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# THE POTENTIAL OF USING BLOCKCHAIN TECHNOLOGY IN HUMAN LIFE: EXAMPLES OF IMPLEMENTATION

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**Abstract:** *Blockchain technology, successfully implemented for the first time in 2009, with the launch of the first bitcoin cryptocurrency, is increasingly used in other areas of human life. As a cryptographically secured, distributed register is a guarantee of the stored data. The main assumption of blockchain is to eliminate, through built-in validation mechanisms, any central or trusted parties necessary to confirm the correctness of the data. The first part of the article presents general information about the technology. Next, the analysis of the potentials of its implementation in (I) financial and economic, (II) security, (III) political and social, (IV) legal and information was undertaken. The work is based on a case study of successful applications, as well as a comparative analysis, ended with a discussion and conclusions.*

**Keywords**: Blockchain technology, cryptocurrencies, security, implementation, European Union.

## 1. Introduction

Blockchain technology has been referred to as the most important invention since the inception of the Internet for several years (De Silva, Parker, and Broun, 2017). It is a mechanism that allows individuals to send a unique digital record without the risk of copying, and without the need for a trusted third party. In practice, it is a shared, distributed, and fault-tolerant database that keeps records in blocks. Blockchain technology is regularly included in the top ten list of the Council on New Technologies of the World Economic Forum in Davos, which prepares a list of the most disruptive technologies with the greatest impact on improving the lives of societies, transforming other areas of the economy, and protecting the natural environment (Nisco Rayome, 2019; Mincewicz, 2021a).

Blockchain is sometimes referred to as the next trusted layer of the Internet (Mougayar, 2016) or the Internet of value (Szpringer, 2019). Although the natural and primary area of application of technology is and will remain cryptocurrencies, the possibility of its use is not limited only to virtual currency. A decentralized network is successfully implemented in various forms in subsequent areas of operation of institutions from the banking sector, private companies, and other organizations, where security plays a key role (Swam, 2015; Tapscott and Tapscott, 2016). Daniel Drescher points out that the blockchain does not evaluate the processed data; hence, their scope and number of areas of potential application are as wide and varied as the scope of human activity. As examples, he mentions payment management, use in the creation of digital resources or digital identity. Blockchain can also be used, for example, in the digitization, storage, and verification of documents and contracts, proofs of ownership, in the provision of notary services, conducting business audits as part of auditing services, or during voting during elections (Drescher, 2017: 226–7). This collection is not closed, as it is practically impossible to discuss all uses of the blockchain. However, it is expected that new areas of implementation will emerge constantly. This is because the decentralized network, distributed over hundreds of computers around the world, based on public- and private-key encryption, is a secure structure for storing and transferring information and data. Therefore, blockchain can potentially be used to improve all processes and activities in which it is necessary to ensure the secure transfer of information or data.

The presented article consists of four parts. The first one, organizing the presented content, indicates the limitations, purpose, and scope of the study. The next one is dedicated to the outline of the concept of blockchain technology and answers the question of what it is and presents three generations of technology. The third part defines four areas in human life, where the technology is successfully used in other countries, including the European Union, which constitute the discussed case study, that is: (1) financial and economic area, (2) security area, (3) political and social, (4) legal and information area. Summaries and conclusions as the ending of the study include a synthetic presentation of the outlined content. Additionally, barriers and challenges related to the further implementation of technologies in the European Union countries were indicated as a starting point for the continuation of research.

## 2. Limitations, purpose, and scope of the study

The issue of blockchain technology is a multidisciplinary issue that is of interest to lawyers, economists, IT specialists, security specialists and representatives of other social sciences, including political science. The potential of using blockchain technology in human life is therefore a complex issue which, confined to one area of knowledge, does not allow for a comprehensive analysis. The article presents an outline of knowledge related to the potential of implementing blockchain technology in non-economic areas in terms of social sciences. The presented study is the starting point for future in-depth research. The project, carried out on the basis of secondary data, systematizes the current state of knowledge, and also constitutes a voice in the discussion on the use of blockchain technology. An important limitation for the content presented, especially in the next section, is the narrowing of the issues only to blockchain technology and its significant advantages over previously known solutions. Due to the multitude of available solutions, in order to indicate its most important elements constituting the basis of the technology, it is necessary to use a specific example, which in such a situation is usually bitcoin, as the first fully successful implementation. It should be remembered that the first cryptocurrency can be understood in two ways. In the former, it is the set of concepts and technologies that underpin the crypto-based digital money ecosystem, and in the latter, they are simply units of value in a blockchain.

