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Blockchain in the New Era of Smart Contracts

Norberto Novoa Torres[1], Stiven Andrés Delgado Artehaga[2], Sergio Andrés Guerrero Cepeda[3]

[1, 2, 3] Universidad Distrital - Francisco José de Caldas, Bogotá, Colombia.

[1]Master in Education with Emphasis in Educational Informatics, Engineering Department.
[2]Telematics Engineer, Universidad Distrital Francisco José de Caldas.
[3]Telematics Engineer, Universidad Distrital Francisco José de Caldas.

Abstract

In this document, a review is carried out that will reveal what smart contracts are, their advantages, their characteristics, as well as the state in which they are currently and the different applications that they have had so far. development with this blockchain-based technology. So far, smart contracts have had a very large impact worldwide, since they are contracts developed so that they can be executed automatically once the different parties have determined the terms that must be met. We surely see this as something distant, due to how many contracts are still carried today, in the typical paper that we must sign and enforce. So, what could we have or do to make the contracts run by themselves? It is a question that we will solve in the course of the article.

Although we have that smart contracts are a little different from the common contracts that we all know, both are contracts in which two or more parties are involved and must meet certain conditions for this to be fulfilled. However, smart contracts are applications or a decentralized code where one of their characteristics and differences with the typical contracts signed on paper is to save the need for intermediaries, such as lawyers. In addition to the fact that these are safer and faster in terms of their execution, several studies are currently being carried out and many of the industries worldwide are adopting these contracts as an option to see the advantages and the impact that this new technology is generating worldwide.

Keywords: Smart Contracts, Blockchain, Voluntary Consent.

1. INTRODUCTION

Smart contracts are more increasingly used than is believed, currently there are several types of contracts that are used to fulfill a series of conditions agreed between two or more people; these agreed conditions are taken to a document that is then signed by the parties, which makes it a legal document before the corresponding institutions, there may also be other types of less used contracts, such as: verbal, and these depending on the type of conditions or negotiations carried out by the parties involved.

Smart contracts, on the other hand, are a type of software that uses blockchain technology for their development.Since they are a type of software like any other, it does not need intermediaries as is the case with paper contracts or other types of contracts which need a series of procedures and lawyers for its development, this being one of the advantages of smart contracts in terms of costs and times.

These contracts are developed so that they have the ability to take actions and to process measures which must be fulfilled by two or more parties, which makes it 100% more effective than common contracts, being another of its advantages, the security both in technical and legal terms and other aspects that must have a contract.

2. METHODOLOGY

The methodological approach of the following work is based on a theoretical investigation that describes smart contracts, where a documentary-type analysis is carried out in which a general search was previously accomplished on the subject proposed in books, articles, examples and current developments found on the Internet and is publicly accessible.

In the first phase, we sought to collect all the possible information for the development of our topic in order to subsequently make a selection of the information collected that helps to build and generate a document with the most important and relevant aspects from its creation to the present.

Since the focus of our research is current technologies and developments that until now are beginning to be implemented not only in Colombia if not in different countries of the world, it was sought to have recent information of no more than 10 years in order to have an article that helps to highlight the most important aspects of smart contracts today.

3. THEORETICAL FRAMEWORK

The growth of technology is going faster and faster, which helps us to streamline and / or improve processes today, such is the case of smart contracts. Smart contracts are codes created in a programming language that runs in a very secure way by the technology in which it is developed (Blockchain) which makes it a self-executing application and almost impossible to be modified, within the software or program are included the clauses, guidelines, conditions and the entire body of the contract that will be executed and signed by the parties, which in this case may be two or more people without the need to hire a third party to act as an intermediary and make the contract comply.

