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## SMART CONTRACTS: SECURITY ISSUES AND FURTHER DEVELOPMENT IN BRAZIL

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### ABSTRACT

This study aims to describe how smart contracts are made and the legal certainty of using them on business contracts. For this, the study conceptualized the smart contract, as well its characteristics and the difference between smart contract and e-contract. It described the legal certainty of smart contracts and how they can be used on business transactions. Besides, the research explained the importance of blockchain, ethereum and cryptocurrency in the smart contract. At last, it describes how smart contracts are applied in the legal universe and demonstrated their advantages as self-execution and clauses' immutability. For this work, bibliographic research and deductive method were used. The study concluded that the inexistence of law causes legal insecurity which represents an obstacle to spread the use of smart contracts.

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## 1. INTRODUCTION

This paper was organized based on the explanation of the smart contract concept and its distinctions with regard to other types of electronic contracts, such as the e-contract, since the so-called technological revolution has presented several tools to simplify, make feasible and democratize several activities of human life, which inevitably led to the inclusion of the contract, one of the oldest institutes of Law.

In the first chapter the concept of smart contracts was presented, which consists of contracts whose terms are reduced to programming languages that execute the commands that were contracted automatically.

Moreover, it was also shown that although the existence of a smart contract does not depend on its insertion in a blockchain, its use became much more attractive after the emergence of this technology. Along these lines, it was found that the blockchain is a decentralized data storage network, similar to a ledger, with the difference that there is no central authority able to change any of the data stored on the network.

The most widely used blockchain for smart contracts has been Ethereum, which was created in 2014 by Vitalik Buterin precisely with the goal of spreading the use of these resources, such as smart contracts, tokens, decentralized organizations, and other applications.

In the second chapter, the need for security in business transactions established through technology was demonstrated, thus, asymmetric cryptography has also been shown as a great ally, because it is essential to ensure security for users, however, the lack of regulation has been a major obstacle, as in the case of the Securities and Exchange Commission not considering a crypto-asset as a security due to the uncertainty of regulation leading to insecurity for the crypto economy.

In the third chapter, in turn, it was shown that, despite the obstacles that still exist for greater diffusion of the technology in the business environment, day after day the use of blockchain has been disseminated in various areas of law, especially in business activities, in notary and intellectual property records, however, the potential of this technology combined with smart contracts has been extremely broad, from cost sharing contracts to Decentralized Finance (DeFi).

The research was conducted through bibliographic research, under the deductive method, whose problem was centred on the investigation of the legal (in)security present in smart contracts and how this can influence its diffusion in the business environment. From this, the objectives of conceptualizing smart contracts and explaining the applicability of programming and blockchain networks in the legal universe in business practice were stipulated.

Finally, it was found that the potential for use of the technologies presented is great, moreover, that the regulation of this new economy (crypto economy) can help popularize its use, since it will represent legal certainty to the user.

## 2. SMART CONTRACTS: GENERAL CONCEPTION

The beginning of this discussion permeates the contractual universe, therefore, for a better understanding of smart contracts, we will first make a brief note about contracts, since they are the essence of the discussion. According to experts [4, 11], a contract is a kind of legal transaction that results from an agreement of wills between two or more parties, precisely when these parties intend to create, modify or terminate rights in accordance with the legal order, creating in its content an individual legal rule capable of regulating the relationship created between the parties, furthermore, establishing rights and obligations, whose noncompliance is capable of generating sanctions and penalties, provided that it is a valid legal transaction.

Article 104 of the Brazilian Civil Code<sup>1</sup> provides for the assumptions of validity of a legal transaction, which are: to be performed by a capable agent, having as purpose a lawful, possible, determined or determinable object, in a form prescribed or not defended by law<sup>2</sup>.

