half of the article on the legal features of smart-contracts. In addition, the current legal framework that can be implemented to smart-contracts, in particular, on the example of Ukrainian legislation in the field of civil law.

Methods of analysis and synthesis are utilized to define concepts, their main features, and characteristics, to characterize the studied phenomena, such as blockchain, tools for concluding smart-contracts, cryptocurrency exchange, etc. Synthesis is used to generalize and draw conclusions about the results of the study.

848

Olga Klepikova, Oleksandr Harahonych y Iryna Antoshyna
Smart contracts in the context of digitalization: the legal realities of world experience

3. Results and Discussion

3.1. Background of smart-contracts

The idea of smart-contracts was first voiced by Nick Szabo in the 90s of the 20th century. The main thought was that the use of such contracts does not require the trust of the parties, while the efficiency of their implementation is at a high level. In his work, Szabo (1996) compared smart-contracts with a vending machine, which, receiving money, gives out the goods – thus a simple operation of execution of the contract of sale. His next publication extended the understanding of the execution of such contracts to various types of property (Szabo, 1997). The execution of smart-contracts was conditioned by digital technologies.

In today's world, when we say smart-contract, the blockchain should be mentioned. Blockchain is a decentralized database divided into sequences – blocks in which information is transmitted that is difficult to break, process, and easily trace its origin (Nofer *et al.*, 2017). Indeed, these technologies are interactive, or rather: a smart-contract is software or source code involved in a blockchain environment (Buterin, 2013). In the blockchain network, smart-contracts work as follows. The output parameters are entered into the blockchain, its algorithm processes this information, at the output, we get a change in the status of the smart-contract or a new blockchain transaction. Thus, smart-contracts are first and foremost digital computing technology.

The most widespread smart-contracts are based on the blockchain Ethereum, which uses the programming language Solidity, which operates on the basis of EVM (Ethereum Virtual Machine) (De Filippi *et al.,* 2021). On the Ethereum platform, smart-contracts work as follows. After entering the blockchain, they are assigned an address. To use a smart-contract, the parties make a transaction at this address - this is how the smart-contract code is executed. The Ethereum blockchain is the environment, the network in which this occurs (Buterin, 2013). Execution of a smart-contract is carried out independently, decentralized, with a guarantee of performance (Buterin, 2013; De Filippi and Mauro, 2014; Chen, 2017; Voshmgir, 2017). However, it is remarked that writing software code for smart-contracts can be extremely difficult, and its verification may require a special approach (Bhargavan *et al.*, 2016).

Compared to conventional contracts, smart-contracts have the following advantages (Zheng, 2020):

1. Security. Reduction of risk, unauthorized interference of third parties in the execution of the contract in the blockchain network.

2. Cost-effectiveness. The use of smart-contracts reduces administrative

and other costs because the smart-contract is introduced and executed in a decentralized manner.

3. Efficiency. Smart-contracts can increase the efficiency of business processes. Because they have a standard form, the customer's agreement to receive the goods triggers the execution of a smart-contract instantly, it happens quickly in the blockchain network.

Today, smart-contracts have not yet become widespread and are used only among IT professionals, people, who are directly involved in blockchain technology, cryptocurrency mining, etc. However, large corporations and government agencies are interested in smart-contracts, as they can greatly facilitate and standardize their work.

Smart-contracts are of particular interest to the world of finance, which is interested in the application of innovative banking technologies, as well as in securing valuable data (Hamledari and Fischer, 2021). At the same time, smart-contracts penetrate other areas of human life. For example, they are used in construction and infrastructure. The subjects of capital construction contracts use smart-contracts to make payments and other deductions to ensure the construction of mattering infrastructure facilities. Other researchers confirm these findings. In particular, the introduction of smart-contracts should have a positive impact on the production and supply chain, the competitiveness of the enterprise, according to the employees of the construction sector (Badi *et al.*, 2021).

The prospect of using smart-contracts is in the field of online auctions such as eBay. The use of software code can increase the credibility of transactions, make them fast, improve their tracking. You can use smart-contracts based on the Ethereum blockchain.