The presented possibilities of use will serve to verify the hypothesis about the usefulness of blockchain technology as a potential tool to support various processes in subsequent spheres of human functioning. The significant advantages of the solution have been indicated, which allow to define the advantages of the technology in comparison with the ones known so far, as well as the potential threats and risks related to the possible implementation. For the purposes of the work, scientific sources in the form of academic publications, internet sources, reports and studies were used.

## 3. Blockchain technology: an outline of knowledge and properties

Blockchain, as an innovative concept, presented for the first time in 2008, has aroused very different and often controversial reactions since the publication of the first example of its use. Sometimes, it is perceived as a general-purpose technology, capable of changing the currently used model or data transfer schemes. On the other hand, there are authors pointing to numerous limitations and shortcomings, thus suggesting that analyzing and using it was an action devoid of deep sense or doomed to failure (e.g., Casino, Dasaklis, and Patsakis, 2019). In narrow terms, blockchain can be considered "a special data structure, consisting of transactions assembled into blocks that are cryptographically linked to each other to form a sequential, tamper-resistant chain that defines the order of transactions in the system. A transaction represents any change or modification to the database (Rauch et al., 2018). As a publicly available, distributed, and fault-tolerant database that can be shared by any network participant and over which no one can take exclusive control (Shetty, Kamhooua, Njilla, 2020), blockchain is a technology for decentralized, self-organizing information management. It is a way to save encrypted information in "blocks" on multiple devices (Johnson, Manion, 2019).

The blockchain is the technological solution on which cryptoactives are based. It should be noted that in its proposal, which is also the first successful attempt to implement, Satoshi Nakamoto (2008) cleverly managed to combine the previously existing technological elements. Generation 1.0 was used in cryptocurrencies. Blockchain that covers basic applications such as payment and application support. Its superstructure is generation 2.0, which will apply to various financial assets, but also smart contracts, Ethereum and Hyperledger platforms. In the following years, ideas for the implementation of technology in the non-economic industry appeared: healthcare, media, justice, or various government institutions, which makes up layer 3.0. Futurologists, in turn, envision a single public blockchain that everyone can use. The X.0 blockchain will offer a variety of services, and agencies will use it to make rational decisions and interact with other agencies acting on behalf of the person (see, e.g., Bashir, 2017: 36–7).

Blockchain is a register in which any information secured with the use of public-key and private-key cryptography can be saved, and their transfer takes place in a peer-to-peer network (person to person). The registry in its original form is dispersed, which makes it resistant to damage and modification, and no one can take control of the database. Due to its form, blockchain can economically provide reliability and credibility without the need for expensive infrastructure for replication and recovery after a possible failure. The solution does not require configuring the nodes that want to join it and synchronize the data. The nodes communicate with each other directly on a P2P network thanks to built-in redundancy and elimination of the need for continuous supervision. The chain is made up of successive blocks, which in turn contain the header and the data. The header includes a reference to the previous block in the chain (its hash), the timestamp of the block creation, and the root of the hash tree of the data or information it contains. In the data block, the hash tree of transactions contained in the block is available, and then the data itself. This way of writing allows you to search for transactions by its hash (in short), without the need to read all the data (Oksanowicz, 2018). The main assumption of the blockchain is to eliminate, through built-in validation mechanisms, any central or trusted parties necessary to confirm the correctness of the data. Blockchain networks, due to their dispersed nature, are resistant to damage, which allows their nodes to eliminate others that fail or behave incorrectly; they generate an error (the so-called Byzantine generals' error). Compared to centralized databases, blockchain enables direct sharing of information in environments without the participation of a trusted third party (Nofer et al., 2017).