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<sup>1</sup> BRAZIL. Law n° 10.406, January 10th, 2002. Establishes the Civil Code. Diário Oficial da União: section 1, Brasília, DF, year 139, n. 8, p. 1-74, January 11<sup>th</sup>, 2002. PL 634/1975. Retrieved from [https://www.planalto.gov.br/ccivil\\_03/leis/2002/110406compilada.htm](https://www.planalto.gov.br/ccivil_03/leis/2002/110406compilada.htm)

<sup>2</sup> Art. 104. The validity of a juristic act requires: I - a capable agent; II - a licit, possible, determined, or determinable object; III - a form prescribed or not defended by law. Retrieved from [https://www.planalto.gov.br/ccivil\\_03/leis/2002/110406compilada.htm](https://www.planalto.gov.br/ccivil_03/leis/2002/110406compilada.htm)

Therefore, as the contract is a legal transaction, in order for it to be legally valid it is necessary to comply with the three essential requirements, which are subdivided into subjective, objective and formal [4] and which make up the Pontean Ladder of existence, validity and effectiveness.

Although the Brazilian legislation contemplates contracts whose solemnity is a validity requirement, such as the real estate purchase and sale contract that requires the form of a public deed for goods whose value is higher than thirty minimum wages, there is no form required in the Brazilian legal system for the formation of smart contracts, there is not even specific legislation to regulate them, therefore, there is no obstacle regarding the validity of a smart contract, provided that the validity requirements exposed above are observed and it is possible to prove its authenticity and integrity, as well elucidated by Jimene [12] when discussing the admission of electronic documents as documentary evidence of legal acts and facts, according to the provisions of the Code of Civil Procedure, provided they have the peculiar characteristics of authorship and veracity.

Nick Szabo was a pioneer when writing about smart contracts, comparing them to a vending machine, due to its characteristic of formalizing and executing a certain contract autonomously from pre-determined commands, since the deposit of the amount required by the buyer would be enough for the machine to confirm the payment and deliver the chosen product without the need for the presence, in loco, of a person in the sales position.

Szabo further conceptualizes the smart contract as a set of promises and protocols in which the parties make promises and fulfill them [24, 25]. Currently these protocols are written in programming language and can be inserted in a blockchain<sup>3</sup>, in which case they will be automatically executed as the parties confirm the fulfillment of their obligations.

It should be noted that the term "smart" is used because of the ability of the program, whose contractual terms were written, to execute the promises contained therein from the confirmation of the programmed commands and without the need for a relationship with a trusted third party between the

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<sup>3</sup> A blockchain is a simple chronological database of transactions recorded by a network of computers. Each blockchain is encrypted and organized into a smaller data set called a "block". Each block contains information about a certain number of transactions, the reference of the previous block in the blockchain, and the answer to a mathematical puzzle, which is used to validate the information contained in each block. Each computer on the network contains a copy of the blockchain, and these computers synchronize the information periodically to ensure that they all contain the same information.

parties, therefore, it is enough that both parties trust the code and the network used to write and insert the contract that will be signed between them, regardless of their location.

The discussion about the concept of smart contract has sharpened in recent years, and from it, Josh Stark pointed out two distinct definitions for smart contract, namely, Smart Contract Code and Smart Legal Contract [21]. The first term is used by professionals linked to programming and computer science to define the technology related to the code or program inserted in the blockchain capable of executing commands written in programming language, the second term is related to the legal conceptualization of the use of smart contract code for the formalization of a legally valid contract capable of being protected by law.

For Pinheiro "[...] smart contract can be understood as the set formed by the contract and the software used in its execution (Pinheiro, 2021). [...]". Authors such as Divino, on the other hand, restrict the concept of smart contract considerably [5]:

[...] unilateral or bilateral legal business, almost inviolable, imperative, previously agreed upon in writing or verbally, reduced to the appropriate computer language (algorithms) and expressed in a digital term that will represent *ipsis litteris* the previously agreed upon, stored and executed in a decentralized database (*Blockchain*), to manage it autonomously and automatically from its formation to its termination - including conditions, terms, charges, and eventual clauses of civil liability - with the aid of software and hardware, without the interference of third parties, aiming at reducing transaction costs and eventual legal expenses, provided that legal and economic principles compatible with the contractual relationship established are applied.