3.2. What is a smart-contract?

A smart-contract is a program code used in a blockchain environment, or source code, from which the program code of a smart-contract for a blockchain was collected (De Filippi *et al.*, 2021). If its necessary conditions are met, the smart-contract code is executed by the miners of the basic blockchain network. Execution of a smart-contract is initiated through a blockchain transaction and results in a change in its status.

Smart-contracts are often confused with other technologies. For example, smart-contracts are not a script that runs in a blockchain environment and can be modified at the request of the script author. The smart-contract is executed by the blockchain technology itself and all changes made to it can be tracked and noticed. It is also noteworthy that the parties agree to transfer the execution of the smart-contract to the trust of the blockchain, and not to the program itself (De Filippi and Hassan, 2018).

Smart-contracts are also not quite similar to classic contracts because they are written in legal language that can be applied in everyday life. In contrast, smart-contracts are a technical, or even mathematical, representation of ordinary contracts because the language in which they are written is programmatic or source code that is strictly formalized and has a mathematically balanced structure. In this aspect, smart-contracts look stricter than regular contracts. They do not have the flexibility of linguistic techniques that can be contained in a regular contract (Levy, 2017). In this regard, Sklaroff (2017) emphasizes that some terms of regular contracts (such as bona fide obligations) cannot be reflected to the same extent in smart-contracts, as the latter are expressed in other language means. Such inflexibility of smart-contracts is, at the same time, their advantage because the parties can be sure that no discrepancies can be allowed (De Filippi *at al.,* 2021).

The limits of the application of smart-contracts also have their own characteristics (Egberts, 2017; Mik, 2017). For example, if a smart-contract requires the involvement of a third party, such as the state, or certain administrative procedures such as a certificate of ownership, land registration in the land cadaster, obtaining licenses, certificates, etc., smart-contracts cannot guarantee the success of transactions involving a third party that is not part of the actual blockchain technology (e.g., administrative, or institutional power) in which the smart-contract is executed. For example, a smart-contract can be used to secure the transfer of ownership of land, but only the fact of such transfer or payment (for example, in the form of a sale or gift agreement). Simultaneously, the smart-contract cannot cover all stages of this process that require the legalization of the status of the new owner as a property owner. In this sense, Hulicki (2017) draws an analogy with the vending machine: it implements the contract of sale only of specific objects of the material world contained in it.

Accordingly, a blockchain-based smart-contract also implements a contract through transactions in the blockchain network. Another disadvantage is that once a smart-contract is launched, its execution is not so easy to stop if something similar has not been programmed in it from the beginning (De Filippi *et al.*, 2021). From this point of view, the termination of a classical contract looks easier. Again, this is a manifestation of a special language in which smart-contracts are written (programming language). Other disadvantages of smart-contracts related to their implementation in everyday life, for example, the formation of the appropriate staff of qualified IT specialists in blockchain technology, programmers, the creation of appropriate logistics infrastructure, etc. (Osmolovskaya, 2018).

Misconception is to believe smart-contract is always a self-executing program (Zhou *et al.,* 2019). For example, if the third party tasked with monitoring the implementation of the smart-contract, as well as maintaining

the necessary third-party data on related transactions (e.g., registration of ownership, obtaining a license, etc.), does not keep the necessary data as a third party, the use of the smart-contract may not happen. Such a third party, whose participation is required in the implementation of a smart-contract, is called "oracle" (Egberts, 2017; Guadamuz, 2019; Mühlberger, 2020). Not only a theoretical problem is the situation in which blockchain miners can agree among themselves to interfere in the work of the network, and thus interrupt the normal execution of the smart-contract. Reijers (2018) cite the example of the decentralized investment fund The DAO, which was created using a smart-contract in the blockchain network Ethereum in 2016. This fund managed to raise $ 150 million in less than a month. However, taking advantage of the lack of software code for the smart-contract on which the fund was based, the attackers managed to take advantage of this and extract more than $ 60 million from the fund (De Filippi *et al.,* 2021).

3.3. Smart-contract as a legal agreement

Smart-contracts are a topic of discussion in the legal environment (Ferreira, 2021). This is since in the current legislation of many countries there are obstacles to the introduction of this technology in everyday life. However, according to Ferreira (2021), they can be overcome and, therefore, allow contract law to evolve into a more technological and innovative legal phenomenon, and allow ordinary participants in legal proceedings to enjoy all its benefits such as speed, security, and convenience.