In its original form, blockchain was a digital ledger that was created to verify, process, and record all transactions in a distributed network. Although the primary, basic form of blockchain use is and will remain cryptocurrencies due to Satoshi's manifesto published in 2008 Nakamoto, the technology itself is constantly being developed. Despite the many benefits of using blockchain technology, most initiatives are still in their initial development studies and function as pilot implementations, test solutions, or a classic *Proof of Concept*. The following speaks in favor of the use of technology: (1) the potential improvement in the quality of services and products; (2) the speed of response by producers and consumers; (3) the ability to efficiently communicate between networks of different links; (4) increasing the competitiveness of individual industries, sectors, or economies (Włodarczyk, Tomala, Sikorska, 2021). They analyze the possibilities of technology, its undoubted advantages include potential economic benefits in all areas of social and economic life - wherever proper electronic information management allows reducing transaction costs. In 2015–17, optimistic estimates indicated that by 2025 at least 10% of the world's GDP would be managed by blockchain technology (Dudek, 2017; Grech and Camilleri, 2017). Updated forecasts are more cautious, and the cut-off date is 2030 (Davis, PwC, 2020).

Existing blockchains can differ in at least two characteristics: they can contain or not have permissions, and they can be open (public), open to all, or limited, private, intended for a specific user, and corporate. The basic difference between the individual is related to the degree of trust between system users, ranging from a total lack of trust in the case of the public system to a relatively high level in the case of the private system, which is reflected in their different architecture. The only truly decentralized blockchain solution is the public system. A private blockchain solution is fully controlled by one organization and cannot be considered decentralized, while the corporate system will be only partially decentralized. Another significant technical difference between the above-mentioned solutions is the possibility of changing historical data. In the public system, it is impossible, while in the other systems it is allowed if such is the will of the main users (Hulicki, Lustofin, 2017).

The main features of blockchain technology are decentralization, immutability, and transparency of records. Decentralization is defined as the elimination of a trusted third party in the data transfer process. In blockchain, transaction verification is based on a consensus mechanism between network participants. Invariability means that it is not possible to withdraw data once entered, while the fact that the blockchain is public gives transparency. In blockchain 2.0. The most important change compared to the previous generation of blockchain was the introduction of smart contracts. Smart contracts are defined as a software system that automates the fulfillment of contract terms. They represent computer code that will be automatically executed on a peer-to-peer network, which can reduce administration, lower costs, and improve efficiency. Blockchains 3.0. It is primarily a proposal of private or corporate chains, based on previously known cryptographic solutions that can be adopted by other institutions.

The basis of blockchain technology is a mathematical hash function. The hash function is one of the most important elements of modern cryptography, which assigns any string of characters to any string of characters with a nonspecific value of a fixed length. The hash function works by computing a short signature for the given input. Having any document or other information in digital form as input, and even entire huge data sets, using the hash function, we can calculate a "hash" of these data, which will be resistant to collisions, because two different data sets will not give the same hash, and there is practically no possibility of generating a data set with the same hash as the indicated data set. Another feature of the digest is that it is unidirectional and irreversible, and it is impossible to recreate the original message knowing its digest. These features are used in practice to quickly identify digital data and verify the integrity of the data. The point is that even the smallest change in the source data should make the calculated hash different from the hash of the source data (Rodwald, 2013: 91–2). In the Bitcoin system, the RIPEMD-160 and SHA-256 hash algorithms are used as the first implementation of the technology. RIPEMD in the blockchain is used to create Bitcoin addresses, and the SHA-256 algorithm is used to verify the computational effort generated by the miners. The hash function based on the 256-bit SHA algorithm is a precompiled access contract at 0x2 and generates an SHA256 hash of the input data. The function is used to implement the second cryptographic tool, which is a digital signature. In the case of Bitcoin, it adopts the Rivest Shamir Adleman standard (RSA), which was the first implementation of a public-key cryptography system[1]. Asymmetric cryptography is used to generate a pair of public and private keys that are mathematically related with the use of Euler functions. In cryptocurrencies, the public key is used to receive payments to the wallet, and the private key is used to sign transactions and generate a "fingerprint" confirming the possession of coins. The public key is on an open blockchain, so all users can access it. It is generated from the private key due to the mathematical relationship between the key pair. The private key is 256-bit randomly selected numbers within the range specified in the Elliptic Curve Algorithm (ECDSA) recommendation. The private key is usually encoded in *Wallet Import Format* (WIF), making them easy to copy and use. The WIF allows you to save a complete private key in a different format (Vaskovskyi, 2018: 13). When a transaction signed with a private key is sent out on the Bitcoin network, the nodes use public keys to verify that the transaction was signed with the appropriate private key. This process confirms the ownership of bitcoins (Antonopoulos, 2014: 61–4). It is therefore the basic condition for the existence of the system.