However, this is a very restricted concept, since it is not necessary to aim for the reduction of transaction costs and eventual legal expenses in order to form the smart contract, although, in fact, the reduction of transaction costs and eventual legal expenses may be considered advantages of a smart contract compared to traditional contracts, however, they are not essential features for the formalization of the smart contract, moreover, furthermore, nothing prevents the smart contract code from being written for another network instead of a blockchain network, since the factor that makes a contract be considered smart is its ability to perform the terms adjusted without the need for human interference, therefore, it is the machine intelligence that differentiates a simple contract from a smart contract, thus, it becomes restrictive to conceptualize the smart contract together with the technology used contemporaneously with the text considering that technology is in constant evolution.

Therefore, from a broader perspective, one can see that the smart contract is an unilateral, bilateral or more than two parts in a legal transaction, whose terms are reduced to a computer language expressed in a computer program capable of managing it autonomously and automatically.

Having made these initial conceptual considerations, it is important to elucidate the distinctions between smart contracts and e-contracts.

Electronic contracts or e-contracts are formed by electronic means of communication, especially the internet. Anderson Schreiber argues that the e-contract could not be considered another contractual genre, but only a means of electronic contracting (Schreiber, 2014), in this sense Bandeira corroborates by providing that "[...] smart contracts do not consist in a new type or contractual species; but in a technological means for contract formation [...]" [Author's translation] [1].

Thus, any contract formed by electronic means could be considered an e-contract, whether they are adhesion contracts, whose signature is the acceptance issued by the contracting party through the website or computer program, or the contracts inserted in platforms that enable the reliable collection of the electronic signature.

That said, it can be said that every smart contract is an e-contract, but not the opposite, because the smart contract has unique features that are not applicable to any electronic contract, which will be analyzed below.

The smart contract needs to be written in algorithms or other computer language of a certain software to dictate and execute the terms of the agreement, thus creating a computer program through the smart contract code, on the other hand, other electronic contracts do not need such technological complexity, it is enough that they are formed by electronic means.

In the wake of Divino an essential feature of the smart contract is that it is autonomous, that is, once its protocols are programmed, the contract performs its programming regardless of the will of the parties, however, it is not to be forgotten that not every e-contract has this feature, only the smart one [5].

Once the smart contract code is inserted in a blockchain it will not be possible to make any amendments considering the level of technological advancement today, that is, it is not possible to have an amendment term capable of modifying the terms written in a smart contract, however, in other

electronic contracts this will be possible by simply inserting the amendment term in the same platform and collecting the signatures of the parties.

Thus, it can be said that the e-contract is a genus of which the smart contract is a species, and for a better understanding of the subject, it is necessary to situate the noble reader in relation to the blockchain, bitcoin and Ethereum.

In the line of Aaron Wright and Primavera de Filippi, blockchain is a platform that works as a distributed database with chronological records of transactions recorded by a network of computers, in which each blockchain is encrypted and organized into a set of smaller blocks that contain the information about a certain number of transactions accompanied by information from previous blocks and the answer of a mathematical puzzle, called hash, which is used to validate the data associated with each block [24].

Each computer has a copy of this blockchain that is synchronized with the other copies of the network periodically to ensure that everyone has the same database so that no one can defraud the network without requiring more effort than the potential reward for defrauding it.

So, for Aaron Wright and Primavera de Filippi:

*A blockchain is simply a chronological database of transactions recorded by a network of computers. Each blockchain is encrypted and organized into smaller datasets referred to as "blocks". Every block contains information about a certain number of transactions, a reference to the preceding block in the blockchain, as well as an answer to a complex mathematical puzzle, which is used to validate the data associated with that block. A copy of the blockchain is stored on every computer in the network and these computers periodically synchronize to make sure that all of them have the same shared database<sup>1</sup>*

Thus, in the wake of the authors, one can state that a blockchain is equivalent to the ledger of a notary's office, since everything that is done in that program will be recorded, however, unlike the latter, there is no need for a server endowed with public faith to validate that information, because these are validated by anyone who uses the network, thus ensuring the authenticity of the information since it is confirmed by thousands of people who have no interest in it.

Mazzola and Lundgren teach "[...] it is literally a chain of blocks in which data of any nature is stored. It is as if the technology were a big digital ledger, where all kinds of transactions are registered

[...]" [13] This technological innovation is of utmost importance to smart contracts, however, its utility is infinitely greater, for those authors "[...] the potential for use of this technology is practically infinite [...]"