Like other agreements, a smart-contract can be broken down into components and standard terms. Its signatories are the parties to the agreement. The contract is signed with an electronic signature. The subject of the contract is its content. Its conditions are written as a mathematical algorithm. A smart-contract is not only a contract but also a guarantee of its fulfillment. Among the features of smart-contracts: autonomy, decentralization, confidentiality, security of execution and data, resource savings, convenience, accuracy, and standardization.

Smart-contracts are a digital software (mathematical algorithm) variant of classic contracts. At a time when classical written contracts are characterized by flexibility and variability due to the use of ordinary language in which they are written (thus multiplying the variability of their use and execution), smart-contracts are not flexible because they are designed to accurately perform the task, for example, purchase and sale, transfer of the object for rent, etc.

The use of smart-contracts is promising for performing legally simple transactions such as purchase and sale, other types of transfer of ownership to individuals or legal entities in cases where it is necessary to provide a secure transaction for a significant amount of money. That is, in a situation

where under a regular contract, the transaction still has a large number of risks due to the variability of the usual language of the contract and further potentially exhausting and costly litigation, it will be easier to enter into an agreement and execute it in the form of a smart-contract. In this sense, the prospect of using smart-contracts can be found in such areas as:

1. buying and selling real estate, vehicles.

2. supply of goods and raw materials.

3. intellectual property.

4. credit, loan;

5. rent.

6. Leasing.

7. financing.

8. Insurance.

9. Franchising.

10. corporate relations.

11. tenders, and;

12. IoT (Internet of Things).

Previously, it was considered that to enter into an agreement in the form of a smart contract you need to be an experienced programmer in the field of IT-technologies, specifically – blockchain and cryptocurrency. Therefore, the ideal option for legal professionals is to have both legal and the above technical skills. Also, to conclude a smart-contract will most likely have to involve an IT specialist (Myronets and Sukhanov, 2020). However, in practice, it is enough to trust the blockchain platform and the instructions that it offers when concluding a smart-contract to make a transaction. In this sense, the role of intermediaries and even lawyers in the future in concluding smart-contracts is questioned, as their participation is no longer necessary (Boyko, 2018).

In the coming years, the number of smart contracts concluded in sports may increase many times over. Smart contracts are concluded using blockchain technology, respectively, the human factor is completely excluded (Kharytonov *et al.*, 2020). In this regard, such contracts are protected cryptographically, and to violate such a contract in connection with any manipulation of the text or signatures, it is almost impossible. Smart contracts will be the main innovative breakthrough in sports in the near future (Kharytonov *et al.*, 2021; Tkalych *et al.*, 2020; Kolomoiets *et al.*, 2021).

It is worth noting that the following proposals were made to improve the legal regulation of smart contracts. For example, the proposal to supplement Art. 636-1 of the Civil Code of Ukraine (Law No. 435-IV, 2003) content, according to which the smart contract is concluded in electronic form, takes effect from the compilation of the code and its placement in the blockchain network, and the identification of the parties is their electronic digital signatures, plus standard protocols for smart contracts (Veres, 2020). Opinions were also expressed on amendments to the Laws of Ukraine "On Electronic Commerce", "On Electronic Trust Services" (Pryamitsyn and Kovalik, 2021).

From the point of view of the Civil Code of Ukraine (Law No. 435-IV, 2003) (paragraph 1 of Article 202), a smart contract is a transaction, i.e., an action aimed at acquiring, changing, or terminating civil rights and obligations (Boyko, 2018). There is a point of view according to which such transactions concern small households. From a legal point of view, it is optimal to use smart contracts in the sphere of insurance, for the corporate acquisition of property, to pay for the delivery of goods or services. Promisingly use smart contracts for the exchange of stocks, bonds, options, as well as for microfinance services. It is noteworthy that the currency used to pay for smart contracts is often digital. However, in Ukraine, for example, the regulatory framework for the use of cryptocurrency has not yet been developed, as the concept of cryptocurrency is already found in court decisions (usually in criminal cases of misappropriation of digital assets).

