Smart Contracts – Support for Successful Businesses

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Smart contracts have been one of the hottest topics over the last few years. They represent a step forward in the progression of blockchains from a financial transaction protocol to an application that automatically implements the terms and conditions of a business agreement. A smart contract is a computer program that runs on a network that uses a consensus protocol that helps the network's nodes make decisions about actions to follow, and is responsible for the network to be trustless. It ensures the automatic and direct transfer of digital currencies, goods, assets, or information between parties without the need for intermediaries. This paper aims to briefly present the smart contract technology, its advantages and disadvantages, as well as several areas that could gain important benefits by implementing new systems based on blockchain and smart contracts.

1 **A short presentation of smart contracts**
A contract is a written agreement between two or more partners, each having their rights and obligations, who decide to give or do something to someone. Its guarantee is given by the force of law, as a legal norm.

Unlike a traditional contract – a paper-based one – a smart contract guarantees the relationships between the involved parties with the help of a cryptographic code. A smart contract is a computer program that embeds the terms and conditions of a contract and is stored and executed on a blockchain-based platform.

Both traditional and smart contracts contain the rules, terms, and conditions of an agreement that establishes business relationships between the involved parties. The main difference between the two types of contracts is the fact that smart contracts are executed automatically, without the intervention of a third party, which is always present in a traditional contract: a banking institution, a law company, a notary office, a government establishment, or other intermediaries.

The term "*smart contract*" was first defined in 1994 by computer scientist Nick Szabo. He came up with the idea of being able to record contracts as computer programs, which would be executed automatically when certain conditions were met. Szabo realized that this idea would potentially remove the need for third-party entities when a transaction is made

because the contract is self-executed on a trusted network that is completely controlled by computers [1].

Nick Szabo stated that "*a smart contract is a set of promises, specified in a digital form, including protocols with which the parties perform on these promises*" [2]. The classic example of a smart contract offered by Szabo was a vending machine. After inserting a sum of money into the machine and selecting a certain product (the contract's conditions are met), the machine automatically honors the terms of the unwritten agreement and dispenses the requested product (the contract is fulfilled). But if a user does not insert the required amount or does not complete the selection of a product, the vending machine will not deliver any product. This is because the contract conditions – which are stored in the machine's program – were not met.

Although Szabo was thinking further than a vending machine, the concept could not be put into practice at that time due to the lack of technological infrastructure needed to support it. The development of blockchain technology, which enables building decentralized business models, made possible the implementation of the concept thought up by Szabo.

Vitalik Buterin, one of the co-founders of the Ethereum blockchain platform, defined a smart contract as being "*a mechanism involving digital assets and two or more parties, where*

some or all of the parties put assets in, and assets are automatically redistributed among those parties according to a formula based on certain data that is not known at the time the contract is initiated" [3].

At its basic level, a smart contract is a computer program or a transaction protocol aiming "*to digitally facilitate, verify or enforce the negotiation or performance of a contract*" [4], and "*to automatically execute, control or document legally relevant events and actions according to the terms of a contract or agreement*" [5] without the need for intermediaries, in a faster, more secure, efficient, and reliable way.

The objectives of smart contracts are to accomplish all contractual conditions – such as execution conditions, guarantees, payment terms, or confidentiality –, to reduce the need for trusted intermediaries, arbitration, transaction costs, and fraud losses, and to decrease the number of malicious and accidental exceptions.

Smart contracts are computer programs stored, replicated, supervised, and executed across a blockchain network. As a stored procedure in a database, a smart contract is embedded in the blockchain and has access to its internal functions such as transparency, data security and integrity, cost and time efficiency.

Due to blockchain **transparency**, all the parties involved in the agreement can permanently follow the performance of the contract, the compliance with its clauses, obligations, and terms.

As mentioned above, ensuring the **security and integrity** of data is a major objective of blockchain. Users can trust the technology and can be sure that no one may alter what is agreed in the contract.

