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BLOCKCHAIN TECHNOLOGY

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Annotation. Although the basic principles of blockchain technology were developed back in the early 1990s, it only became relevant when there was a need for people to transfer digital information quickly and reliably. Blockchain technology, its types, areas of application, the main advantages and problems of using this technology in various fields of our life are considered in the paper.

Key words: blockchain, database, transactions, cryptocurrency, nodes.

Introduction. The whole world just a few years ago started talking about some new electronic currency called bitcoin due to the rapid growth of its popularity. Bitcoin was created in 2008 by an unknown individual or group of individuals under the pseudonym Satoshi Nakamoto. The idea was to create a digital currency that was decentralized and could be used for peer-to-peer transactions without the need for intermediaries such as banks [1]. This idea was implemented in blockchain technology, the application of which has become widespread in many areas. This technology will be discussed in the paper.

Main part. Blockchain technology is a decentralized database mechanism or ledger that allows for the open exchange of information within a computer network. The blockchain database stores data in blocks that are connected with each other in a chain. You can't delete or change the chain without permission from the network because the data is chronological sequential. As a result, you can use blockchain technology to create an immutable or perpetual ledger to track different transactions such as orders, payments, invoices, and etc. The system has internal mechanisms that prevent illegal entry of transactions and create consistency in the overall storage of these transactions [2].

The stages of working of blockchain technology are described below. When a transaction is made on a blockchain network, it is broadcast to all of the nodes on the network. Each node validates the transaction using complex algorithms, and once it is verified, the transaction is added to a block. The block is then broadcast to all of the nodes on the network, and each node adds the block to its copy of the blockchain [5]. The detailed scheme of work is shown in Figure 1.
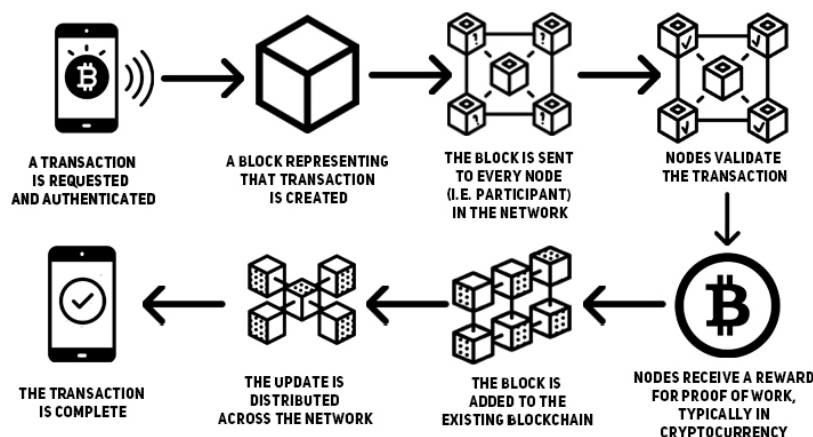

Figure 1- How blockchain works

There are 4 main types of blockchain networks, each of them is more suitable for certain purposes [4]:

1. A public blockchain. It is a decentralized network that is open to anyone. Transactions on a public blockchain are transparent, and anyone can read and write data to the blockchain. Public blockchains frequently provide rewards in the form of cryptocurrency tokens to encourage people to participate in maintaining the accuracy of blockchain. The most popular examples of public blockchain networks are Bitcoin and Ethereum.

2. A private blockchain. It is a closed network that is only accessible to a group of authorized individuals or organizations. Transactions on a private blockchain are more secure, and participants have more control over the network. Private blockchains are often used by businesses and organizations to improve efficiency and reduce costs. The most popular examples of private blockchain networks are Ripples' Interledger Protocol (ILP), Hyperledger, Ethereum Enterprise.

3. A semi-private blockchain (a hybrid blockchain). This network is administered by a separate company that grants access to any user that meets the given criteria. Hybrid blockchains provide the best of both types, giving users the flexibility to choose which type of transaction they would like to make, so they have both opportunities: the security of a permissioned blockchain with the transparency of a permissionless blockchain. Examples of semi-private blockchains could include ones for government entities for record-keeping, land titles, public records, etc.

4. A consortium blockchain is a mixture of public and private blockchains. In a consortium blockchain, a group of organizations or individuals controls the network, but it is still decentralized and open to the public. Consortium blockchains are often used in industries such as finance, supply chain management, and healthcare to improve transparency and reduce costs.

Like all the technologies, blockchain has its own advantages and disadvantages. It will be right to start analyzing the pros of blockchain technology with security. Blockchain technology has a good level of security because of its decentralized construction. As the ledger is distributed across a network of nodes, it is extremely difficult to hack it. This makes it an ideal solution for industries that require high levels of security, such as finance, healthcare and etc. In addition, blockchain is transparent also due its decentralization which means that any network user can validate data recorded into the blockchain. And records of information which is stored using blockchain technology is permanent which means that no one needs to worry about losing the data because duplicate copies are stored at each node. Therefore, people can trust the network. In addition, blockchain technology has such an advantage as instant traceability which will be very usable in industries where consumers are concerned about environmental or human rights issues surrounding a product or in industries troubled by counterfeiting and fraud. Moreover, there's no censorship in blockchain which means that no single authority (even governments) can interfere with the work of the network. For comparison, usual databases have central authorities regulating the operation of the network, and authorities can affect on it, including the use of censorship. Also, blockchain technology can significantly improve efficiency by eliminating intermediaries and reducing transaction costs.