For a contract to be legally binding, it must meet the essential conditions that normally apply to it. According to item 1 of Art. 638 of the Civil Code of Ukraine (Law No. 435-IV, 2003), the contract is concluded if the parties have duly agreed on all material terms. The real intentions of individuals are expressed in the form of a contract and its essential terms. If it is not proven in court that the smart contract reflects the real intentions of the parties, such an agreement will likely be declared invalid. Accordingly, the contract in the form of a smart contract must meet the conditions specified in Art. 203 of the Civil Code (Law No. 435-IV, 2003) on the requirements for the validity of the transaction. For example, contracts for the transfer of ownership or lease of real estate, land are characterized by stages that must be complied with by law for such a transfer to take place (e.g., notarization, registration of ownership, etc.).

The transfer of such objects to ownership does not in itself entail legal consequences and changes in legal status. For smart contracts, this means that their architecture must be complicated by additional variables. If this does not happen, then from the point of view of legal technique, such transactions will be incomplete, as they do not reflect the full intentions of the parties and do not fully complete the necessary "cycle" of procedures for the transaction. This means that conventional contracts with less effort can

describe a larger range of variability. In this sense, the ability to cover more consequences and "branches", "scenarios", conditions are the advantage of classic contracts over smart contracts (Boyko, 2018). Accordingly, from a legal point of view, smart contracts can be considered, which are only part of a broader set of agreements that require additional action, for example, by third parties (notarization, state registration) as a type of security under paragraph 2. Art. 546 of the Civil code of Ukraine (Law No. 435-IV, 2003), as it guarantees a particular transaction within the limits of the classical contract.

Foreign law confirms that for a smart contract to be legally binding, it must meet the requirements of the law on the conclusion of agreements. For example, Section 9(1) of the Estonian Law of Obligations Act (ELOA) (Law 81/487/2001, 2001) states that only an agreement concluded based on a proposal of one party and the consent of the counterparty, or by other means of a declaration of such mutual consent by both parties to the emergence of mutual rights and obligations. The United Nations Convention on Contracts for the International Sale of Goods (United Nations, 1980) (CISG) provides similar considerations for the conclusion of contracts (Art. 14-24). This is in line with the regulation of contracts under UNIDROIT (INTERNATIONAL INSTITUTE FOR UNIFICATION OF PRIVATE LAW, 2010) Principles of International Commercial Contracts (PICC) (Art 2.1.1), Principles of European Contract Law (TRANS-LEX, 2002) (Art. 2:101), and Draft Common Frame of Reference (TRANS-LEX, 2009) (Art. II 4:101) (Kolvart *et al.*, 2016).

The traditional view of concluding a contract in many countries implies that the offer to enter into a contract comes from the offeror and is accepted by the acceptor. At the same time, the bidder reveals in a sufficiently clear form that he seeks to become a party to the obligation on the proposed terms. If the original terms are not accepted by the acceptor, he may offer to enter into a contract on modified terms. This will mean that the parties have exchanged places, and the conclusion of an amended contract is a counter-offer (counter-proposal), i.e., a new contract is already implied, because its terms are different. But this is a traditional view, where there is a bidder, acceptor, offer, its acceptance, respectively, the formation of obligations under the conditions specified in the contract. The development of e-commerce offers new forms of contracting, which have their characteristics, and this should be taken into account, including using the available legal framework in the field of contract law. But which of its provisions apply to smart contracts?

For example, Article 2: 103 of the PECL provides that the parties may agree on other conditions necessary for the conclusion of the contract, such as a fixed price or the terms of the contract. In this case, they agree on the essential terms of the contract. In this case, the formation of additional

conditions – is a counter-offer from one party to another. According to PICC Article 2.1.13, a party to an agreement may insist on the acceptance of all the details of the agreement, and until the time it insists that the agreement cannot be concluded before all or a specific part has been agreed upon, it is justified. The party to the contract has the right to insist on the approval of all terms of the contract (Kolvart *et al.*, 2016). With regard to smart contracts, this means that if they are part of a broader agreement but are not specifically mentioned in it, they may not have legal force, as the parties have not agreed in sufficient and clear form on their use. For example, if the parties have agreed on a contract for the supply of goods, stipulated terms, subject of the contract and price, and the party pays for these goods in a non-contractual way – through a blockchain platform using cryptocurrency, such a smart contract cannot have legal force. Simultaneously, if the parties directly in the contract provided for such a possibility of payment as the main or alternative, then the smart contract is legally binding as part of the contract.