Users do not need to invest in sophisticated systems as they can benefit from the capability of technology to provide **cost and time-efficient** solutions for the maintenance, security, and integrity of the system.

Smart contracts use blockchain technology to facilitate the exchange of goods, properties, money, content, shares, information, or other valuables under certain conditions, transparently, without the need for a trusted third party, because the involved parties trust the code.

As stated in [6], "*a smart contract is a self-enforcing agreement embedded in computer code managed by a blockchain*". The rules agreed by the parties by which the business will be conducted are contained in this program. The involved parties can transact directly with each other and their contract runs with no control of any party. The computer code verifies the fulfillment of a predefined rule and, if and when that condition is met, automatically executes the terms provided in the agreement, as an IF-THEN premise: the action A is triggered when the event E occurs. None of the involved parties can intervene in the agreement's progress once it is accepted. It is only the computer program that decides if the conditions for the contract execution are met, that makes these protocols "*smart*".

In essence, a smart contract represents business rules transposed into computer code. It defines the conditions, rules, and obligations of an agreement and automates its execution without the need for a central authority, legal system, or external enforcement mechanism. When the predefined conditions occur, the terms of the agreement are executed automatically and carried out without the need for a third party.

In such a decentralized approach, all data is stored in a distributed system and none of the involved parties can control it for their own benefit. Therefore, a blockchain is nearly impossible to be hacked or shut down. The transactions are safe and no fraud can occur.

A smart contract allows the exchange of digital currencies and assets between parties under certain conditions. If those conditions are not fulfilled, the contract is revoked and the asset exchange is not performed. As the contract is executed automatically under the circumstances agreed by all counterparties, the deal is performed safely, with no risk to any party, because the execution of the contract is controlled and audited by the network as a whole, not by a server program as it happens in a centralized system.

2 Blockchain technology – support for smart contracts

The concept of smart contracts is closely related to blockchain technology. In April 2020, the European Parliament included blockchain on the list of the 10 most innovative technologies to help society in the critical domain of epidemic management, but also in other crisis situations. "*Blockchain applications could provide a robust, transparent, and cheap means of facilitating effective decision-making and, as a result, could lead to faster response during emergencies of this kind*" [7].

Simply speaking, a smart contract is a computer program stored on a blockchain network, rather than a server. As the US National Institute of Standards and Technology stated, a smart contract is "*a collection of code and data (sometimes referred to as functions and state) that is deployed using cryptographically signed transactions on the blockchain network*" [8].

A blockchain is a digital ledger of linked batches of transactions, a chain of blocks containing digital data or information. Every block has its own code, named *hash code*, which is a unique key generated through a cryptographic algorithm, based on the content of the block. The hash code is stored in the next block too. This thing makes it impossible to alter the content of a block without changing the information of all the next blocks on the blockchain. In addition, each block also contains a timestamp, which shows the moment when the block was created.

Sometimes named a distributed ledger, a blockchain runs on a decentralized network of computers interconnected to one another, providing an accessible, secure, consistent, and reliable database. As shown in [9], a blockchain has several features that make it a strong instrument. Some of the most important features are briefly described below. These features are closely related and influence each other.

A blockchain is a **decentralized system**. The information is stored on all the computers in the network, with no one holding the authority of the overall network, which does not include a single central point like in a centralized system with a conventional database. Such an architecture makes actually impossible for the network to be exposed to failures or attacks.

A blockchain runs on a **peer-to-peer network**, which is a distributed architecture that partitions tasks or workloads between interconnected computers, called *peers*. The network has a flat topology, with no central authority, nor any hierarchy. As trust between the parties is no longer an issue, no trusted third party is required.

A blockchain is **immutable**. Any data once written on the blockchain becomes permanent and cannot be altered or changed anymore. Immutability is given by the mechanism of chaining the blocks through cryptographic hash codes, which act as a firewall for external attacks.