3.1 Historic context

The concept of smart contracts appeared in 1994 for the first time by the Computer Engineer Nick Zsabo at that time it appeared as a protocol that was capable of executing the clauses of a contract. In his design, Nick Zsabo wanted to achieve a

system that would meet the contractual needs of a contract and avoid the existence of third parties or intermediaries. At the same time, by this time the web was on the rise and the concept of the Internet was beginning to take hold, which would help commercial and financial processes, However, insecurity problems also came with them, as the data began to be exposed on the network, which facilitated fraud and generated a potential risk; It is thus then that they also began to speak of creating a virtual currency that had the same value as cash, which occurred only up to 15 years later with the Bitcoin protocol which was invented by Satoshi Nakamoto, this would solve many problems and open the doors to generate and implement various systems that required this technology which was called "Blockchain" which then allowed us to carry out any type of online transactions safely. After defining this new technology, the doors were opened and finally what Nick Zsabo wanted at the time was to open the world to the use of smart contracts.

3.2 Main Features of Smart Contracts

As we have mentioned throughout this article, one of the main characteristics of smart contracts is that they are executed automatically and autonomously without the need for third parties and any type of mediator that may favor any of the parties involved in the contract. Another of its important characteristics is that they are self-adjusting, which means that once the contract is in progress or is executed by the parties, it can no longer be stopped or modified under any circumstances. Although some of the main characteristics have already been mentioned, we also have some others which are:

- **Autonomous:** Smart contracts are programmed to perform any type of action or task, making them applications that work independently.
- **Transparent:** Since smart contracts are developed under Blockchain technology, their code is visible and open to anyone who has an interest in them.
- **Immutable:** This being one of the most important characteristics of smart contracts, since once they are implemented they cannot be modified by any of the parties, they can only be eliminated if and only if, in the development of the program, a function was created prior to allowing it; in other words, smart contracts can be defined as tamper proof software code (Tamper Proof Code).
- **Trustworthy:** As we have already mentioned, smart contracts, like conventional contracts, can be executed for two or more people depending on the type of contract, this feature allows the parties to interact with the contract without the need to know or trust each other ; due to Blockchain technology that guarantees security and that the contract data is accurate.
- **Deterministic:** Smart contracts will only perform the tasks that were programmed in their software code, which guarantees that the result is always the same no matter which party is who executes it.

3.3 Smart Contracts Advantages

Once it is clearer what smart contracts are and what their characteristics are, there are also a lot of advantages or benefits, the advantages are obvious, and can be reduced to three words: autonomy, security and trust. Using smart contracts it is no longer necessary to resort to a third party such as a lawyer or a notary, which in addition to being prone to errors, causes significant expenses. The blockchain is capable of safeguarding information in an encrypted network that can be consulted from anywhere in the world, so speed and security are obvious. Apart from the aforementioned, we also have some important advantages, which are defined as follows:

- **Autonomy:** It is not necessary for a lawyer to review the contract, the parties involved in it will simply participate.
- **Costs:** Since they do not depend on third parties or any type of intermediary, costs are significantly reduced.
- **Trust:** Smart contracts go directly to a Blockchain which makes them encrypted and only the parties involved can read it.
- **Security:** Executing smart contracts could generate certain risks or security problems. However, one of the advantages is that because it is based on blockchain technology and everything is recorded in an immutable way, it is impossible for someone to make the contract disappear or modify it in some way. In addition to the fact that the documents are encrypted, which helps to reduce hacking and makes it almost impossible to access the contracts.
- **Speed:** Being applications developed in a programming language and having all the processes that will be executed automated, increases the efficiency, response and speed of the business processes in which smart contracts are used.
- **Backup:** As they are in blockchains, contracts are duplicated a great number of times, thus providing backup copies for the parties involved.

3.4 How Do Smart Contracts Work?

While a conventional contract is a verbal or written agreement expressed in common by the parties involved, an agreement that must be reviewed by a lawyer verifying each of the guidelines described, smart contracts or smart contracts are programs that execute exactly what the developer codifies.

3.5 Applications In Smart Contracts

Since the arrival of Smart Contracts, different types of applications have been presented in which their use has facilitated and improved the processes in the companies or entities that implement them, within the applications with the most uses we have:

Registration and Properties Change:

You can register the information of the delivery documents of a property as well as change its ownership through smart

contracts, currently some European countries are implementing this technology to redesign the systems in real estate.