ELOA, PICC, PECL, and DCFR are quite flexible in defining the conditions that must be specified in the contract for it to take legal effect and certainty. In fact, they do not contain such references, except that the contract (more precisely, the offer) must be sufficiently defined. This means that for a contract to be executed in a manner sufficiently legally binding, its interpretation may be applied under the legal field (legislation) in which it was concluded (Kolvart *et al.,* 2016). In the sense of smart contracts, this does not mean their automatic invalidity but rather serves as a guarantee that if the terms of such an agreement meet the legal requirements for transactions, such a smart contract can be equated to a legally binding contract.

The intentions of the parties in concluding the contract can be determined objectively by their actions and deeds. This is important in interpreting the contract. Nevertheless, the clarity and clarity of the terms set out in the contract contribute to the easy interpretation and legality, the certainty of the contract.

It should be perceived that the provisions of the DCFR and PICC may apply to contracts that use an automated contracting process. If the parties have agreed to enter into an agreement on a digital platform without a physical presence at the time of conclusion, this does not preclude the legality of the agreement.

Following the requirements of Article 2.1.1 of the PICC and Article II – 4: 101 DCFR, the idea of intent, which can be determined by the actions, deeds, conduct of the parties, is necessary for the interpretation of contracts, the time of which cannot be determined unambiguously. Accordingly, if the conduct of the parties is sufficient to demonstrate consent, the contract may be considered concluded even despite the impossibility to determine the time of its conclusion (Kolvart *et al.*, 2016).

Further, we note that following Art. 2.101 (2) PECL and Art. 1.2 The PICC agreement may not be concluded or confirmed in writing. This means that it can be concluded and later confirmed by any means, such as e-mail, witnesses, Skype conversations, and so on.

A critical caveat is that data security may be compromised due to the development of cryptographic tools in the future (Mosca, 2018; Denning, 2019). This means that what is now a strength of smart contracts and blockchain, namely data security, contract enforcement, and liability, may be hit by the development of quantum computers, which benefit from more efficient cryptographic solutions. Hence, quantum computers are more likely to be able to crack modern encrypted codes and cryptographic tools than any ordinary or even advanced computer can at present (Mosca, 2016). According to Mosca, the main cryptographic security tools with a probability of 1 to 7 chances will be broken by 2026 and with a 50% probability – by 2031. Thus, increased security of smart contracts and blockchain may be a temporary phenomenon.

It is now difficult to say whether there are programs designed specifically for lawyers that allow you to create or translate ordinary paper contracts into a smart contract format. In the long run, the creation of software and hardware that will allow users to compile computer code to create the programs they need conveniently and affordably can influence the spread of smart contracts in the lives of ordinary citizens without much effort spent on computer programming languages (Boyko, 2018). Thus, smart contracts can become tools of everyday life, rather than a futuristic exotic for legal professionals of the classic (paper) model.

Conclusions

The study confirmed that a smart contract is a computer code applied in a blockchain environment. Its advantages at the moment are convenience, safety, speed. At the same time, smart contracts can be considered from a legal point of view as part of a normal contract in the sense of a performance guarantee. In order for a smart contract to be legally equivalent to a regular contract, which is legally binding, it must meet the criteria set out in civil law, in particular, the rules for concluding agreements (validity of transactions). Analysis of the practice of domestic and foreign legislation in this aspect shows that smart contracts have the prospect of application in various spheres of life, but for this, they should comply with the law, which is not always optimal for smart contracts. It follows that the adoption of laws and regulations specifically related to smart contracts is still ahead, as well as testing their endurance with new technologies, in particular in the field of quantum cryptography.

Bibliographic References

BADI, Sulafa; OCHIENG, Edward; NASAJ, Mohamed; PAPADAKI, Maria. 2021. "Technological, organizational, and environmental determinants of smart contracts adoption: UK construction sector viewpoint" In: Construction Management and Economics. Vol. 39, No. 1, pp. 36-54. Available online. In: https://www.researchgate.net/publication/344356398_Technological_organisational_and_environmental_determinants_of_smart_contracts_adoption_UK_construction_sector_viewpoint. Date of consultation: 02/02/2021.

