

ARTIFICIAL INTELLIGENCE AS A
BASIS FOR THE DEVELOPMENT OF
THE DIGITAL ECONOMY
Textbook

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1.4. Artificial intelligence and its possibilities

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In the current functioning of the global world, an important place is occupied by the processes associated with the transition to a knowledge economy and information society, which determine the directions of economic and social development of international and national economies. According to modern realities, the pace of scientific and technological development, globalization processes, informatization of all spheres of society cause significant changes in economic and social policy, and accordingly changes the attitude to the use of artificial intelligence. Artificial intelligence (AI) can expand and strengthen human abilities and skills, and its technologies are a valuable business resource in today's environment of information technology. The use of AI helps to meet the demand of ordinary citizens for better personalized goods and services, and allows officials to save time on routine tasks, ensuring the search for creative and innovative approaches to improve services.

AI is a strategic imperative of any business, as the use of various forms of its implementation has helped many companies to gain a competitive advantage, gain additional profits and achieve their goals [1,2,3,4]. Among such forms of AI can be noted such as:

- chatbots use AI to quickly analyze customer and supplier requests and the ability to respond in a timely manner to customer responses and comments;
- "smart helpers" use AI to extract the necessary information from large amounts of data, optimize planning;

- referral systems automatically select applications for viewers based on information they have previously viewed,
- digital platforms, such as the Trans.eu Platform, offer state-of-the-art solutions such as: optimization of permanent routes, automated customer search and proposals using algorithms, etc.

Artificial intelligence technologies can be used in many areas, summarizing which in some of the most active, it should be noted their characteristics (Fig. 9)