- **Insurance:** Insurance industries globally lose hundreds of millions from claims. In addition to the fact that their processes are often delayed and depend a lot on third-party validation, smart contracts help to improve the entire claims process, these could help to detect and handle faster all the criteria that must be validated when making valid insurance.
- **Energy Transactions:** Blockchain is allowing greater autonomy to all consumers and producers of the energy sector today, there are already many companies that have seen the benefits of smart contracts in this sector since with these it is possible to achieve transactions of energy supplies, guarantees, management of assets, emission rights, energy certificates and the use of cryptocurrencies as payment methods, thus changing all these manual methods that are currently available for automatic methods through smart contracts.
- **Voting:** Although it is not currently being applied, it is known that electoral fraud is becoming more and more common, so one of the solutions that could be given to this problem would be to change the current voting system for an electronic voting system through smart contracts. They could be used to validate the identity of the voters as well as to record their vote and all this because one of the characteristics of the contracts is that the information cannot be altered once recorded.
- **Intellectual Property:** When the royalties or copyrights of a process, product or service are shared, it is a bit complicated to manage the distribution of the income obtained, so a solution would be to automate this process through smart contracts. At present, the United Kingdom has started to make this type of contracts in the video game industry.
- **Real Estate Sector:** The use of smart contracts in the real estate sector obtains improvements in transactional processes, as well as the cost savings that this sector spends on the use of intermediaries. Cost savings could not only occur in these aspects but also the costs of valuation of homes and properties, expert rates and legal costs. With this implementation in this sector it could also be given that sellers could have the ability to carry out transactions directly.

As we can realize the applications of smart contracts are quite a lot and with the passage of time we will not only have some sectors but we could handle any type of sector that implies value or we could even handle things as simple as the loan of money to another person.

4. BLOCKCHAIN FOR SMART CONTRACTS

Although we have talked a lot in this article about blockchain technology and how it has been of great importance in the development of smart contracts, since without this it would be almost impossible to have been able to develop and / or use what we know so far about the contracts. It is also relevant to know what this technology is about and what its impact has been on the development of smart contracts.

The implication of what this technology has achieved is very important, with the beginning of the internet and its entire boom, we all began to exchange or send information to each other. But thanks to what blockchain is, we can more than just transfer information, we can make transfers of monetary value or tangible or intangible assets without the need to depend on any third party such as a notary or lawyer.

4.1 What is Blockchain?

Blockchain is a distributed database connected to several nodes of the network, which makes this a secure database, the big difference that exists between blockchain with the rest of databases is that it does not depend on any central server.

If we talk about Blockchain, maybe the first thing we think about is Bitcoin or some other type of cryptocurrency but it is much more than this, as its name indicates, Blockchain is a Chain of Blocks in which in each chain we have:

- Certain number of valid records or transactions.
- Information regarding each individual block.
- A code or a unique identification for each block.

An important characteristic is that each of the blocks has the information of the previous block, with this it is impossible to lose information since it is deposited in each of the blocks that make up the chain within the network, making it apart from being very safe also very reliable

Considering that Blockchain works as a distributed technology and each of the nodes stores a copy of the chain, it guarantees that there is no loss of information and that there is availability at all times. In the event that a hacker wanted to carry out some type of attack, this would have to carry out the attack on each of the nodes of the network. Since with only one that is working we would have availability of the information, summarizing a little it could be said that Blockchain is a technology that provides us with information with 100% availability and information impossible to be eliminated, modified or that could be lost.

4.2 Technologies Used For The Development Of Smart Contracts

As previously mentioned, smart contracts are nothing more than applications written in programming language. Next, it will be shown which are the development tools used to create these smart contracts:

- **Ethereum:** Ethereum is perhaps one of the most recognized projects within the so-called smart contracts, it is a distributed and decentralized development platform, which means that it is not controlled by any government entity, or any other type of entity. Based on Blockchain technology, Ethereum has created a very complete development environment. This platform has had to develop an entire network from scratch, moving away

from one of the most powerful networks known to date, such as Bitcoin. Over the last few years many developers of this technology use this tool due to its ease and the number of features that this development environment has. This was created in 2015 by the developer Vitalik Buterin, the Ethereum Blockchain is very similar to how Bitcoin works but its programming language allows developers to create applications that can manage and automate transactions, which is what we know as smart contracts.