BHARGAVAN, Karthikeyan. 2016. Formal verification of smart contracts: Short paper. In Proceedings of the 2016 ACM workshop on programming languages and analysis for security. Vienna, Austria. Available online. In: https://dl.acm.org/doi/pdf/10.1145/2993600.2993611. Date of consultation: 19/12/2020.

BOYKO, Natalia. 2018. Smart contracts are really contracts and really "smart". NAAU. Available online. In: https://unba.org.ua/publications/3169-smart-kontrakti%E2%80%93chi-spravdidogovori-ta-chi-dijsno-rozumni.html. Date of consultation: 19/12/2020.

BUTERIN, Vitalik. 2013. Ethereum whitepaper: A next-generation smart contract and decentralized application platform. Available online. In: https://ethereum.org/en/whitepaper/. Date of consultation: 19/12/2020.

CHEN, Lin. 2017. Decentralized execution of smart contracts: Agent model perspective and its implications. International conference on financial cryptography and data security (pp. 468–477). Springer. Available online. In: https://doi.org/10.1007/978-3-319-70278-0_29. Date of consultation: 19/12/2020.

CLACK, Christopher D; BAKSHI, Vikram A; BRAINE, Lee. 2016. Smart contract templates: foundations, design landscape and research directions. arXiv preprint arXiv:1608.00771. Available online. In: https://arxiv.org/pdf/1608.00771v2.pdf. Date of consultation: 19/12/2020.

DE FILIPPI, Primavera; HASSAN, Samer. 2018. Blockchain technology as a regulatory technology: From code is law to law is code. arXiv. Available online. In: https://arxiv.org/abs/1801.02507. Date of consultation: 19/12/2020.

DE FILIPPI, Primavera; MAURO, Raffaele. 2014. Ethereum: The decentralised platform that might displace today's institutions. Internet Policy Review. Available online. In: https://policyreview.info/articles/news/ethereum-

decentralised-platform-might-displace-todays-institutions/318. Date of consultation: 19/12/2020.

DE FILIPPI, Primavera; WRAY, Chris; SILENO, Giovanni. 2021. "Smart contracts" In: Internet Policy Review Vol 10, No. 2. Available online. In: https://doi.org/10.14763/2021.2.1549. Date of consultation: 02/02/2021.

DENNING, Dorothy E. 2019. "Is quantum computing a cybersecurity threat? American Scientist" Vol. 107, No. 2, pp. 83-85. Available online. In: https://www.americanscientist.org/article/is-quantum-computing-a-cybersecurity-threat. Date of consultation: 19/12/2020.

EGBERTS, Alexander. 2017. The oracle problem-an analysis of how blockchain oracles undermine the advantages of decentralized ledger systems. Available online. In: https://doi.org/10.2139/ssrn.3382343. Date of consultation: 19/12/2020.

LAW OF ESTONIA. 2001. Law 81/487/2001, of September 26, 2001, Obligations Act. Available online. In: https://www.riigiteataja.ee/en/eli/ee/506112013011/consolide/current. Date of consultation: 19/12/2020.

FERREIRA, Agata. 2021. "Regulating smart contracts: Legal revolution or simply evolution?" In: Telecommunications Policy. Vol. 45, No. 2. Available online. In: https://doi.org/10.1016/j.telpol.2020.102081. Date of consultation: 02/02/2021.

GUADAMUZ, Andres. 2019. "All watched over by machines of loving grace: A critical look at smart contracts" In: Computer Law & Security Review. Vol. 35, No. 6. Available online. In: https://doi.org/10.1016/j.clsr.2019.105338. Date of consultation: 19/12/2020.

HAMLEDARI, Hesam; FISCHER, Martin. 2021. "Role of blockchain-enabled smart contracts in automating construction progress payments" In: Journal of Legal Affairs and Dispute Resolution in Engineering and Construction. Vol. 13, No. 1, pp. 1-38.

HULICKI, Maciej. 2017. The legal framework and challenges of smart contract applications. Conference on System Sciences, 3-4. Available online. In: http://www.cs.bath.ac.uk/smartlaw2017/papers/SmartLaw2017_paper_3.pdf. Date of consultation: 19/12/2020.