After that, the concept of cryptocurrency will be exposed, which, according to experts [20] is a digital representative of values, whose issuance is not linked to a central authority of currency issuance, nor intertwined with a common fiat currency, but is accepted as a means of payment and can be stored in a digital wallet.

Bitcoin, in turn, is a cryptocurrency that was created by a person, or group of people, using the pseudonym Satoshi Nakamoto, programmed in open-source code in a peer-to-peer system, in which there is no central server or authority able to control its issue, which in turn is done through a process called mining. Mining is a process that involves the computational ability to solve a mathematical problem while processing the transactions made on the network.

The revolutionary potential of this technology provokes discussions in several areas of scientific knowledge, from programmers and economists to political scientists. With this in mind, Fernando Ulrich conceptualizes bitcoin for the legal universe as an intangible asset, as follows:

[...] Bitcoins, as a monetary unit, are best considered an intangible good that, in certain markets, have been accepted in exchange for goods and services. We could say that these transactions constitute an exchange, and never a sale with payment in cash, as currency in each jurisdiction is defined by force of law, and is the exclusive prerogative of the state (Ulrich, 2014).

Ethereum, in turn, was created by Vitalik Buterin and consists of a blockchain platform that is equivalent to bitcoin, however, was not created with the intention of becoming digital currency, because its main function is the use of smart contracts. In this sense, authors Mazzola and Lundgren state that in addition to the implementation of smart contracts, the Ethereum network enabled "[...] the creation of voting systems, registration of property titles and, potentially, registration of any type of information and/or object, especially in the digital environment. The platform's currency is called ether and is used to reward the platform's miners, as well as being the platform's medium of exchange to enable the use of smart contracts. Undoubtedly, it is the largest smart contract platform today as it is able to perform the full turing, according to Gavin Wood (Wood, 2017).



Conceição argues that within Ethereum it is possible to create smart contracts written in high-level computer language, which are converted to Ethereum bytecode, after which it will be inserted into the Ethereum blockchain to be executed [3].

That said, it is salutary for the popularization of smart contracts that the security of blockchain networks be duly proven, because it is undeniable the revolution that the use of this technology can bring to the legal universe, which will be demonstrated below.

### 3. SECURITY IN SMART CONTRACTS

It is known that technology is present in contemporaneity, so much so that any breakdown in the system and the lack of connection leads to financial losses and a real chaos in the business world, as it happened on October 04, 2021, when a problem in the WhatsApp, Instagram and Facebook systems caused an absence of communication in an interval of approximately 7 (seven) hours, costing Mark Zuckerberg more than 6 billion dollars and the position of 4th richest in the world to Bill Gates (Uol, 2021).

This insecurity leads, therefore, to conservatism and a certain resistance in the adoption of technologies for the execution of contracts. Nowadays, there is a very important security tool used in several technological sectors, namely cryptography, therefore, understanding cryptography is fundamental to study the security system of smart contracts.

Firstly, we must emphasize the difference between steganography and cryptography, since they are two different techniques, in which steganography seeks to hide a message without obscuring its content. Cryptography, on the other hand, differs from steganography and, according to Fiarresga, its true role is to hide the information so that, even if someone intercepts the message, they will not be able to understand it [9].

A curious fact is that Herodotus reported how Histieu transmitted a certain message to Aristagoras telling that Histieu shaved the head of an individual and wrote the message on his scalp, then waited for the individual's hair to grow back and sent him to meet Aristagoras, In this situation, this would represent steganography, you see, in this example, if the individual was intercepted and the interceptor shaved his

head, he would have no difficulty in understanding the meaning of the message that Histieu sent to Aristagoras.

Otherwise, according to Fiarresga, cryptography uses several ciphers throughout time, varying according to their sophistication. It should be noted that only in the second half of the last century asymmetric ciphers started to be used, which means that from that moment on the key used to encrypt a message would no longer be the same as the one used to decrypt it, since two keys started to be used, one of them public and used to encrypt the message and the other private, which has the function of decrypting the message.