In quantitative terms, theorists and practitioners indicate that the most important competitive advantage of technology is decentralization (see, e.g., Peters, Panayi, and Chapelle, 2015: 10; Zhang et. al., 2019: 29; Regal et. al. 2019: 698). Apart from the fact that, thanks to the decentralized form, the record contained in the register remains beyond the reach of direct regulations, monetary policies, supervision, or control of institutions, they are resistant to cybercrime threats. Cryptocurrencies are an example of a decentralized network with a P2P architecture. Nodes connected in this way, i.e., electronic devices that communicate with each other, in the case of cryptocurrencies function in a network where there is no central unit (server). Cryptocurrencies operate on a so-called peer-to-peer network. It is a network made by the users themselves, who communicate directly with each other. The architecture model is based on the

[1] Another, identical name, asymmetric cryptography.

equivalence of all nodes. This means that, in contrast to the most widespread, classic *client / server architecture,* there is no control server or centralized services in the network. There is also no predetermined hierarchy, and each user is part of the overall system. In practice, this means that it can act as a server as well as a client - download data from other machines and share its resources with all other dedicated computers (Schollmeier, 2001: 101-2). Describing the IT aspect of the functioning of the Bitcoin system, it is often emphasized that it was designed as a digital financial system with a P2P architecture, thanks to which it is fully decentralized. Decentralization ensures that the entire system is resistant to failures, physical and IT attacks, or the collusion of some dishonest participants.

## 4. Areas of successful technology implementation

Although blockchain technology is in an early stage of development and there are few examples of its implementation, previously implemented own and literature studies have led to the identification of the following areas where blockchain technology is currently found or may be used soon. Among the four separate levels of human life, there are: (1) the financial and economic level; (2) safety plane; (3) the political and social level; (4) the legal and information level. This collection, however, is not exhaustive; it is a summary of the current state of knowledge and a starting point for further research.

### 4.1. Financial and Economic Area

**The financial and economic** plane is an area of application that is fundamental to blockchain technology. The financial industry was the first to recognize the enormous potential of blockchain. For several years, a huge rash of startups that develop blockchain based cryptocurrency technologies have been visible. In 2008, the blockchain was the basis for the first Bitcoin cryptocurrency Bitcoin. The system proposed by Nakamoto assumed the creation of a mechanism allowing units that do not know each other to send a unique digital record without the risk of copying it, and in a direct manner, excluding the need to use the services of central exchange intermediaries. It allows all entities, both using the system directly and interested only in the circulation and state of digital records, to have equal access to the same and available in real time information on the indicated issues. The next generation of blockchain allowed for economic, market and financial application in services going beyond simple monetary transactions, such as bonds, futures, mortgage loans, title deeds, and smart contracts. Entities that operate in the financial sector use blockchain technology in: (1) applications and technology solutions they offer to the client; (2) middleware and services; (3) infrastructure and protocols for customer service (Mougayar, 2016). The governments of individual countries became interested in the possibility of implementing blockchain relatively quickly, striving, among other things, to link the technology with their official money. Resilience to failures, hacking attacks, reliability, speed of operation, protection against fraud or crimes committed with the use of electronic tools - these are just some potential advantages of the system that have been noticed and are the basis for the design of *Central Bank Digital Currency* (CBDC).