The disadvantages of blockchain technology are discussed below. Firstly, blockchain has slower speed than the traditional database has because blockchain technology carries out more operations. And, because of it, blockchain technology requires a significant amount of energy to work, particularly in the case of proof-of-work consensus algorithms. This has led to concerns about the effect of blockchain technology on ecology. Then, blockchain is costlier than a traditional database. Implementing blockchain technology incurs hefty first expenses. Even though most blockchain solutions are open-source, investing in them is relatively expensive. Paying for work of developers, managing a team that excels in various aspects of blockchain technology, maintenance costs, etc. are all expenses. The price of implementing enterprise blockchain projects can reach a million dollars or even more. Moreover, blockchain technology does not allow easy correction of data after it was recorded, and it requires rewriting the codes in all of the blocks, which takes a lot of time and is quite expensive. That's why it is hard to correct a mistake or make any necessary adjustments if it is necessary [3].

The scope of blockchain technology is various. As it was said before, firstly blockchain was made for bitcoin transactions, and then began to be used for other cryptocurrencies. A few years af-

ter the appearance of the first-generation currency, the developers decided to consider the use of blockchain not only within cryptocurrencies. For example, the inventors of Ethereum decided to use blockchain technology in asset transfer transactions. A good decision was the start of using smart contracts. Smart contracts are scripts that automate the actions specific to a contract between two parties. Smart contracts do not contain usual language, terms, or agreements—only code that starts working when specified conditions are met. It is also interesting that some countries, such as Sweden, are planning to maintain a land registry using blockchain technology. Moreover, blockchain technology can be used to conduct online voting. Also, blockchain technology can be used in the field of identity verification. For example, in June 2017, Accenture and Microsoft introduced a blockchain-based digital identity system and Estonia has a blockchain system of e-citizenship. In addition, there's a usage of blockchain technology in game industry for monetization in the form of cryptocurrencies and non-fungible tokens [6]. To see the growth in the use of blockchain technology, it is necessary to turn to the statistics. As part of this work, the information about the number of bitcoin wallet users from 2012 to 2022 was found. The results are presented in Figure 2. It is obvious that the number of bitcoin wallet users grows very fast and nowadays there are more that 85 million. Thus, we can conclude that blockchain technology is still gaining popularity.
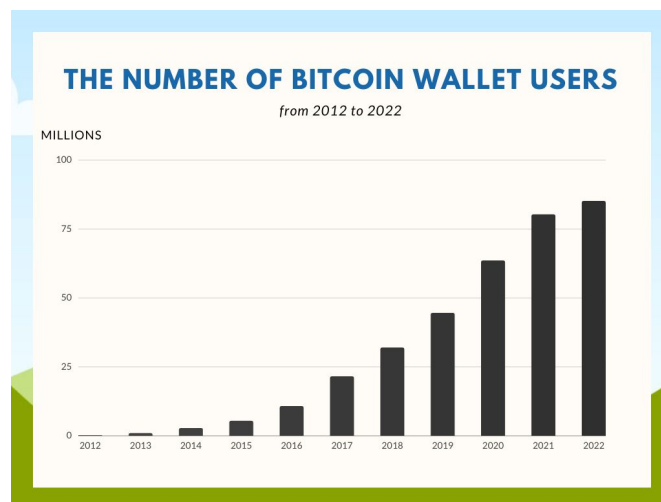
Figure 2 – The number of bitcoin wallet users from 2012 to 2022

Conclusion. Blockchain technology is a revolutionary project that has the possibility to transform many spheres of our life. There shouldn't be any doubt that blockchain technology will benefit and attract the attention of many businesses and organizations, all of which will invest generously in it. Blockchain is decentralized, secure, and transparent that makes it ideal for a large list of applications, from cryptocurrency to supply chain management. Even though it will solve several common market problems at once, the technology has many more miles to go. As companies implement new applications, blockchain technology continues to improve, and the potential for blockchain development is limitless.

References

1. Paul Vigna, Michael J. Casey The Truth Machine: The Blockchain and the Future of Everything. - St. Martin's Press,2018.-320 p.

2. What is blockchain technology? [Electronic resource]. – URL: https://aws.amazon.com/what-is/blockchain/?nc1=h_ls&aws-products-all.sort-by=item.additionalFields.productNameLowercase&aws-products-all.sort-order=asc. – Date of access: 16.03.2023.

3. Advantages and disadvantages of blockchain technology [Electronic resource]. – URL: https://www.forbes.com/sites/forbestechcouncil/2022/10/20/advantages-and-disadvantages-of-blockchain-technology/?sh=53b5f8643453. – Date of access: 16.03.2023.

4. Blockchain facts: what is it, how it works, and how it can be used [Electronic resource]. – URL: https://www.investopedia.com/terms/b/blockchain.asp. – Date of access: 16.03.2023.

5. What is blockchain & how does it work? [Electronic resource]. – URL: https://vitalflux.com/what-is-blockchain-how-does-it-work/. – Date of access: 16.03.2023.

6. Blockchain [Electronic resource] – URL: https://en.wikipedia.org/wiki/Blockchain. – Date of access: 16.03.2023.