About asymmetric cryptography, Pereira and Nascimento "in this asymmetric model, the public key can be shared among all members who will make the communication; however, the private key is kept secret [...]" [Author's translate] (Pereira and Nascimento, 2021).

Sanas exposes that this type of cryptography with asymmetric cipher is used in blockchain networks such as bitcoin and ethereum granting a higher level of security for the user who has two keys, one public, which is used to identify his wallet on the network and another private, which has the function of authorizing access to his wallet (Sanas, 2021).

Another security tool that blockchain networks offer the user is consensus (mining), which consists in confirming the movements made on the network in a decentralized manner, through the solution of a mathematical equation. Now, imagine a person wants to transfer a certain amount of bitcoins to another, in which case the transaction will go through the validation process (consensus) before it is confirmed by the network, thus preventing fraudulent transactions, whether in an attempt to manipulate the network with duplicate transactions or hacker attacks in order to alter information recorded in the blockchain.

Having exposed the main technical security tool, not only of smart contracts and the so-called crypto-economy, a brief study will be made on the legal security related to smart contracts. A priori, it is necessary to consider that there are no legal impediments for the use of smart contracts, since for the existence of a legal business it is enough that the requirements of article 104 of the Civil Code of 2002 are observed, moreover, there is no legal form prescribed by law for the formation of these contracts, therefore, it is perfectly possible that an agreement is formalized by means of a smart contract, in this line, "implications were found as to the validity and effectiveness of legal business instrumented in smart

contracts, especially with the claim that the principle of the social function of the contract is an obstacle to the validity [...]” (Sanas, 2021).

One should not forget that the social function of contracts is provided for in article 421 of the Brazilian Civil Code and, therefore, it must also be observed in smart contracts, since it is a general clause of contract law.

Thus, although Efig and Santos have concluded that the principle of the social function of contracts would prevent the implementation of smart contracts in Brazil, the authors did not consider all the possible functions of this technology, because even if the insertion of the smart contract in the blockchain makes it immutable, nothing prevents that, provided that prior to the insertion in the blockchain, mechanisms to control the execution of the contract are programmed, or even that a reverse operation can be performed to correct any error in execution [6].

To make this situation possible, it was suggested "the figure of the 'Judge as a Service', a kind of arbitrator with technical powers to reverse or change transactions performed through smart contracts on the Blockchain [...]".

But it is worth noting that throughout the research were not found authors who support the idea of changing transactions, however, this does not make less impactful the figure of the judge as a service, in this sense, Sanas explains that the use of smart contracts for alternative dispute resolution is easy to develop and can increase efficiency and reduce transaction costs.

Judge as a Service is very similar to the figure of the arbitrator, already consolidated in Brazilian law through Law 9.307/96<sup>4</sup>, which allows the parties to elect the arbitration court to resolve conflicts, in accordance with the provision of Article 2 of that law, *in verbis*:

Art. 2 The arbitration may be of law or of equity, at the discretion of the parties.  
§ 1st The parties are free to choose the rules of law that will be applied in the arbitration, provided they do not violate good customs and public order.  
§ 2nd The parties may also agree that arbitration be based on general principles of law, usages and customs, and international rules of trade.  
§ 3rd The arbitration involving the public administration will always be in law and will respect the principle of publicity.

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<sup>4</sup> BRAZIL. Law 9.307 de 1996. Brasília, DF: Presidency of the Republic. Available at: [http://www.planalto.gov.br/ccivil\\_03/leis/19307.htm](http://www.planalto.gov.br/ccivil_03/leis/19307.htm). Access in: october, 26th, 2021.

In addition, the Civil Code after the changes introduced by Law 13,874/2019<sup>5</sup> safeguards the compliance with the principle of minimum intervention and the exceptionality of contractual revision in private relations, thus strengthening the principle of *pacta sunt servanda*.