Due to the immutability embedded in blockchains, it becomes easier to detect the tampering of any data. Any change in one block can be detected immediately, so blockchains are considered **tamper-proof**.

A blockchain not only ensures **privacy** but **transparency** too. The real identity of a person who generates a transaction is hidden in a public address through complex cryptographic algorithms. However, blockchains are transparent systems, allowing any participant to see all the transactions made by a certain public address.

A blockchain is based on a **consensus** protocol, which helps the network make decisions and ensures it is the only version of the truth. Each node has exactly the same version of the code. Copies stored on all nodes of the network are updated at the same time, so they have separate but identical records at any moment. Editing the blockchain is only possible if there is a consensus between the nodes of the network storing separate but identical versions of the blockchain. Every time a node adds a new block, this one has to be validated by all the other users through a special protocol, which ensures the consensus of the whole network. This way of working, based on the consensus of all nodes in the network, is illustrated in figure 1.
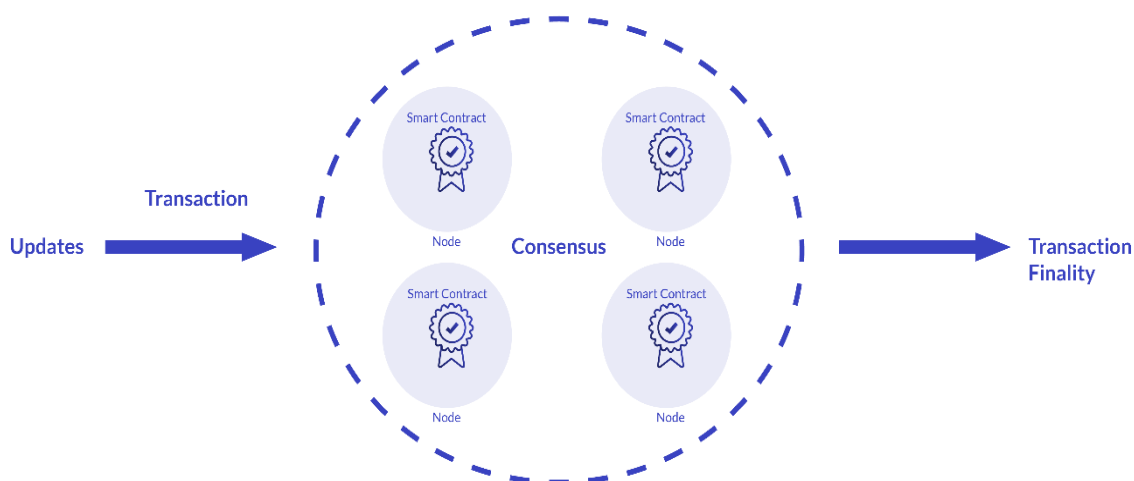
Fig. 1. Consensus-based operating mode
(source: [10])

A transaction initiated by any of the participants will be accepted by the system only after validation through consensus by all other users of the network.

In a conclusion, due to its security and immutability, a blockchain is the proper medium for storing smart contracts. Being stored on a distributed ledger in an encrypted manner, smart contract data cannot be lost, altered, or deleted.

3 Advantages and disadvantages of smart contracts

Due to the programming algorithms used in their development and the features of the blockchain on which they run, smart contracts are a credible alternative for establishing trusted relationships between business partners and for performing secured transactions. They offer several **advantages** to their users, some of them being as follows:

a) cost efficiency;
b) fewer intermediaries;
c) lower transaction cost;
d) processing speed;
e) security;
f) higher transparency;
g) autonomy;
h) trust, accuracy;
i) reliability.

a) Smart contracts are digital and automated, so users don't need to spend time processing large quantities of paper-based documents, reconciling them, to verifying and correcting errors that could be accidentally introduced into the system by human processors.