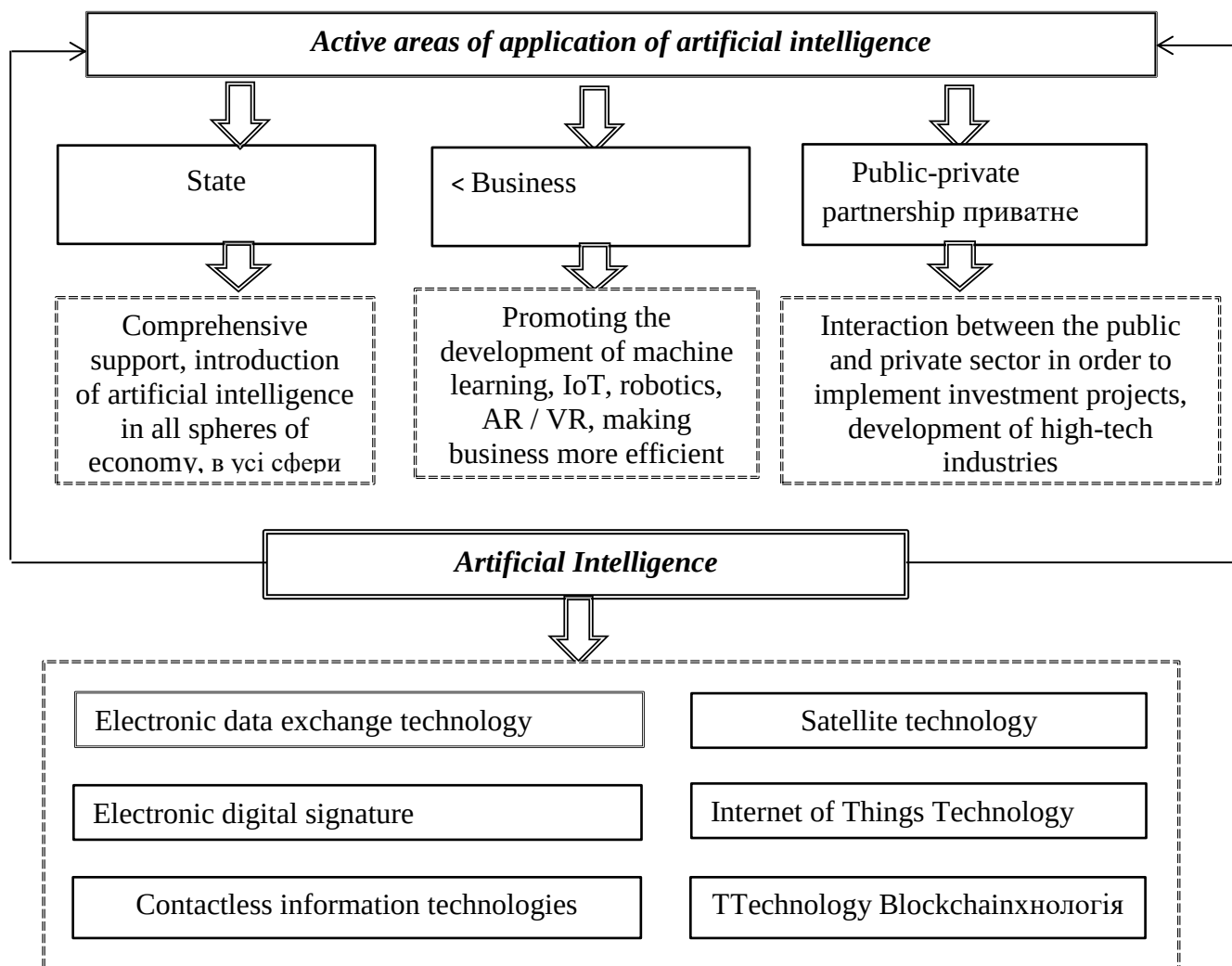


Figure 9. Components of artificial intelligence

Source: Artificial intelligence in the system of managerial decision-making (2012), Blockchain Association of Ukraine (2019)

Thus, the state forms policies and priorities, government procurement, investment and project financing (use of AI systems in public services, formation of open data policy, development of support programs for AI startups and their involvement in GOVTech activities, etc.). A business that, thanks to flexibility, quality management and high speed of implementation, can build machine learning, IoT, AR / VR, robotics. Public-private partnership is considered the most optimal option for the formation of a new industry for the development of outer space, the development of smart cities, new energy, transport. By pooling

resources and sharing risks and rewards, the state and the private sector implement cost-effective projects, create or renovate cost-effective facilities that require investment. Such synergy contributes to the creation of new markets for high-tech products, solving social and economic problems, improving the business climate in general.