It is important to mention that being a decentralized system, it is autonomous and does not depend on anyone, that is, it does not have a central point of failure since it runs from the computers of thousands of volunteers around the world, which also means that you will not have problems of connection or crashes of your system. Therefore Ethereum is a powerful open source public development language that allows developers to create decentralized applications.

- **Lisk:** As well as Ethereum, Lisk is also a development platform for smart contracts, Lisk is based on the JavaScript language, one of the most widely known languages globally today.

  Lisk as well as its cryptocurrency LSK have become a great option when it comes to creating decentralized applications and although this was launched just a year after Ethereum is still in the process of growth and development, seeking to become one of the development tools more powerful when creating smart contracts.

- **Tron:** Tron created by Justin Sun in 2017 is another of the development platforms created to create decentralized applications. Tron is known as a language that allows developers a more optimal development for the execution and scalability of applications. It uses a copy of the Solidity smart contract language, which is a programming language created and used by Ethereum but is fully supported by Tron. One of the most important characteristics of this programming language is that it uses Delegated Proof of Stake (DpoS) which serves to verify transactions on the network, thus making the transaction rate much faster compared to other languages. .

- **NXT:** It is considered as a public blockchain platform that has and contains a number of templates that can be used for the development of smart contracts. Unlike the others, this is not a programming language, as it cannot be coded or done any kind of development. NXT is restricted to the number of templates it already has, so if we want to carry out a new development this is not an option.

5. SMART CONTRACTS IN COLOMBIA

Much has been said about this new technology around the world and especially in recent years not only because of the impact it has had on countries, companies and entities, but also because of the advantages that have already been appreciated in its implementation. However, like any other technology, it is not easy to understand and much less migrate to the new technologies that are being presented, such is the case in Colombia that although there is already a lot of information and much research has been done on the subject of Smart Contracts have not ceased to be more than just information, and it is that in Colombia there are very few entities that have begun to wave and implement this new technology.

5.1 Present And Use Of Smart Contracts In Colombia

At present, few Colombian entities take risks and give way to the use of smart contracts. However, there are some projects, such is the case of the Vivelab Bogota company that with the support of some entities such as Mintic, Davivienda, the research center of the National University and Colciencias are developing the land restitution process, which always has presented drawbacks.

The existing information of the properties until October 2018, has the information of the owners, records and documents of the properties. All this data included in each of the nodes of the blocks of the chain. With this project, the entire land restitution process would be carried out in a transparent manner. In addition, it would open a path towards the automation of processes that require high security in its information and that in turn can carry out processes that are unalterable.

Also the Faculty of Engineering of the National University is currently delivering academic certificates with blockchain technology, which implies that the certificates are delivered with transparency, authenticity and trust. One of the things that the University intends is that in the future it is not only them, but also all the universities in the country would join in this type of development.

6. CONCLUSIONS

Smarts Contracts are a technology that in recent years has been growing worldwide and that thanks to the emergence of blockchain, it could become into a reality. Its innumerable advantages and benefits have made many economic sectors carry out studies and become more interested in this subject, And although it has only been a few years since this started being a topic of discussion, there are already some companies that have been able to carry out some projects based on smart contracts. It is that the mere fact the security it provides and the costs that help reduce its implementation, makes more than one industry consider this technology to be applied.

However, it should be clarified that although not all companies have managed to migrate or know very well how this technology works, it has been said that inevitably smart contracts are here to stay. And it is that in just a few years, we will see how all countries will change many of their processes in their industries by adapting smart contracts in them. Not only in industries such as the banking sector, public or private sector. It is also seen that at the moment several software development environments are also being developed and improved and that the growth of developers in the last years of this technology speaks a lot of the progress so far.

It only remains to wait and continue to see how this technology, while it continues to grow, adapts to all sectors that can move

the industry. Since this, like any other technology, needs work and continuous improvement, which can only be achieved with the cooperation of the same society, which is in charge of adapting to the changes that are occurring.

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