In this sense, even before the Economic Freedom Law (13.874/2019)<sup>6</sup> came into effect, the Brazilian courts have already decided for the application of the principle of the autonomy of the will and the mandatory force of the agreements (*pacta sunt servanda*) to business contracts, as per the content of REsp 936. 741/GO under the Rapporteur of Minister ANTONIO CARLOS FERREIRA, in the FOURTH GROUP, whose judgment was held on 03/11/2011 and published in the DJe 08/03/2012, as well as in special appeals 1910582, 1644890, 1799627, 1691008, 1441620, 1409849 and 1413818 all judged by the Superior Court of Justice.

Therefore, the apparent conflict between the immutability feature of smart contracts and the principle of the social function of the contract and even the *rebus sic standibus* clause does not prove to be a major obstacle for its use.

Nevertheless, considering the applicability of smart contracts in foreign trade transactions, the immutability of smart contracts is not an obstacle in the eyes of international law, since, according to Pinheiro (2021), the autonomy of the will is a principle of Private International Law common to most national systems.

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<sup>5</sup> BRAZIL. Law 13.874 from 2019, **Establishes the Bill of Rights for Economic Freedom**. Brasília, DF: Presidency of the Republic. Article 421, § sole. Available at: [http://www.planalto.gov.br/ccivil\\_03/\\_ato2019-2022/2019/lei/L13874.htm](http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2019/lei/L13874.htm). Access in: october, 26th, 2021.

<sup>6</sup> BRAZIL. Law 13.874 from 2019, **Establishes the Bill of Rights for Economic Freedom**. Brasília, DF: Presidency of the Republic. Available at: [http://www.planalto.gov.br/ccivil\\_03/\\_ato2019-2022/2019/lei/L13874.htm](http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2019/lei/L13874.htm). Access in: october, 26th, 2021.

#### 4. APPLICABILITY OF BLOCKCHAIN PROGRAMMING AND NETWORKS IN THE BUSINESS ACTIVITY

The blockchain technology and smart contracts have been generating impact on the world economy due to its popular use with cryptocurrencies, however, there are countless other activities common to the legal universe that can be impacted by the use of this technology.

This is what is inferred from the intelligence of Sanas apud Santa Cruz "the more crypto active products consolidate, the smarter contracts will also consolidate, I think they are very closely linked [...]"(Cruz, 2021).

Thus, it is possible to state that smart contracts have great potential to overcome the problem of distrust between the parties, due to their attributes of self-execution and immutability, which represents a very important differential in the business environment, especially.

Moreover, as demonstrated elsewhere, the blockchain can be compared to a ledger, due to its feature of immutability of the information entered and authenticated, thus, in view of this immutability and granting of legal security to formalized acts, the use of blockchain has also significantly impacted the notarial activities in Brazil, so much so that the National Council of Justice (CNJ) through Provision No. 100, of May 26, 2020, regulated the practice of electronic notarial acts using the e-Notary system, which is able to perform notarial acts digitally.

Also, in 2020 the Notarchain project emerged, which aims to allow the validation and authentication by the notaries of documents in digital form through Provision No. 100/2020<sup>7</sup>, with this, the Brazilian College of Notaries intends to make each notary's office a validation node of the e-Notary network and, for this, has been using the Hyperledger Fabric blockchain.

It also highlights the practicality that blockchain technology grants to the procedure of registering works for the protection of intellectual property, for Mazzola and Ludgren "[...] The registration of creations in blockchain allows, therefore, robust proof of authorship and the exact moment of creation of original works (Mazzola, 2021)".

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<sup>7</sup> BRAZIL.CNJ. **Provision n° 100, may, 26th, 2020**. Provides for the practice of electronic notarial acts using the e-Notary system, creates the Electronic Notary Registration-MNE and makes other provisions. Available at: <https://atos.cnj.jus.br/atos/detalhar/3334>. Access in: october, 18<sup>th</sup>, 2021.

The use of this technology cumulated with smart contracts would make possible automatic applications for licensing the use of works by third parties, with automatic remuneration for the artist, outside the intellectual property branch, it would also be possible to write off in fiduciary alienation, For example, as from the confirmation of the payment by the smart contract, the smart contract would automatically, without the need for human intervention, proceed with the write-off procedure at the real estate registry, which would undoubtedly represent the celerity of the procedures and debureaucratization of the system.