Advances in cryptography and distributed ledger technology create the possibility of widespread use of digital currencies, also by Central Banks. The introduction and dissemination of CBDC may constitute a historic innovation in money circulation, as well as in banking, and ultimately lead to the realization of the so far utopian vision of a cashless society (Fabris, 2019). In addition to the potential exclusion of physical cash from circulation, CBDC will allow central banks to increase their control over the circulation of money by permanently mediating all exchange transactions. The additional mathematical algorithm that underlies the projects allows the central bank to potentially automate transactions and create rules according to which they can be implemented. CBDCs offer the possibility of introducing a variable speed of circulation, which means that the government can program the money to give it an expiry date, as was the case in, for example, China.

According to a report by the Bank for International Settlements from 2020, 70% of all central banks in individual countries are studying the possibility of issuing their own digital currency. 10% of respondents indicate that they will implement such a solution in the next 3 years, and another 20% within six years (Boar, Holden, Wadsworth, 2020). The work on detailed solutions was accelerated during the Sars pandemic CoV-2. The most advanced work on the implementation of CBDC is carried out by the People's Bank of China (PBOC), that is, the central bank of the People's Republic of China (see Mincewicz, 2021b). In Europe, it was only in 2019 that individual financial institutions began to recognize the potential of CBDC on a large scale. In the European Union, the work of the European Central Bank has been intensified. In October 2020, the report of the task force on the possibility of issuing the digital euro was published (European Central Bank - Eurosystem, 2020). The authors indicate that there is a need to intensify work on the creation of a digital euro, and the dominant premise has again become the digitization of society, the growing importance of electronic payments, as well as striving to create a secure and stable payment system. In addition to the work at the European Union level, individual countries, as part of their own policy of creating monetary policy, undertake research on the possibility of introducing the digital currency of the central bank into circulation. In its report (Deutsche Bank Research, 2020), Deutsche Bank points to the role and need to intensify CBDC work in connection with the COVID-19 pandemic, which accelerated the "digital cash revolution". Tests on the digital euro have already taken place in France (Banque de France - Eurosysteme, 2020), and more countries such as Estonia are working with private entities to start research.

### 4.2. Security area

**Security is** the second area where blockchain technology is already being used and is likely to be widely used in the future. When pointing to the potential for implementation in this area, attention should be paid to the many possibilities offered by the blockchain in the functioning of the army. In the first comprehensive study of 2016, there is a proposal to use blockchain in the military for: (I) maintaining security in cyberspace, mainly in the area of data transmission and integrity, (II) managing the supply chain of products and services for the military, especially in emergency situations, (III) and for effective and reliable communication (Barnas, 2016). The available data show that work on the possibility of using blockchain technology in the military field is carried out by the three largest military powers: the United States of America, the Russian Federation, and the People's Republic of China. In turn, countries such as South Korea and India announced pilot test programs in 2019 (Mincewicz, 2020). The North Atlantic Alliance (NATO) also seems to recognize the potential that can be used to strengthen security. Anders Fogh Rasmussen, the former Secretary General of the Alliance, has repeatedly indicated that securing data transfer using blockchain in the future will be common (Singer, 2019). Another example of the use of technology to ensure security is the improvement of border control systems. A significant problem in the currently used systems is data exchange, which makes it difficult to track, for example, suspected persons. The systems are controlled by one entity and cannot be easily transferred between different security institutions. The mechanisms used do not make it possible to immediately create a passport blacklist or invalidate a document (Chang, Iakovou, and Shi, 2020). Blockchain is the solution to this problem because information can be transferred anywhere in the world using smart contracts. All changes and updates concerning wanted persons are available to authorized entities, which significantly improves the work (e.g., Geneiatakis et al., 2020; Mastilak et al., 2020).

