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## SMART CONTRACTS AS A MECHANISM FOR FINTECH PRODUCT DEVELOPMENT IN PUBLIC MANAGEMENT

### SMART КОНТРАКТИ ЯК МЕХАНІЗМ РОЗВИТКУ FINTECH ПРОДУКТІВ В ПУБЛІЧНОМУ УПРАВЛІННІ

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*Корецький М. Х., Гребенюк М.Ю. SMART контракти як механізм розвитку FinTech продуктів в публічному управлінні. Оглядова стаття.*

Стаття присвячена висвітленню використання smart-контрактів для розвитку *FinTech* продуктів у сфері публічного управління. Проаналізовано зарубіжний досвід використання smart-контрактів, а також перспективи їх запровадження в Україні. Визначено основні переваги та недоліки цієї технології. Зроблено достатньо висновків та були представлені пропозиції, щодо вдосконалення та впровадження нових інформаційних технологій та використання старих методів передачі інформації. Задля цього було проведено достатньо обґрунтоване дослідження цієї складної та на сьогоднішній день невіршеної проблеми надійності укладання контрактів для нашої країни та усього світу загалом. Тому саме сьогодні, саме зараз дослідження у цих дуже складних темах повинні бути оприлюднені, цьому і присвячена стаття.

*Ключові слова: інформаційні системи, публічне управління, адміністративні послуги, електронне урядування, інновації, база даних, smart-контракти.*

*Koretskiy M. Kh., Grebeniuk M.Yu. SMART contracts as a mechanism for FinTech product development in public management. Review article.*

The article is devoted to the coverage of the smart-contracts usage for development of *FinTech* products in the public administration. The foreign experience of using smart-contracts, as well as the prospects of their implementation in Ukraine, has been analyzed. The main advantages and disadvantages of this technology are identified. There were sufficient conclusions and proposals for improving and introducing new information technologies and using old information transfer techniques. We have studied this complex and there is still unresolved reliability problem of contracts for our country and the world as a whole. That is why it is today that research in these very complex topics should be made public, and this is the article subject.

*Keywords: information systems, public administration, administrative services, e-government, innovation, database, smart-contracts.*

**A**s of today, “fair and transparent” contracts conclusion is of great importance for the maintenance of any state’s vital arteries and interests. Developed and secure environment creation is an indispensable condition for a society and a state development, based on the latest automated technologies.

Recently, there have been some qualitative and quantitative changes in governance processes at all levels in Ukraine, which have been driven by the intensive introduction of new information technologies and the “safe and transparent” agreements implementation at all levels of government and commercial agreements. The rapid informatization improvement, its penetration into all spheres of vital interests caused, besides the undeniable advantages, the number of strategic problems appearance. The unauthorized interference risk with the operation of computer, information, telecommunications and other advanced systems is increasing.

*The goal of the article* is to determine the perspective of using Smart contracts in Ukraine in the field of public administration and public procurement, highlight the advantages and disadvantages of this technology, as well as to analyze the international experience of using Smart contracts.

#### The main part.

From English Smart- is clever, contract- is an agreement, further smart agreement / contract. Smart contract is an electronic algorithm or condition in which the parties can exchange money, real estate, shares and other assets. A decentralized network, where all participants have equal rights, is needed to implement a sensible treaty. Cryptocurrencies are used as a financial instrument. The collocation “smart contract” was created by scientists in the field of informatics, cryptography, as well as in the field of law, by Nick Szabo in 1996, to

emphasize what he calls “highly developed practices” of contract law and related business practices in electronic protocols development of trafficking between strangers on the Internet. It can be said that this is about the settlement of the relationship of the parties by fixing their expressed will in the form of a certain code that is suitable for reading by a computer. Sabo, inspired by the researcher David Chaum, also had broad expectations that the specifications based on clear logic and verification, or the implementation through cryptographic protocols of other digital security mechanisms, might represent a sharp improvement over a traditional contract, even for some traditional types of contractual provisions that could be transferred to the computer protocols power [2].