Moreover, it is also worth mentioning that the Internet of Things is in vogue, which in the words of Santos "is nothing more than an extension of the current Internet, which allows everyday objects (whatever they may be), but with computing and communication capabilities, to connect to the Internet." (Santos et al, 2016).

In this way, combined with the IoT (Internet of Things) it is possible, for example, for a smart contract to be able to shut down or reduce the operation of vehicles from the moment the purchase and fiduciary alienation of the vehicle are programmed into the smart contract, therefore, the lack of payment of the installments will trigger the command provided in the contract code and automatically may, even before the creditor takes legal action, turn off the functions of the vehicle, subject to the technological conditions of the vehicle, obviously, which will reduce the cases of concealment of assets to avoid liability.

The significant economy of time and resources that would be spent by the creditor when he or she calls the Judiciary to declare the search and seizure of the vehicle will be remarkable, thus reducing the risk of it being stolen and transported to an uncertain place. Even if it is, current technology makes it almost common to locate vehicles in real time.

Another possibility of use of smart contracts applied in blockchain networks are the Decentralized Autonomous Organizations (DAO), which work from the interconnection of several smart contracts and according to Porto, Junior and Silva these have the function of codifying the rules of operation and the structure of an organization (Porto et al., 2019).

The use of smart contracts can be of great value to the so-called cost sharing contracts, which according to Estrada and Bez-Batti are contracts that aim to apportion the costs of research, development

and services, since smart contracts have the ability to debit pre-determined accounts with previously defined values, thus facilitating the apportionment of expenses [7].

Furthermore, much has been discussed about Decentralized Finance (DeFi), which consists of decentralized finance protocols controlled by governance tokens that entitle their holders to vote on these finance protocols. This type of use allows overly bureaucratic and time-consuming practices to be carried out with extreme efficiency and time savings, however, like everything involving smart contracts, its use is still in the experimental phase.

Tokens, in turn, are digital certificates that represent some item, fungible or non-fungible (NFT) and that are commonly transacted on a blockchain, in the meantime, according to Mazzola and Lundgren "[...] on the blockchain network, virtually any item of any nature, whether physical or digital, can be represented by means of a token".

Tokens are very useful for smart contracts and represent in bits and bytes existing physical assets. Recently tokens representing a farm in Arapuanã<sup>8</sup> were issued to finance a mining project on its land. At the time, each token issued represented a portion of the land on this farm.

This "tokenization" economy has been growing a lot and, as a result, has drawn attention to a discussion about the need for registration of the public offering with the Securities and Exchange Commission (CVM), which, in turn, through the Administrative Sanctioning Procedure 19957.003406/2019-91 considered that a certain company offered tokens in an irregular manner.

In this procedure, it was discussed whether the crypto asset offered should be considered a security in Brazilian law or not and, considering that the asset was publicly offered, purchased by people in a collective venture in expectation of profits, it was concluded that it was in fact a security, resulting in a fine to the issuer for offering securities irregularly.

Given these situations, there is still uncertainty regarding the development and spread of the use of smart contracts and blockchain, which can be justified due to the lack of regulation, a fact that causes uncertainty for people. However, the national regulatory bodies have been moving in this direction. The

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<sup>8</sup> Cointelegraph. (2020). "Fazenda de Ouro no Amazonas será tokenizada no Ethereum e se tornará uma das primeiras cryptoproperty do Brasil". Available at <https://cointelegraph.com.br/news/farm-in-amazonas-becomes-cryptau-the-first-fully-tokenized-property-in-brazil>

Brazilian Federal Revenue Service, for example, through Ordinance No. 1,074<sup>9</sup>, published in June 2019, dispensed with formalities for the provision of information to the Individual Taxpayer Registry (CPF) and the Corporate Taxpayer Registry (CNPJ) if shared through blockchain. This is what can be inferred from the content of Article 1 of the aforementioned Ordinance, in verbis:

Art. 1 The formalization of adjustments in existing agreements for the supply of information from the Individual Taxpayer Registry (CPF) and the Corporate Taxpayer Registry (CNPJ) to agencies, autarchies and public foundations of the Union, the States, the Federal District and the Municipalities, in the event of adoption of data sharing through:

I - blockchain permissioned network;

II - web services or application programming interface (API).