### 4.3. Political and social area

The third of the defined areas where blockchain technology can be successfully used is the political and social level. Estonia is one of the classic examples of digitization of all public services. At the end of the twentieth century, the X-Road platform was developed to enable the integration of IT systems and secure data transfer (Paide et al., 2018). In 2001, the electronic ID card was implemented and, in 2005, the first electronic voting in the elections was carried out (Sheeter, 2005). After the experiences of 2007 and the cyberattack (eg, Biaoskórski, 2011), even more attention was paid to cybersecurity in the country. The result was the design, testing, and implementation of solutions that will ensure the security of the Estonian e-Government system. When voting in elections, for example, Estonian citizens use a special ID card that entitles them to vote. Although blockchain technology in this case is used to support the election process, it may become its central link over time. In 2019, on the i-Voting website, in the elections to the European Parliament and the national parliament, 46.7 and 43.8 percent of the votes cast their votes electronically voting (valimised.ee, 2019). Blockchain technology, in addition to Estonia, has been used, among others, in conducting clerks at the local regional level in Switzerland (Zug) (Offerman, 2018). In November 2018, in turn, when the Thai Democratic Party elections were held, a total of 127,000 votes were cast across the country through the blockchain -based application (Cheng et al., 2018). In South Korea, there was a blockchain-based voting system during the referendum in Gyeonggi-do province (Emem, 2018). In view of the coronavirus pandemic in Poland, the e-voting functionality offered by the National Depository for Securities was developed, which was used for electronic voting during General Meetings of Shareholders of listed companies (Gałus, 2020). In addition to supporting the administration and voting system, medicine seems to be an ideal example of the possibility of using blockchain technology in the political and social area. In Sweden (Stawicki et al., 2018), a pilot research program is underway to enable all physicians and healthcare professionals to have safe and easy access to patient records and treatment history. The potential use of blockchains in the healthcare industry allows achieving a number of benefits, such as financial savings, high availability, and preventing the distribution of counterfeit drugs. Blockchain is therefore becoming a BigData supporting tool (Dhanalakshmi and Babu, 2019). However, it should be borne in mind that the implementation of technology in the medical sector, in line with the above example, creates a number of new challenges. They are related, for example, to the need to maintain privacy and the protection of personal data. Although the registry allows you to verify who and when had access due to authorizations, it will create a field for significant abuse related to the protection of sensitive medical data that may be taken over by unauthorized persons (a similar risk exists in traditional systems). This problem concerns each of the analyzed spaces, but it should be expected that soon solutions will be developed that will allow for its marginalization. Two scenarios seem likely. The first involves the development of a tokenization system (analogy to voting with the use of blockchain) that will entitle you to gain access. An alternative is to use private blockchain algorithms for dedicated solutions that prevent such activities. A hybrid solution also seems possible.

### 4.4. Legal and Information Area

Blockchain technology has significant implementation potential in the **legal and information field** of human life. The wide-ranging space includes: blockchain use to protect property rights; for digital identity management, confirmation of the authenticity of university diplomas, or in the field of the Internet of Things as a tool supporting its development. A permanent record placed in a chain allows, for example, to confirm that a given thing, object, or work undeniably belongs to a specific person. The blockchain stores this information in a permanent and unchanging manner. In this way, using the so-called proof of existence, the authorship of the work in question can be confirmed. The properties of blockchain offer numerous possibilities of application also in the field of various registers of property rights. Blockchain -based applications could also make it possible to direct payments for listening to a given song directly to a specific artist. Potentially, blockchains can support the management of access rights to information resources. The tools offered by applications using blockchain make it possible to generate your own identity in a distributed network, i.e., without using the resources of a trusted third party. Identification systems used in blockchain, unlike traditional solutions, are more reliable and, above all, more resistant to attempts to falsify information and are more effective in protecting data against unauthorized access. Due to its properties, blockchain in connection with digital identity can be successfully used by universities to ensure the authenticity of their diplomas (Gresch, 2018; UntungRahardja, EkaPurnamaHarahap, 2020). The report, commissioned by the Joint Research Center of the European Commission, explicitly indicated that one of the four most important applications of blockchain should be document authentication (Anderberg et al., 2019). As the next layer of the Internet, blockchain also significantly complements the functioning of the dynamically developing Internet of Things (IoT), which offers several benefits – from savings to enabling companies to make decisions and improve results thanks to data provided by devices connected to the IoT. The network model is based on a centralized structure where devices connect to a data cloud or central servers to transfer and process the relevant data. The blockchain allows things connected to the Internet to communicate directly with each other and carry out transactions. Due to the availability of smart contracts, devices can directly handle negotiations and execute transactions without the need for human action or the use of indirect services.