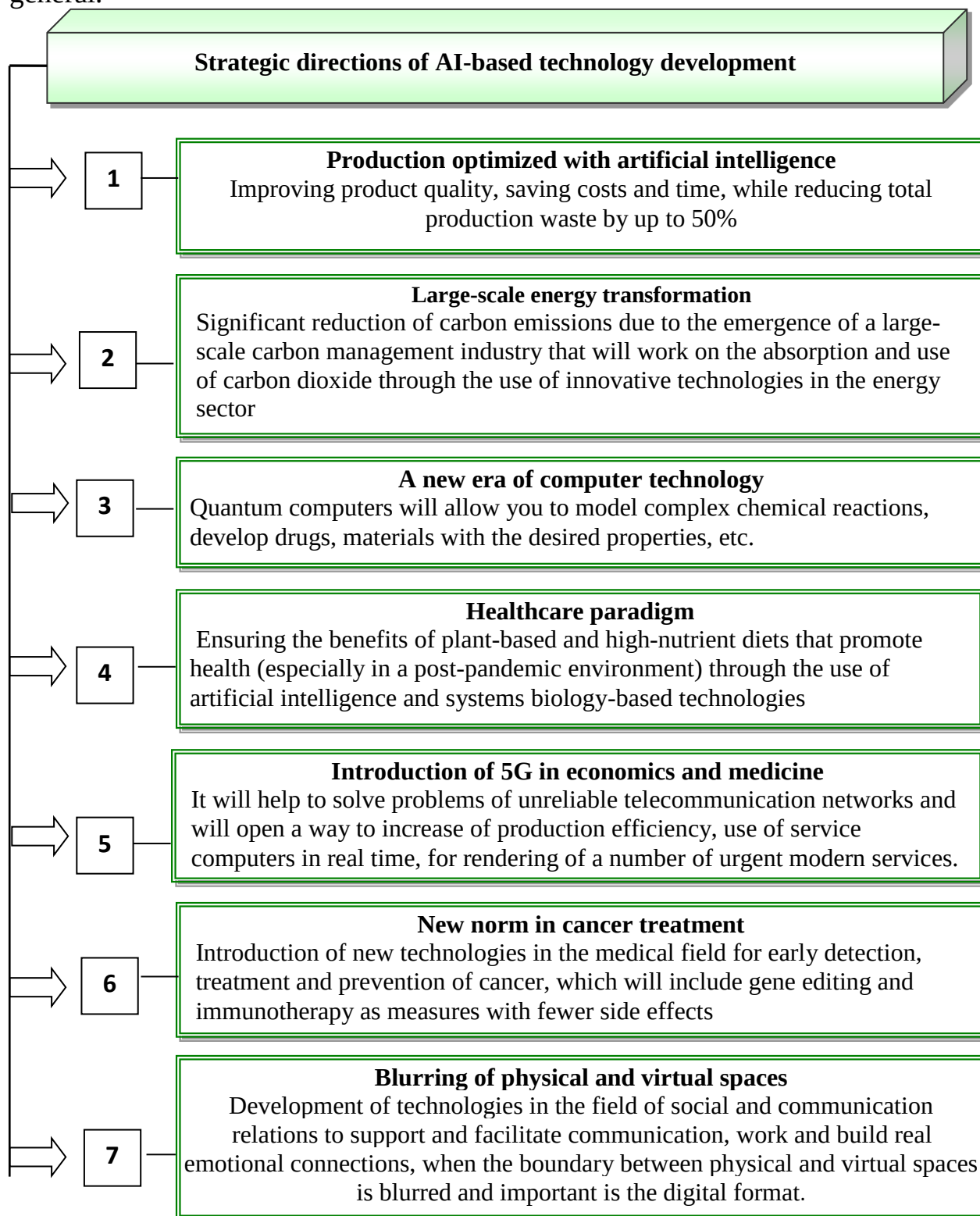


Figure 10. Strategic directions of AI-based technology development

Source: Seven technologies that can change the world by 2025 (2020).

According to analysts and researchers in the field of AI, among the many technologies that in the next five years can significantly expand the capabilities of mankind and cause a significant impact on the lifestyle and standard of living of a large proportion of the population should pay attention to those who will be flagships of technological progress (Fig. 10). It should be noted that among such technologies are widely used various search engines, information servers, interactive stores, browsers - programs that allow you to find and view hypertext documents posted on the Internet, e-mail programs, communication programs, and more. Consider the characteristics of some of them:

- ✓ Electronic Data Interchange (EDI) technology allows you to optimize the creation, sending, receiving and processing of any electronic documents and integrate them with existing business applications.

- ✓ Electronic digital signature (EDS) - details of an electronic document designed to protect an electronic document from forgery, which allows you to identify the owner of the signature key certificate and establish the absence of distortion of information in the electronic document; has legal status.

- ✓ Contactless information technologies - technical means, organizational measures, sequence of actions that ensure the registration of objects and rights. Entering this information into the media is carried out without the use of a real-time keyboard (card, biometric technology, bar coding technology).

- ✓ Radio Frequency Identification (RFID) technologies - RFID chip transmits information in the radio range to a special device or scanner. International Automatic Identification System (EAN UCC) - used to identify units of account with a unique global trade item number GTIN (Global Trade Item Number). This number is displayed on the packaging of goods in the form of a bar code of the international coding system EAN / UCC. The EPCglobal Network should form the basis of the global supply chain management of the future. EPCglobal's mission is to develop and promote standards for all elements of the network and to ensure immediate, automatic identification of goods and exchange of information in the supply chain.

- ✓ Satellite technologies - satellite communication systems, radio navigation systems, commercial transport control systems. The use of WMS (Warehouse Management System) for warehouse management is a hardware and software complex that allows you to effectively manage the placement and movement of goods in the warehouse, has a management role, optimizes the tasks and routes of loading equipment. MRP (Materials Requirement Planning), MRP II (Manufacturing Resource Planning), ERP (Enterprise Resource Planning) - technologies for planning and resource management of different levels of coverage.