The automated processes enabled by smart contracts require not only less human intervention, but a smaller number of intermediaries too, which leads to lower costs. Therefore, it can be stated that smart contracts eliminate many operational expenses and save resources, including the people needed to monitor their progress, as well as intermediaries, because business partners can trust the technology for the good performance of the contract. There is no need for another person to verify and validate the terms of the contract because they are embedded into the code.

b) Smart contracts allow the automation of processes and activities, so the need to appeal to intermediaries is reduced. It is no longer necessary for lawyers, notaries, or financial institutions to intervene in the negotiation or performance of smart contracts.

c) Because smart contracts are automated processes, they have lower transaction costs than traditional contracts. As they eliminate intermediaries, allowing business partners to interact and transact directly, they also remove additional commissions, third-party agent fees, transfer fees, or escrow accounts.

d) Due to the ones presented above, smart contracts can run faster than traditional

contracts. They use software code to automate tasks and processes. Reducing human intervention – or even eliminating it in many cases – smart contracts increase the processing speed of the transactions stipulated in the business agreement.

e) Smart contracts use the advantage of blockchain security to offer a higher level of trust than traditional contracts can provide. Being self-verifying and self-executing, smart contracts are resistant to failure and attacks and guarantee a greater degree of security to all business partners involved.

As already mentioned, smart contracts are completely distributed on the blockchain. Their execution is not managed by a certain entity, but automatically by the network as a whole. The network, as a decentralized system, prevents the possibility of contract modification without the approval of all users. It safeguards and facilitates smart contract results, protecting information and virtually eliminating the risk of manipulation, errors, nonperformance, or potential cyber-attacks, as transaction records are encrypted on blockchain and it is very difficult to be hacked. Moreover, each record is linked to the previous and subsequent records, so the whole chain would need to be altered to change a single record.

f) Blockchain technology allows for the immutable recording of business transactions. It offers a higher level of transparency, so anyone entitled can see, audit, and track the content of a smart contract and the stage of its execution.

g) Blockchain in general, and smart contracts in particular, provide all parties involved with not only transparency but also autonomy. Smart contracts are performed automatically by the network. They allow direct dealing between partners and remove the need for a third party, as well as the risk associated with it.

h) Smart contracts are trusted in business because of their transparency and security. A blockchain-based system is a reliable one. As a smart contract automatically executes once the stipulated conditions are met, the parties can be sure the agreement will be fulfilled as established. They don't need to trust each other, they only need to trust the computer code, which embeds the terms and conditions of the agreement. As they are automated, smart contracts are less exposed to human errors and ensure the accuracy of the data.

Smart contracts are designed and implemented on blockchain-based platforms, and therefore they inherit some of the blockchain's features. Business transactions are executed automatically according to predetermined rules. They are encrypted in chained blocks and shared across the involved parties. Smart contracts are immutable and unbreakable, which means they cannot be changed, tempered, or broken down, so users can trust the accuracy of the information. At the same time, smart contracts are distributed, which means that each step of a contract is validated by all users in the network. This makes it impossible for hackers to steal funds because their attempts would be detected immediately by the other participants and invalidated [11].

Within the blockchain, every user is in control, yet no one is in total control. Once a transaction is executed and recorded into a block, no one can change or reverse it. However, a new transaction can be made to cancel its result, but such an action has to be validated by all users of the network through full consensus.

i) Smart contracts can take advantage of blockchain technology to track, verify and maintain a reliable record of all activities related to the execution of complex processes. Data entered into the blockchain cannot be changed or deleted. Also, each part is protected. No action will be initiated unless each party has fulfilled its obligations stipulated in the contract. Moreover, all contract transactions are time-stamped and stored in chronological order in the blockchain, so they can be accessed and audited as they take place. All users of the network can see all transaction details, with no limitations, in order to verify, review or analyze them.

One **disadvantage** of smart contracts is the lack of international regulations governing their operation, as well as that of blockchain and cryptocurrencies. It can be said that technology has evolved faster than the law. Without such internationally recognized regulations and unanimous standardizations, it is difficult for

these technologies to be used and monitored uniformly in the global economy.