## 5. Discussions and conclusions

The implementation of blockchain technology creates several important problems that should be considered when starting work on pilot projects. The main challenge is the question of how justified is the use of blockchain technology in a specific case, what direct benefits does the technology bring to a specific area of application? The authors' opinion should certainly be shared, who, quoting the thought of Joseph Schumpeter, claim that, like any new technology, blockchain initially causes creative destruction, and later may stimulate the development of a larger ecosystem embracing old ways of operating (e.g., Pasterny, 2021: 88). The thesis that technology can be complementary to other spheres of society functioning directs thinking towards evolution, not revolution. Although it is an information technology in its original use, it has many other dimensions. First, as a decentralization tool, it is a new revolutionary paradigm of computational processes. When analyzing the possibilities of implementation, and at the same time the benefits of using the technology, so far, the greatest opportunities are in the areas of human life, where it is beneficial to have some basic features of blockchain. An example may be the area of security understood in a narrow sense (defense) and in a broad sense (food security, economic security, etc.). Another example is healthcare, where technology facilitates the automation of data operations, supply chain management, and drug safety.

The potential of the technology is primarily: stability, transparency, and potentially the least risk of interference by third parties. Blockchains are based on various cryptographic solutions. Blockchain is a decentralized or distributed system, cryptographically secure, providing unchangeable links when resources are shipped, and having a large computing network. Due to its properties, the technology changed the current mode of operation implemented by automating all processes that had been previously performed manually. Blockchain -based applications operate in a completely decentralized manner. Blockchain also takes into account that its security as a communication medium can be compromised by external or internal actors. Blockchain technology has completely changed the way it works, implemented by automating all processes that were previously done manually with unfortunate features. Blockchain provides efficient results that build trust between entities through a reliable environment and a user-friendly network. Manipulating blockchains is extremely difficult due to the use of a distributed, cryptographically secured data structure and the assumption of the ability to operate in the absence of trust.

Blockchain technology was initially developed to implement cross-border payments as an alternative to government currency. In the period after Ethereum was introduced, it became a computing network. Each time, the basic question when implementing a solution is to decide what type of blockchain it should be (public or private). Based on the presented outline, it should be stated that there are currently no technical measures in blockchain technology that could carry out tasks in a defined area of human life. The projects are at the initial pilot stage. In the European Union, Estonia is a country where political decision makers place a significant emphasis on the possibility of technology development. As early as 2012, Estonia launched the Inheritance Registry in the Ministry of Justice, thus gaining the status of the first country in the world to implement blockchain in its administrative systems. On the part of government agencies, The Estonian Information Systems Authority under the Ministry of Economic Affairs and Communications of Estonia was responsible for the design and implementation of the regulations. The Estonian Information Systems Authority (RIA), as an internal service provider for the government, guarantees access to the blockchain network to government agencies through the X- road infrastructure. To this end, Estonia uses the Guardtime blockchain technology KSI. Guardtime is an Estonian company, a world leader among blockchain technology providers. Technology based on quality guaranteed by an appropriate contract and with limited access ensures integrity, interoperability, and independent verification of the value of the entire system. France, on the other hand, adopted a decree in 2017 that allowed the legal transfer of securities through the blockchain. These laws establish a legal framework that allows French institutions to use ICOs as a means of raising capital. The example of work on CBDC, the euro currency, or the regulations adopted by the European Parliament in 2022, under which the issue of shares and bonds as well as trading in these securities and their settlement using blockchain technology will be tested, indicates the growing role of technology in the European Union.

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