INTERNATIONAL INSTITUTE FOR UNIFICATION OF PRIVATE LAW. 2010. UNIDROIT Principles of International Commercial Contracts. Available online. In: http://www.unidroit.org/english/principles/contracts/principles2010/integralversionprinciples2010-e.pdf. Date of consultation: 19/12/2020.

KHARYTONOV, Evgen; KHARYTONOVA, Olena; KOSTRUBA, Anatolii; TKALYCH, Maxym; TOLMACHEVSKA, Yuliia. 2020. "Las peculiaridades de la regulación legal y no legal de las relaciones sociales en el ámbito del deporte". (To the Peculiarities of Legal and Non-Legal Regulation of Social Relations in the Field of Sport). In: Retos, Vol. 41, pp. 131-137. Available online. In: https://doi.org/10.47197/retos.v0i41.84178. Date of consultation: 19/12/2020.

KHARYTONOV, Evgen; KHARYTONOVA, Olena; TKALYCH, Maxym; BOLOKAN, Inna; SAMILO, Hanna; TOLMACHEVSKA, Yuliia. 2021. "Intellectual property law in the field of sports: specifics of manifestations and features of legal regulation" In: Cuestiones Políticas. Vol. 39, No. 69, pp. 530-546. Available online. In: https://doi.org/10.46398/cuestpol.3969.33. Date of consultation: 02/02/2021.

KOLOMOIETS, Tetianal; TKALYCH, Maxym; MELNYK, Petro; PANCHENKO, Bogdan; TOLMACHEVSKA, Yuliia. 2021. "Combating Corruption in Sport: Legal Aspect" In: Retos. Vol. 41, pp. 746-755.

KOLVART, Merit; POOLA, Margus; RULL, Addi. 2016. Smart contracts. In The Future of Law and eTechnologies (pp. 133-147). Springer. Cham. Available online. In: https://www.researchgate.net/profile/Tanel-Kerikmaee/publication/314538429_The_Future_of_Law_and_Technologies/links/58c32c8445851538eb809e8c/The-Future-of-Law-and-Technologies.pdf#page=141. Date of consultation: 19/12/2020.

LEVI, Stuart; LIPTON, Alex. 2018. An Introduction to Smart Contracts and Their Potential and Inherent Limitations. Harvard Law School Forum on Corporate Governance. Available online. In: https://corpgov.law.harvard.edu/. Date of consultation: 19/12/2020.

LEVY, Karen E. 2017. "Book-smart, not street-smart: Blockchain-based smart contracts and the social workings of law" In: Engaging Science, Technology, and Society. Vol. 3, pp. 1-15. Available online. In: https://doi.org/10.17351/ests2017.107. Date of consultation: 19/12/2020.

MIK, Eliza. 2017. "Smart contracts: Terminology, technical limitations and real world complexity" In: Law, Innovation and Technology. Vol. 9, No. 2, pp. 269–30.

MOSCA, Michele. 2018. "Cybersecurity in an era with quantum computers: Will we be ready?" In: IEEE Security & Privacy. Vol. 16, No. 5, pp. 38-41.

MOSCA, Michele. 2016. A quantum of prevention for our cybersecurity. Global Risk Institute. Available online. In: https://globalriskinstitute.org/publications/quantum-computing-cybersecurity/. Date of consultation: 19/12/2020.

MÜHLBERGER, Roman. 2020. Foundational Oracle Patterns: Connecting Blockchain to the Off-Chain World. In: Asatiani A. et al. (eds) Business Process Management: Blockchain and Robotic Process Automation Forum. BPM 2020. Lecture Notes in Business Information Processing. Vol 393. Springer, Cham. Available online. In: https://doi.org/10.1007/978-3-030-58779-6_3. Date of consultation: 19/12/2020.

MYRONETS, Oleksandr; SUKHANOV, Oleh. 2020. On smart-contracts in Ukraine. Science, Research, Development. Available online. In: http://xn--e1aajfpcds8ay4h.com.ua/files/114_01_vii_2021.pdf#page=32. Date of consultation: 19/12/2020.

NOFER, Michael; GOMBER, Peter; HINZ, Oilver; SCHIERECK, Dirk. 2017. "Blockchain" In: Business & Information Systems Engineering. Vol 59, No. 3, pp. 183-187. Available online. In: https://core.ac.uk/download/pdf/301372278.pdf. Date of consultation: 19/12/2020.