Although blockchain technology offers many possibilities for the development and use of smart contracts, there are some intrinsic limitations. Smart contracts can execute only conditional logic (*if this-then that*) and do not have enough flexibility to apply more concepts that might be embodied in a traditional contract [12]. Moreover, once the smart contract is created, its terms cannot be modified anymore. The building or modifying smart contracts represents a complex process. As they are computer programs, their implementation has to cover the whole cycle of software application development. Low scalability and a lack of total interoperability are weaknesses of the technology. The blockchain platform has to be able to handle more and more data while maintaining the speed of accessibility for all involved parties. In addition, as with any computer software, programming bugs or malicious attacks could occur. If, due to the support provided by the blockchain, attacks from the outside are unlikely to succeed, correcting any error in the code can be expensive and time-consuming.
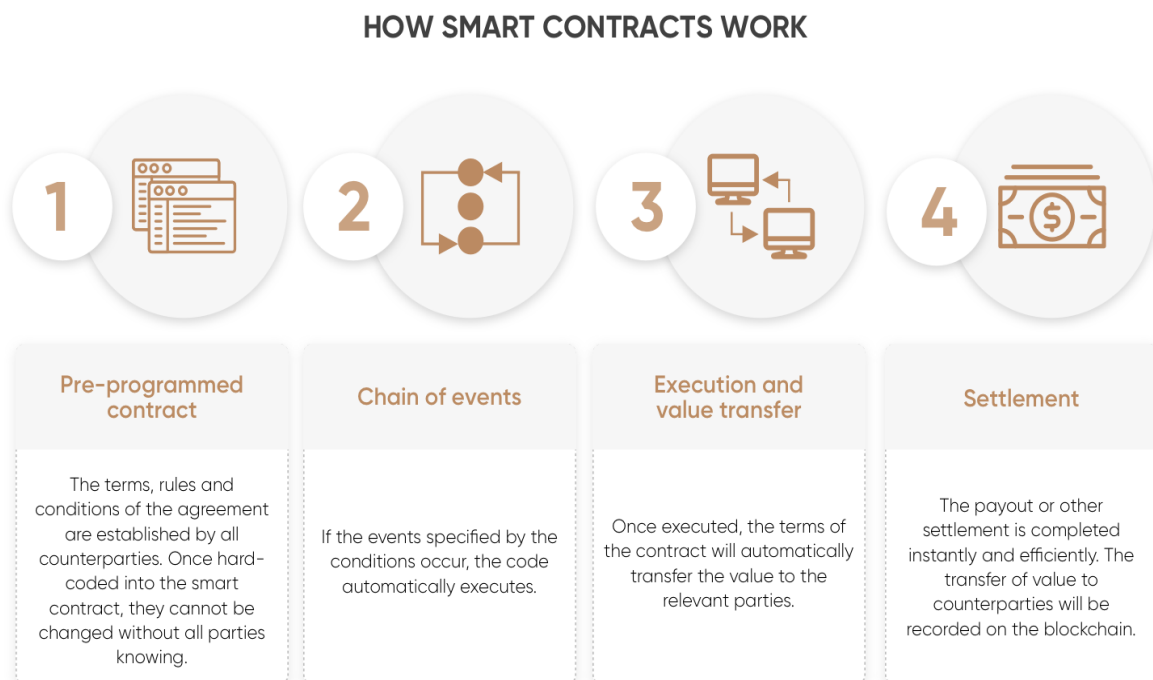
However, these disadvantages are not insurmountable obstacles, and these technologies will be used in more and more applications in various industries and fields of activity.

4 Smart contracts' functioning

Smart contracts define the terms, rules, conditions, and consequences of an agreement between two or more parties in the same way traditional paper-based contracts do. They are decentralized applications that execute business logic if certain predetermined events happen. The business logic represents a set of conditional statements that describe possible scenarios of future transactions. Once created, the code of the agreement is stored within the blockchain and replicated among all the participants in the network. When an event specified by the contract's conditions occurs, the code is run and executed automatically by all computers in the network, without the need for intermediaries or human intervention. It performs various tasks, processes, or transactions – that is the terms of the agreement – that have been programmed to be triggered when certain conditions are met. The results of automatically generated transactions are recorded on the blockchain immediately and securely and are immutable.