- ✓ Internet of Things (IoT) technology allows you to integrate physical means into a single network, making them "smart", that is, to connect the digital and material worlds. According to a joint study by GT Nexus and Campegini,

today about 70% of retailers with their own logistics services use IoT to optimize the supply chain.

✓ Big Data services are becoming the center of the logistics business - they help reduce costs, increase the level of customer service, make forecasts (for example, identify problem points in the supply chain). Internet of Things technology is responsible for collecting large amounts of information, the analytical system transforms this data into routes to traffic directions. This gives impetus to the development of autonomous vehicle technology (unmanned vehicles, drones). Robotization is one of the contradictory trends. According to St. Onge Company in 2016, only 5% of the world's warehouses were automated and 15% mechanized. Therefore, the penetration of this technology is still small, but is already widely used by large corporations.

✓ Blockchain technology, which allows you to reduce the supply chain, reduce contractors and replace it all with productive management. benefits. To properly understand this concept, it is necessary to gradually consider the components of blockchain technology. Thus, the technology can be divided into three main parts: the blockchain itself, peer-to-peer networks and the consensus-building mechanism..

First and foremost, Blockchain is a revolutionary technology, decentralized storage of large amounts of information, with the inability of its users to re-modify or edit it, for their own benefit. To properly understand this concept, it is necessary to gradually consider the components of blockchain technology. Thus, the technology can be divided into three main parts: the blockchain itself, peer-to-peer networks and the consensus-building mechanism. Among the important tasks facing the implementation of Blockchain technology in the enterprise, it should be noted: minimize logistics costs so that its share in the price of goods is minimal, ensure transparency of supply processes and solve the problem of trust of contractors; control of cargo flows, when all actions are recorded in Blockchain, which allows you to have up-to-date information on the status of unloading;

From a technical point of view, a smart contract is a computer code that, in the event of a certain condition or condition, is able to work automatically according to predefined functions. This is a fragment of program code that performs certain tasks in the case of compliance with a pre-established condition in the program [5]. This code can be stored in a distributed registry and write any changes to it. If blockchain technology or other distributed registers are used, the smart contract is stored and duplicated in it, the algorithms of the smart contract are determined by its program code within the network of the distributed register. Therefore, anyone who has access to the distributed registry can verify that the smart contract operates in accordance with the conditions, which ensures that they cannot be changed [5].

A fairly common definition of the concept of smart contract from a legal point of view is its understanding as an agreement of the parties, which exists in the form of program code that operates in a distributed data register and ensures self-fulfillment of such agreement in case of pre-defined circumstances (Fig. 11).

Therefore, it should be understood that the concept of a smart contract is a kind of agreement in the form of coded mathematical algorithms, the conclusion, change, execution and termination of which is possible only with the use of computer programs (Blockchain platforms) within the Internet.