In a 2013 document, Mark Miller and others emphasized opportunities as the basis for the smart contracts security, unlike Chaum and other researchers in the cryptographic financial community, who use modern cryptographic protocols [3] to ensure the security and confidentiality of digital money, credentials, signatures contract, auctions, and other commercial mechanisms.

Several formal languages have been developed and proposed to define contractual arrangements. [4] [5] IEEE has conducted two seminars with electronic contracting.

Recently, the noise around blockchain, smart contracts has been used mainly in the sense of a common understanding of the purpose that is happening on the blockchain. In this interpretation, a smart contract is not necessarily relevant to the classic contract concept, but it can be any computer programme.

Szabo assumes that a smart contract is an infrastructure that can be implemented through duplicate asset registers and contract execution using a cryptographic hash chain and Byzantine fault tolerance. Each node in the peer-to-peer network acts as a registry header and conditional bail that changes ownership and automatically marks the rules governing these operations and checks the same operation of other nodes. Asquemos implemented this approach in 2002, using the scheme as a contract script language.

Cryptocurrencies such as bitcoin have introduced special cases of such registries, where property is money. Bitcoin and many of its spin-off offices contain mechanisms to have more opportunities for joint ownership and contract execution. The support code is a hidden part of the Bitcoin protocol, based on a probable and anonymous (due to the work proof based on Byzantine) reward.

One proposal to use Bitcoin to register assets and execute a contract is called “coloured coins”. [4] The registry domain name is registered in Namecoin; we register names for potentially arbitrary forms of ownership, along with contract execution, implemented in Crypti Ripple, Mastercoin and Ethereum. [1] NXT realizes title to proof of ownership, interest in the base currency.

Smart contracts can be implemented using the Ricardian contract design template. [1]

Applications may include financial instruments such as bonds, stocks and derivatives, collateral contracts, and other documents and agreements where the nodes can monitor developments that are subject to reasonable contract rules. The benefits of a smart contract as an equivalent of an ordinary financial instrument hypothetically include minimizing counterparty risk, reducing settlement times, and increasing transparency. [2] UBS has experimented with “smart” bonds that use bitcoinblockchain, [2] in which payment streams could hypothetically be fully automated by creating a self-paid instrument. [2]

Smart contract is an electronic protocol written using a computer code. Its purpose is to transmit information and to ensure the fulfillment of contract terms by both parties. It is also called a smart contract.

Smart contracts allow you to safely exchange money, shares, property and other assets directly without intermediaries involvement.

In order to conclude any bargain, you need to contact a notary or a lawyer, pay for the documents and wait for their execution. Often, many paragraphs of these documents contain references to legislative articles that can be interpreted to suit you, to circumvent. In case of failure to comply with the terms of the transaction, in real life people have to go to court, spend money on the process again and prove their case. When concluding such transactions, there can be no talk of trust in the parties to the contract. For this, a programme was developed that monitors the fulfillment of the obligations of both parties specified in the contract, and also automatically levies fines for contravention or non-fulfillment of the transaction terms. Smart contracts ensure transaction security and are free from the risk of ambiguous interpretation of conditions due to the fact that they are based on cryptography. These are more profitable transactions in material terms, since a person does not need to pay lawyers, intermediaries or sue if the contract is not fulfilled. Moreover, the fulfillment of the transaction terms occurs automatically with minimal costs for their support, without involving third parties (intermediaries). The simplest example of using smart contracts is multi-signature. With help of such signature, the agreement parties can freeze a certain amount of coins on the blockchain so that, if necessary, spend more than half of the participants will need to sign it. This contract condition ensures the funds safety invested in the project. In case of failure, funds will be returned to the investor automatically. If the declared amount collection was successful, then the multi-signature participants activate their keys, confirming the project integrity in which they invest.

Smart contracts can be used for any financial activities in the field of insurance, registration or transfer of property, lending. The most widespread distribution of smart contracts is observed in the business sphere, where payments and actions due to payments are supposed.