Figure 2 shows an example of a smart contract having as an object the trading of assets or services.

HOW SMART CONTRACTS WORK

1 Pre-programmed contract

The terms, rules and conditions of the agreement are established by all counterparties. Once hard-coded into the smart contract, they cannot be changed without all parties knowing.

2 Chain of events

If the events specified by the conditions occur, the code automatically executes.

3 Execution and value transfer

Once executed, the terms of the contract will automatically transfer the value to the relevant parties.

4 Settlement

The payout or other settlement is completed instantly and efficiently. The transfer of value to counterparties will be recorded on the blockchain.

Fig. 2. How smart contracts work
(source: [13])

The smart contract works on an IF-THEN premise: if the buyer pays the price agreed in the contract, the asset passes from the property of the seller to his/her property. It also works as an escrow account, which holds the assets being moved between the counterparties until the obligations of both parties are fulfilled. That means that both the ownership rights of the asset and the money are stored in the blockchain and transferred to the involved parties at the same time.

Unlike a paper-based contract, a smart contract can receive information from external data sources, process it according to the rules set out in the code, and decide the appropriate action. Among these sources, a special category is the so-called *oracles*, which provide relevant data to the smart contract to make the right decision. Oracles "translate" external events into digital data used as inputs into the smart contract. This data can be about the weather, currency exchange rates, airline flight information, and so on, allowing smart contracts to interact with real-world events with a great degree of trust [14]. In general, data provided by oracles is used to detect external changes that can influence the decision-making process of smart contracts.

At the same time, smart contracts can publish information about the completion of certain transactions, information that can be used as inputs by other applications or entities in the outside world.

5 Smart contracts use cases

Smart contracts, as blockchain applications, are immutable. The immutability feature ensures that any data once written on the blockchain becomes permanent and cannot be lost, altered, changed, or stolen. This feature allows blockchain applications, especially smart contracts, to guarantee the security and authenticity of copyrighted products, job certificates, ownership rights, titles, and many other credentials and applications [15].

Blockchain and smart contract technologies can bring about positive changes in many areas. Because they are based on blockchain platforms, smart contracts run in a peer-to-peer manner, which allows direct interaction between parties without the need for any trusted third entity.

Smart contracts can be used in any area in which funds, digital assets, or information need to be transferred between parties. They may be aimed at exchanging money or delivering

goods, services, or assets. They are complex applications and can go further than a simple transfer of assets. They can be successfully used in a large number of domains, such as financial derivatives, insurance premiums, legal processes, crowdfunding agreements, and many other fields. By simplifying and automating routine and repetitive processes, smart contracts eliminate intermediaries, exempting users from paying fees to banks, lawyers, or notaries.

Two stipulations are met in the vast majority of contracts: (i) ensuring the payment of funds when certain conditions are met and (ii) stipulation of financial penalties if the assumed obligations are not fulfilled [16]. Smart contracts are suitable for carrying out such actions. As they run automatically, without the need for intermediaries, smart contracts save financial, human, and time resources, making them a faster and more cost-effective solution for doing business.

Blockchain and smart contracts are already implemented in various projects, and they are going to disrupt more and more industries. Some areas best suited for using smart contracts are presented below.

Banking. Smart contracts represent an important alternative to the traditional model of bank transactions. They automate almost all banking operations – payments, loans, mortgages –, guaranteeing their accuracy and conformity to legal regulations and requirements. In the trade finance sector, all the parties in an agreement – exporters, importers, banks – can share information on the blockchain network and can see immediately the results of the automatic execution of the smart contract. Smart contracts can reduce costs and make processes more efficient. The advantage will be for the banks that develop their systems based on new technologies, to improve their procedures, to increase data security and the processing speed of transactions, thus being able to offer better services to their customers, while saving their own resources.