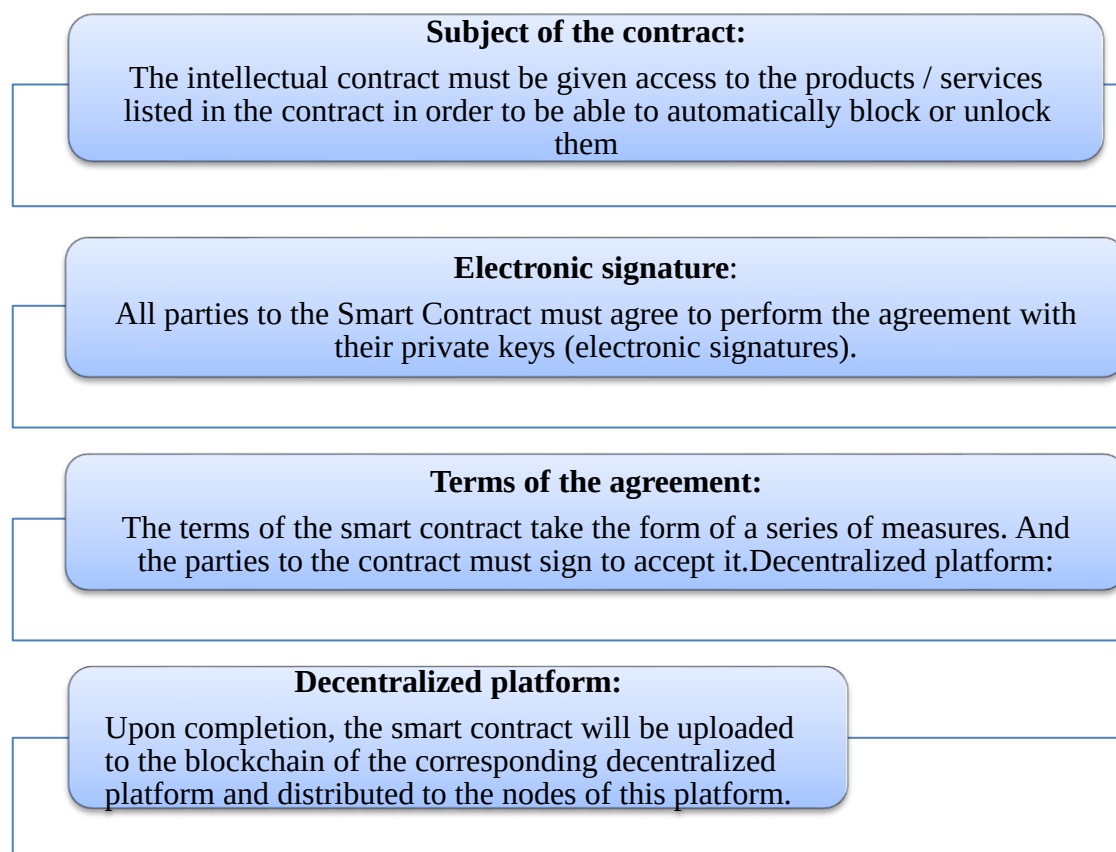


Figure 11. Conditions for creating a smart contract

Source: Blockchain Association of Ukraine (2020), Prospects for the use of blockchain technology in the Internet of Things (2016)

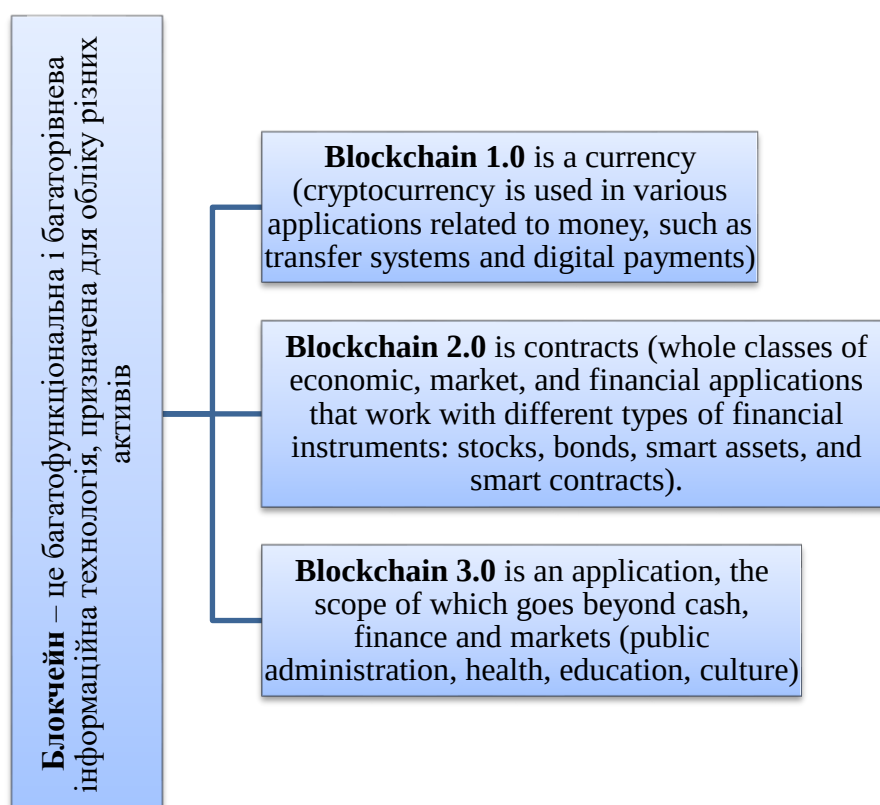
The principle of operation of the Smart Contract can be described in 3 steps:

1. The option contract between the parties to the agreement is written to the blockchain using a code. The parties to the agreement remain anonymous, but the contract is entered in the register;
2. There is an event that is initiated by, the arrival of the expiration date or the strike price is reached, and the contract is executed in accordance with the coded conditions;
3. With the help of the blockchain, regulators can investigate market activities, while information about the terms of specific conditions is kept confidential.