Furthermore, Normative Instruction 1.888/2019<sup>10</sup>, also issued by the RFB, presented a legal definition of crypto active, *in verbis*:

Art. 5 For the purposes of the provisions of this Normative Instruction, the following are considered

I - crypto-asset: the digital representation of value denominated in its own unit of account, whose price can be expressed in local or foreign sovereign currency, transacted electronically with the use of cryptography and distributed record technologies, which can be used as a form of investment, instrument for transfer of values or access to services, and which does not constitute legal tender;

Certainly, the subject under discussion still lacks legal regulation for the use of these technologies to be better used by society. However, in the wake of Sanas the interdisciplinary approach bringing together lawyers, developers and economists could contribute to the agility of this process and the issue of rules and regulations capable of enabling the development of these applications.

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<sup>9</sup> BRAZIL. Federal Revenue of Brazil. Ordinance RFB n° 1074, June 18th, 2019. Waives the formalization of adjustments to agreements in effect for the supply of registration information to organs and entities of the public administration, in the cases mentioned. Available at: <http://normas.receita.fazenda.gov.br/sijut2consulta/link.action?visao=anotado&idAto=101770>. Accessed in: October 26th, 2021.

<sup>10</sup> BRAZIL. Federal Revenue of Brazil. Normative Instruction RFB n° 1888, May 3rd, 2019. Establishes and regulates the obligation to provide information regarding the operations performed with crypto active products to the Special Secretary of the Federal Revenue of Brazil (RFB). Available at: <http://normas.receita.fazenda.gov.br/sijut2consulta/link.action?visao=anotado&idAto=100592>. Accessed in: October 26<sup>th</sup>, 2021.



It is obvious that, nowadays, a revolution in contracting instruments in general cannot be delayed, since their widespread use, whether as a complete replacement for simple instruments such as instantaneous purchase and sale agreements or as tools to facilitate the formation of more complex instruments, would represent an important advance in the globalized and negotiating world.

Nevertheless, this storyline has also shown that although smart contracts are revolutionary they are not capable of replacing more complex instruments loaded with subjectivity, as may happen in corporate transactions such as mergers and acquisitions, which are integrated of several documents, such as *memorandums* and letters of intent, however, in contracts for the acquisition of products, goods, raw materials and other instruments or goods for the operation of the company's activities, the smart contract may certainly speed up the process, besides being less expensive because it would put the businessmen in contact independently of the collaborators.

It is undeniable that the tools studied here will remain permanently in the legal universe and, it is essential that lawyers, servers and judges use ICTs in their favor, since these exist to help these professionals in their work, in this sense, even if blockchain technology and smart contracts are removed from the category of Information and Communication Technology for technical or conceptual reasons, professionals should look at them with the same care.

## 5. CONCLUSIONS

Despite the doctrinal divergence about the degree of innovation that smart contracts along with blockchain technology can provide in the contractual practice, it is common ground that these technologies have conquered a definitive space in humanity and, consequently, in legal practice, so much so that the theme has been growing along with the use of these tools in Brazil.

Proof of this is the emergence of the Notarchain in the Brazilian notarial system, thus indicating that the notaries were the first to advance in this direction, even if with a certain timidity.

The tokenization of assets has also shown itself to be quite advanced, but, despite the level of technological security being quite satisfactory to users, the lack of regulation is still an obstacle to the propagation of the crypto economy, as well as to its reaching various layers of the Brazilian population.

Furthermore, the research found that the use of smart contracts in business activity is too attractive, due to its almost infinite potential combined with blockchain and IoT, however, further development of the crypto economy will be necessary to understand the limits of smart contracts.

It is not to be forgotten that traditional contracts are likely to be radically replaced by smart contracts, given their ineffectiveness in the formation of documents of complex matters, namely, corporate transactions and contracts with great subjectivity.

Therefore, we conclude that the development of the crypto-economy and the effective regulation of crypto-activities are essential to ensure legal certainty and financial security and, consequently, enable the widespread use of this technology in business activities.

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