The “SMART-assets” idea is based on the fact that you can access the asset by blocking the digital asset of the blockchain and may have a secret digital key. Giving an asset to SMART authorities allows to carry out operations with an asset without requiring the appearance of a higher level of income than the participants in the

deal. The essence of using this technology to manage records in public registers is to create a single system, national or international, for a specific registry (for example, the register of property rights), where participants could place information about objects, determine how to use them and control circulation as both commercial and non-commercial. The use of blockchain technology helps to fully transition to a digital format that is naturally relevant to working with information. This system provides the uniform standards existence for the exchange of information based on Smart CONTRACT, which makes it convenient and understandable for both regular users and new entities. The contract is a very complex subject, provided that they are the main means of transferring money to other organizations, including private ones. This document presents a proposal to investigate the of Smart Contracts technology usage in Blockchain environments as a way to counteract corruption in government. Reasonable contracts can be used for all public payments as a way to increase the transparency of transactions, and to avoid exaggeration, provided that contracts and offers are typical methods of fraud and misappropriation of money. Because future research is important to check for impediments to adoption. An important point in the fight against corruption by fraud is to use technology to avoid offenses or reduce its impact.

Contracts are a very difficult subject, provided that they are the main way the government transfers money to other organizations, including private ones. According to the economy, a contract agreement is an agency problem that can have consequences.

Ethereum is considered to be the first platform to use smart contracts in practice.

There are other platforms, but the Ethereum platform allows you to compile any desired programme in a convenient programming language, but you will have to pay for using the the same name cryptocurrency platform.

Smart contracts allow you to get rid of intermediaries in the form of banks, lawyers, notaries, etc., since they independently check the agreement terms and confirm it. The “smart contracts” concept or as they are also called smart contracts introduced by Nick Sabo. In 1994, he defined a smart contract as a set of digital promises, including protocols where Parties fulfill other promises. It is a question of settling the parties relations by fixing their expressed will in the form of a certain code, which a computer reads.

With the development of blockchain technology (building a continuous sequential blockchain (linked list) that can contain any information), the of automatic contracts idea became popular and was put into practice in 2008. In particular, on the Ethereum platform. The smart contract objects are:

- signatories (from both parties) – contract participants who confirm their participation by the electronic signature;
- the contract subject is any object that is inside a reasonable contract system, such as a cryptocurrency, or to which the programme has unhindered access without human involvement. In the future, an increasing number of items and things will connect to the Internet.
- conditions - an algorithm in the form of a clear mathematical description, which has a clear logic and consistency.

The contract subject is an object that can be placed in a reasonable contract. Provided that a reasonable contract has access to this subject. Therefore, it is possible to conditionally subdivide contracts that have a certain element of “reasonableness” into the following conditional categories:

- paper (electronic) form with automated system of cash transactions;
- paper (electronic) form with elements that are executed in automatic mode;
- paper (electronic) form and its exact copy, which is recorded by computer code;
- the contract is completely in the form of a computer programme. Not every automation of a party’s individual obligations under the contract can be qualified as the Smart contract, in this connection, what is understood in the technical environment under the “Smart contract” can and not be a smart contract in a legal sense, understood as the parties agreement, regulated by the civil law rules.

7 peculiarities. The agreements reached formalization, including those concerning the essential terms of the respective agreement, is implemented in the programme code language. Special procedure for concluding a contract (in essence – a kind of an accession agreement).

Special order of the contract performance (in advance expressed by the party at the time of the conclusion of the contract the will to commit actions that constitute the further performance of the contract in an automated manner).

The conditional nature of the implementation of such an agreement, due to the programming language logic (if ..., then ...).

Limited cities apa to influence the progress of such an agreement beyond those expressly provided in the Smart Contract Code itself.

Jurisdictional problems caused by the distributed nature of the blockchain, under which a contract may be “executed” on different codes that are territorially located in different jurisdictions.

Purely “virtual” smart contracts that do not have off-line access (for example, cryptocurrency digital asset contracts) are not territorially bound and, as a consequence, raise the issue of applicable law. As the parties sign

a reasonable contract, using similar signatures of sending funds in existing cryptocurrency methods, that is, with the help of one or another cryptocurrency changes to the blockchain on the conclusion of a reasonable contract. V. Buterin \*, co-founder of Ethereum (Ethereum), a blockchain-based online contracting service, says that without the cryptocurrency, the smart contracts potential cannot be realized. Determining the cryptocurrency legal status is of paramount importance for reasonable contracts implementation in civil legal relationships and on the part of the blockchain technology development.