The "reasonable contract" mechanism of action means that they automatically fulfill pre-programmed conditions only before they meet the necessary requirements. First, the terms of the contract will be written in a programming language, then encrypted and transmitted to the Blockchain block. Once transferred to the unit, this smart contract will be distributed and reproduced by the nodes running on this platform. Upon receipt of the deployment order, the

contract will be executed in accordance with pre-defined conditions. In this case, Smart Contract will automatically check the process of fulfillment of obligations and conditions specified in the contract. The ideal supply chain contains only the "seller" and the "buyer", they must be connected by one goal, and they must meet in a single unified database, such as Blockchain. At present, several elements are not enough to become such a Blockchain system: - international legal support; - unification of all logistics laws and regulations in all countries; - legal framework.

As a transparent public registry, such a system will provide customers and auditors with simple and effective tools to track the entire route. One important aspect is that the blockchain can be used when all members of the supply chain have access to the network. In addition to addressing industry-specific issues, the blockchain brings a package of instant benefits. Not only does it eliminate unnecessary resellers and significantly reduce workflow, but it also offers reliable protection, error reduction, prevention of mislabeling of illegal goods and other attempted fraud. Blockchain – technology is a kind of data storage in the form of a digital register of transactions, agreements or contracts. The analysis of the use of blockchain taking into account technological aspects (Fig. 12) showed that the main advantage of this technology is that such a register is not stored in any one place.



Blockchain is a multifunctional and multilevel information technology designed to account for various assets

Figure 12. Using the blockchain from a technological point of view

Source: Blockchain Association of Ukraine (2020), Transparency and Security: What Blockchain Technology Can Give to the Economy and Law

Blockchain technology can become the most transparent means of communication between the state and the population, excluding any intermediary bodies on the way, first of all, to financial regulatory interaction (grants, benefits, subsidies) between the person and the government.

Principle Blockchain operation is very simple but at the same time is unique, due to the specially written code of process algorithms.

Blockchain technology provides transparency of all transactions that can be tracked, recorded, analyzed and stored, ie are in the area of access of government agencies. One of the main reasons why the blockchain is so attractive to business and other human activities is decentralization and transparency. Blockchain is more than a decentralized network. Unlike a conventional decentralized network, where there are certain connecting points, a blockchain is a distributed registry in which all participants are directly interconnected.

As more and more global logistics market participants become concerned about increasing the transparency and reliability of supply chains, leading IT companies are promoting the idea of using blockchain technology for this purpose. For example, the international IT company IBM has already invited some large companies from various fields of activity to test their developments based on the principle of blockchain. The Hyperledger International Blockchain Consortium was launched by the Linux Foundation in 2015 and currently brings together more than 115 companies from a variety of fields, including finance, automotive, healthcare, IoT and aviation. The main goal of the consortium is to create a single open source blockchain platform that will allow organizations around the world to implement blockchain technology in their business processes. WalMart retailer was one of the first to believe in the bright future of blockchain, it is testing new IBM technology on deliveries of mango in the US and pork in China. According to the company, its implementation will increase the efficiency of inventory management and ensure the safety of food supplied, which WalMart considers especially important after the outbreak of salmonellosis in 2006. At that time, using paperwork, it took the company about two weeks to identify the source of the infection. Blockchain will provide complete information about any batch of goods entered into the database, in seconds, say supporters of the technology [7].