Healthcare. In the healthcare industry, smart contracts can streamline processes for insurance trials, preventing unauthorized access to cross-institutional data and increasing confidence in ensuring the confidentiality and privacy of patients' data [11]. As a result, all participants involved in the process – doctors, pharmacists, insurance providers, researchers, and patients as well – can easily collect, use, track, analyze and exchange patients' data coherently and consistently. Smart contract applications in this field, on the other hand, give patients complete control over the generation, management, and distribution of their electronic healthcare records, while maintaining their security and privacy.

Supply chain. Supply chain management involves tracking the progress of goods and products from the initial shipment to the final delivery. Smart contracts record the ownership rights of products while they are transferred through the supply chain. Due to blockchain transparency, smart contracts can provide real-time visibility in this sector. Every party involved can track the route of products at any given time. Counterfeit or fake products represent a serious problem and could be a major financial loss. By reducing the risk of theft and fraud, smart contracts solve such problems. Smart contracts can be used to monitor goods on their route in any marketplace type, and to automate tasks and payments. In this way, they contribute to facilitating and accelerating trade exchanges.

The Danish shipping company Maersk uses a blockchain-based system for tracking customs documentation on goods that are shipped internationally. Any involved entity, from a port to a customs authority, can quickly look up details about a shipment [17].

Legal issues. By automating many activities and due to the safety and confidence offered by the technology supporting them, smart contracts eliminate the need for trusted third parties, including notaries and lawyers. They give people more autonomy in doing their transactions, offering faster, impartial, and cost-efficient solutions compared to traditional contracts.

Real estate. In the age of the Internet, more and more people are turning towards online platforms to search for properties to buy, sell or rent on the housing market as an alternative to

the classic real estate system, which is affected by bureaucracy and the possibility of fraud because of a lack of transparency. Blockchain technology offers efficient solutions that reduce the costs of searching and trading properties, speed up real estate transactions, and ensure the correctness and integrity of the records. The agreements between the involved parties are encoded into smart contracts that run automatically, without the need to pay fees to third parties to supervise their execution.

Internet of Things Networks. Although they are used in many fields as stand-alone applications, smart contracts can be successfully used together with other technologies, such as the Internet of Things (IoT), electronic devices that are managed and controlled through the internet. Used together, these technologies can manage remote control systems and offer innovative applications in many industries. Connected online to the blockchain system with the help of various sensors, IoT devices act as computerized agents, keeping track of products and processes and entering data into smart contracts without human interference. In the case of a trade agreement, the goods could be scanned and tracked at every step on their way from the seller to the buyer's warehouse. The sensors send the smart contract information about the location and received goods. Based on this data, the smart contract keeps the status of the container's location updated all along the way until the products are delivered. It decides if they comply with the agreement stipulations, ensuring that the right product is delivered to the right person. If those conditions are fulfilled, the smart contract triggers the transfer of funds from the buyer's account to that of the seller.

Property ownership. Smart contracts can be used to record the ownership of any type of property, from buildings, land, and works of art, to intellectual property and copyright. Due to their immutability, processing speed, transparency, and reliability, smart contracts are a better alternative to traditional systems. They remove the need for brokers or other intermediaries, making it a cost-efficient and reliable solution. Sellers and buyers can interact

directly, having the possibility to manage their transactions by themselves.

Insurance. According to statistics, insurance companies spend huge amounts of money each year to provide compensation for various insured events. Due to a lack of automation, claim processing can take a long time, which is a problem for both customers and insurance companies. Often, compensation claims are proven to be fraudulent, which represents significant losses for insurance companies. Smart contracts can help insurance companies improve their systems for processing customer claims. They manage better and faster the approval workflows in insurance claim processing, simplifying and streamlining the processes by automatically triggering payment for claims when certain conditions are met, according to the agreement stipulations, with a lower risk of errors and more efficient costs.