The impossibility of changing the reasonable-contract. Such an agreement is entered into the blockchain system, cannot be altered by either party retroactively, a reasonable-contract by itself. At the same time, it is an undeniable advantage that eliminates various types of fraud, and on the other, the inability to change call on the parties much more careful consideration and transposition of all significant parties to the contract, the code.

Perspectives. Smart contracts proponents claim that many of their types can be made partially or fully self-fulfilling and self-sufficient. Intelligent crypto-based contracts are capable of providing better security than traditional law-based contracts and reduce other transaction costs associated with contracting and possible legal costs.

The smart contracts legal significance can be obtained under the state laws, respectively. This requires smart contracts to contain the conditions and restrictions established by the state laws.

Disadvantages.

Observers fear that the proliferation of automated contract-support technologies could weaken the existing social institutions that humanity has created for generations. In addition, such technologies could lead to the disappearance of a large number of administrative jobs, as well as robotization has led to the industrial jobs disappearance. This applies in particular to notaries, bank employees, and clerks involved in the registration of real estate transactions.

Conclusions. Smart contracts are essentially software that are based on computer logic and are transmitted as code. That is why the parties to the agreement or contract can be assured that all the contract terms will be respected, and no party will be able to change the terms or interpret themselves. Code is the smart contracts law.

Smart contracts can be used for any financial activities in the field of insurance, registration or property transfer, lending. The most widespread use of reasonable contracts is in the business area, where payments and payment-related actions are envisaged.

Blockchain technology has its problems, developers are trying to eliminate all possible shortcomings. But it goes beyond many centralized schemes currently used in banks and government agencies. Obviously, smart contracts will be spread all over the world in various areas of life, as they significantly save money and time, and also make it possible to erase borders with all the world countries in business.

Smart contracts examples in real life

You and your friend play a sweepstakes on a football match result. You make blockchain bets in the form of transactions stored there until the game ends. When the match is over, a reasonable contract checks its result on one of the sports sites and automatically transfers all funds to the winner.

You have ordered a product through an online store. Payment for your item is credited to the blockchain and only after confirmation by the courier service that you have picked up the item and are satisfied with its quality, the money goes to the seller.

Among the blockchain programmes in public organizations, the following can be mentioned: transferring funds from one state level for others or from the government to a private company, managing and storing trade contracts through smart contracts and citizens in elections or referendums. Smart contracts can be used by all governments for payments as a way to increase transaction transparency to avoid exaggeration, provided that contracts and offers are the typical means of fraud and misappropriation of money. In addition to increased access to information and transparency. The contracts characteristics self-cleaning can reduce the manual payments cost, as well as errors and delays, as well as vulnerability to fraud and misconduct. They also take the time and effort to manage them and may directly or indirectly promote asymmetry-induced corruption or misconduct or misappropriation. Smart Contracts are autonomous and perform all actions without the assistance or intervention of any third party, showing incomparable transparency, increased efficiency and reduced vulnerability.

### **Abstract**

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The following can be called: transfer money from one state level for others or from government to private companies managing and storing trade contracts through Smart Agreements and Citizens at Elections or referendums Smart contracts can be used for all governments' payments as a way to increase the transactions transparency in order to avoid exaggeration, provided that contracts and offers are typical ways of committing fraud and money unlawful appropriation.

In addition to increased access to information and transparency, Self-cleaning the characteristics of contracts can reduce the manual payments cost, as well as errors and delays, as well as vulnerability to fraud and misconduct. They also consume time and effort to manage them and can directly or indirectly promote corruption, asymmetric information, or misconduct or misappropriation. Smart Contracts are stand-alone and perform all the actions without any assistance or interference by any third party, showing immeasurable transparency, increased efficiency and reduced vulnerability.

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