The introduction of these technologies will be considered on the example of an industrial enterprise for the production of dairy products. For more efficient functioning of the logistics system it is necessary to develop an algorithm that will include three generalized stages:

- 1) introduction of the process of transferring the management of the entire logistics system into an innovation system Blockchain;
- 2) determining the form in which the Blockchain system of the concern will be integrated;
- 3) implementation of unification of all document flow to standardize the process of concluding Smart Contracts.

Of course, we choose such a Blockchain system as IBM Food Trust, and as it has a number of advantages over industrial enterprises for the production of dairy products, including:

- The IBM Food Trust is an ecosystem of manufacturers, suppliers, retailers and others involved in building a smarter, safer and more sustainable food supply system for the world;

- IBM Food Trust was created by the logistics giant IBM, which has a wide network of partners.

It should be noted that the use of IBM Food Trust involves three main steps, namely:

- select and set up a subscription depending on the size of your company (small, medium, large business) and business needs;

- select best integration option (automatic XML loading, Excel loading, direct data entry);

- choose the best version of the onboard algorithm (homing board, virtually controlled board, onboard assistance).

The IBM Food Trust cloud blockchain solution provides network members with open, flexible, and reliable ways to share product information, leverage the experience of others, develop advanced functionality, and choose where and how to deploy.

A special feature of Blockchain technology is that it creates a new environment for collaboration with data, in which even direct competitors can cooperate. All participants can set access levels and collaborate securely, as this technology stores data digitally and is distributed and unchanged. Trusted members, leading members of the IBM Food Trust network, are collectively responsible for maintaining the integrity of the shared registry and assisting all members of the community in ensuring security, confidentiality, and compliance with data access permissions. The node of each trusted participant receives a full copy of the encrypted registry. This allows participants to see blockchain hashes, check events, view sender access logs, and check for data forgery. However, they do not have access to decrypt the data, so they can only access the allowed data.

It is worth noting that IBM Food Trust has already developed several modules to implement a number of features that help create the IBM Food Trust network you want. The APIs are offered as additional components to the available subscription options. The system has four types of online subscription to the service:

- small business (available modules according to the needs of the company and only for companies that send and receive goods in the food supply chain for less than \$ 50 million);

- medium business (available modules according to the needs of companies that send and receive goods in the food supply chain in the amount of 50 million to 1 billion US dollars);

- large enterprises (available modules according to the needs of companies that send and receive goods in the food supply chain worth more than 1 billion US dollars);

- virtual learning (Virtual learning under the guidance of IBM Food Trust experts, which is available as a supplement to such a system).

Note that the price for these types of subscriptions is different, confidential and set individually for each member of the IBM Food Trust. The system consists of many complex algorithms that are automatically executed for almost all users. In this case, the basic digital algorithms that are listed in one block and are responsible for the same functions are called modules. There are 4 main types of modules in the system structure:

1. Trace module (provides complete tracking of the supply chain).
2. Certificate module (provides transfer of certification documents and their management).
3. Virtual learning module (aimed at faster development of data transfer).
4. Neural networks module (module based on the algorithm of artificial intelligence and neural networks, for self-learning and automatic addition of the algorithm or replacement of inefficient codes).

The IBM Food Trust interface has a special algorithm for determining the savings from the use of the IBM blockchain system, which provides for the appropriate calculation of such savings for key players, including retailers, large manufacturers, distributors. This algorithm is provided for informational purposes only and is based on individual interviews and evaluations, not on actual performance data for any IBM product.

Thus, the use of artificial intelligence in the logistics of any enterprise aims to accelerate all processes, ensuring their more accurate and continuous implementation. The use of paper and pencils in the logistics industry, long-distance transportation of goods, opaque supply chains - all these are the realities of the modern world, which lead to excessive consumption of energy, materials and time. In modern conditions, data conversion, the use of new methods of delivery, automation and robotics are changing the logistics market. In this case, information technology in logistics reflects a set of production and software tools, combined into a technological chain that provides collection, storage, processing and dissemination of information to reduce the complexity of the use of information resources, increase reliability and efficiency with them.

Thus, the comprehensive penetration of artificial intelligence, quantum computing, tighter control over CO2 emissions, new strategic directions of medical development based on the development of modern technologies in the near future will significantly expand the capabilities of mankind and affect their living standards and socio-economic development of each state.

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