For example, an insurance company may provide flight delay insurance policies using smart contracts. The company promises to pay 100 euros if the flight is delayed by three hours or more. The contracts also contain situations of delay for which the insurance company is exempted from the payment of compensation, such as atmospheric conditions that would endanger the safety of the flight. To benefit from that policy, a customer has to pay a premium of 5 euros and notify his flight number. The insurance company sends 100 euros to the blockchain where the smart contract runs. The money is stored as in an escrow account. The smart contract is linked to the database recording flight status and it will receive information on the plane's take-off. If the plane takes off with a delay of three hours or more and it is not due to any cause exempted from the payment of compensation, the amount of 100 euros is made available to the insured customer. Otherwise, the money is returned to the company's account.

Voting. Despite the use of information systems, fraud may occur in the voting process. Smart contracts could be a secure and cost-effective solution to this problem. Deployed on blockchain-based platforms, they can be used to validate voters' identities based on their biometric ID cards, record their votes and

maintain an accurate count of votes. No one can vote using a digital identity other than their own. The counting is tallied automatically, and foolproof, so it is safe and reliable. There is no manual process, and no third party can interfere [18]. Votes are secret and anonymized. Due to blockchain immutability and the consensus protocol based on which it operates, records stored in such ledgers cannot be changed, deleted, or altered. After the voting process stops, the system provides reliable information on election results. In addition, the ledger is transparent and publicly available for audit and verification.

In 2005, Estonia became the first country in the world to use internet-based voting in national elections. Using i-Voting, the voter's choice is saved into a file that is signed and encrypted with their digital signature and then forwarded to the State Electoral Office. There, an automatic process checks the right to vote and removes the signature to maintain the voter's confidentiality. Anonymous i-votes are counted and certificates are issued at each stage of the process for later audit of the correctness and integrity of the data [19].

6 Conclusions

Contemporary society is becoming more and more digital. Nowadays, even small transactions and payments are happening digitally. This has become possible thanks to various new technologies, including blockchain and smart contracts, that are increasingly being used to develop innovative solutions.

Blockchain is the technology that made possible the emergence and development of smart contracts, an innovative technology that penetrates more and more fields of activity, such as banking, healthcare, supply chain, real estate, insurance, voting, and many others. Smart contracts are one of the most successful applications associated with blockchain. They are computer programs that run on blockchain networks under a set of terms and conditions that users agree to. They use blockchain distributed architecture, the decentralized peer-to-peer model, offering involved parties a new kind of business relationship based on trust. Business partners can conduct their agreements directly, without the need for trusted third parties.

Smart contracts are self-executing contracts having terms and conditions embedded into computer programs. They represent digital alternatives to traditional paper-based contracts that automatically verify the achievement of the agreement's conditions and perform its terms. Due to these things, they don't need to involve trusted third entities for the enforcement of contractual promises and minimize human intervention, which is the main objective of smart contracts. As a result, they help to reduce costs for the parties involved and make their business more efficient and cost-effective.

The code of smart contracts is stored on each node of the network, which gives them transparency and security. Although they aim for the same purposes as traditional contracts, the features inherited from blockchain make the difference between the two kinds of agreements. Compared to traditional contracts, smart contracts have several advantages, some of which are presented in this paper: cost efficiency, fewer intermediaries, lower transaction costs, processing speed, security, higher transparency, autonomy, trust, accuracy, and reliability.

Today, the legal framework of smart contracts is not yet defined by international jurisdiction. However, as this technology evolves, the courts will have to decide their status: to be included in the current contract law or to create a new legal framework for them [20]. Regardless of the decision that will be taken, in the years to come, as more people understand and gain confidence in blockchain technology, smart contracts will become more and more an integral part of our society. It is reasonable to expect that in the coming years they will have an impact on daily life in the same way that the internet has done on media. Certainly, they are here to stay.

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