OSMOLOVSKAYA, Anastasia Sergeevna. 2018. "Smart contracts: functions and applications" In: Business education in the knowledge economy. Vol. 2, No. 10, pp. 54-56.

TRANS-LEX. 2002. Principles of European Contract Law (PECL). Available online. In: http://www.trans-lex.org/400200/. Date of consultation: 19/12/2020.

PEREZHNIAK, Boris; HRYSHCHUK, Alina; MENSO, Iryna; STRUKOVA, Kristina; NAZARKO, Arkadii. 2021. "Local Self-Government in Public and Private Law: Latest Experience" In: Amazonia Investiga. Vol. 10, No. 41, pp. 211-23. Available online. In: https://doi.org/10.34069/AI/2021.41.05.21. Date of consultation: 19/12/2020.

PRYAMITSYN, Volodymyr; KOVALIK, Konstantyn. 2021. "Protection of personal data when concluding smart contracts" In: Legal position. Vol. 1, No. 30, pp. 94-97.

RASKIN, Max. 2017. "The law and legality of smart contracts" In: Georgetown Law & Technology Review. Vol 1, pp. 305-341.

REIJERS, Wessel. 2018. "Now the code runs itself: On-chain and off-chain governance of blockchain technologies" In: Topoi. Pp. 1-11. Available online. In: https://doi.org/10.1007/s11245-018-9626-5. Date of consultation: 19/12/2020.

SKLAROFF, Jeremy M. 2017. "Smart contracts and the cost of inflexibility" In: University of Pennsylvania Law Review. Vol. 166, pp. 263-303. Available online. In: https://scholarship.law.upenn.edu/prize_papers/9/. Date of consultation: 19/12/2020.

SZABO, Nick. 1997. The idea of smart contracts. Nick Szabo's Papers and Concise Tutorials. Available online. In: https://www.fon.hum. uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/ LOTwinterschool2006/szabo.best.vwh.net/idea.html.   Date   of consultation: 19/12/2020.

SZABO, Nick. 1996. "Smart contracts: Building blocks for digital markets" In: EXTROPY: The Journal of Transhumanist Thought. Vol. 18, No 2.

TKALYCH, Maxym; DAVYDOVA, Iryna; TOLMACHEVSKA, Yuliia. 2020. "Current State and Prospects of Development of the Sports System of Ukraine: Legal Aspects" In: Retos, Vol. 38, pp. 385-389.

TRANS-LEX. 2009. Draft Common Frame of Reference (DCFR). Available online. In: https://www.trans-lex.org/400725/_/outline-edition-/. Consultation date: 11/02/2020.

LA OF UKRAINE. 2003. Law 435-IV/2003, of January 16, Civil Code of Ukraine. Available online. In: https://zakon.rada.gov.ua/laws/show/435-15#Text. Consultation date: 11/05/2020.

VERES, Ihor. 2020. "The legal nature of a smart contract" In: Entrepreneurship, Economy and Law. Vol. 9, pp. 15-18.

VOLOSHYNA, Vladlena; SHYLIN, Denys; CHEREMNOVA, Antonina; PRYTULIAK, Valerii; STEPANETS, Yurii. 2019. "Show Business Contracts: Civil Legal Analysis of Ukraine Legislation with International Application Experience" In: Amazonia Investiga. Vol. 8, No. 22, pp. 141-146. Available online. In: https://amazoniainvestiga.info/index.php/ amazonia/article/view/38. Date of consultation: 19/12/2020.

VOSHMGIR, Shermin. 2017. "Disrupting governance with blockchains and smart contracts" In: Strategic Change. Vol. 26, No. 5, pp. 499-509.

ZHENG, Zibin. 2020. "An overview on smart contracts: Challenges, advances and platforms" In: Future Generation Computer Systems. No 105, pp. 475-491. Available online. In: https://arxiv.org/pdf/1912.10370.pdf. Date of consultation: 19/12/2020.

ZHOU, Mimi; CHENG, Grace; HEREDIA, Marta Soria. 2019. In code we trust? Trustlessness and smart contracts. Computers and Law. Available online. In: https://www.scl.org/articles/10493-in-code-we-trust-trustlessness-and-smart-contracts. Date of consultation: 19/12/2020.