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PHILOSOPHY OF DIGITAL ECONOMY

Textbook on academic discipline

"Philosophy"

For students, listeners mastering the content

educational program of higher education of the 1st stage

for all specialties full-time and part-time forms of education

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The textbook supplements the lecture material with topical issues of the philosophy of neural technologies. The material belongs to the section "Philosophy of natural science and technology" of the lecture course on the philosophy and methodology of science. The natural-science aspects of human consciousness and technological trends in the evolution of convergent structures of digital ecosystems are described. The evolution of system computer engineering is analyzed.

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INTRODUCTION

This tutorial has a practical focus. It is concentrated on the subject field of economic topics, which became relevant under the influence of the fourth industrial revolution, as well as the industrial Internet programs "Industry 4.0" and "smart industry" that followed from it. The institutions of digital e-commerce and the digital service economy have actually integrated into the information space of the modern society of social networks through the technologies of digital ecosystems and metaverses. As a result, an interdisciplinary format for the analysis of modern socio-economic reality has emerged. In this interdisciplinary format, philosophy plays an important role, since it analyzes the essential characteristics of the digitalization of technological processes and professional activities. It introduces students to trends in social dynamics and new methodological practices of business processes. Its subject field included systemic characteristics of the modernization of business practices, the labor market and the consumer market, not only taking into account economic factors, but also epidemiological determinism.

The subject of philosophy was the institutional environment of the modern economy and the institutions of the digital economy emerging in it, as well as the peculiarities of the legal regulation of the status of these new institutions. The manual presents the results of the analysis of the conceptual self-determination of digitalization as the modernization of an industrial society. In this context, the features of the formation of the institutional environment of the digital economy in the Republic of Belarus are described.

Digital modernization of economic activity

Modernization, as a philosophical category, indicates the transformational evolution of a certain type of activity, for example, an industrial type. This type of human activity was formed by the 18th century in the form of manufactory production of consumer goods. Workers worked at manufactories, who in a market economy received wages and spent it on meeting individual needs in urban life. Consumption created a large domestic consumer market and stimulated production and job creation. When the development of the consumer market at the expense of the colonies of the New World began to outpace the production of goods, the technological modernization of the UK market economy with the widespread involvement of machines in production became in demand. As a result, the achievements of the first industrial revolution were in demand.

Technical and technological modernization was accompanied by threats to the labor market. It was a threat of job cuts, and also, the workers were forced to improve their professional skills. Technicians were in demand. Employment threats were minimized by the transformation of the industrial structure. In addition to the production of consumer goods, the extraction of coal and iron ore, metallurgy, mechanical engineering, shipbuilding, and the construction of canals and roads began to play an important role. As a result, conditions were formed for the addition of steam engines, machines on an electric and diesel basis.

Electrification has become a trend and the essence of the second industrial revolution. To implement the strategy of transition to an electric energy basis, the infrastructure of power plants and power lines was created. Railways were electrified. As a result, an energy industry was formed, the main resources for which were hard and brown coal, oil, natural gas and peat. These natural resources have become the basis for a separate branch of the world economy. This industry continues to play a key role in shaping the macroeconomic indicators of the world economy.

In addition to Great Britain, many states of the Old and New Worlds followed the path of industrialization. Among them were Germany, Russia, the USA and Japan. Geopolitical competition between them has created a military-industrial complex in the structure of the economy. Engineering personnel of high design qualifications were concentrated in this complex. The developments they created in the form of samples of military equipment were tested on the battlefields of the First World War.

The risks for a market economy oriented towards a mass consumer society created the cyclical nature of a free market economy. Economic cycles are accompanied by crises in the form of a sharp decline in consumer demand, rising unemployment, as well as bankruptcies of companies and banks. In order to avoid social discontent, examples of which, under the influence of the First World War, were the cessation of the existence of such European monarchies as Austria-Hungary, Prussia and the Russian Empire, the United States adopted the Keynesian model of economic development of a market economy during the Great Depression for institutional implementation. This model assumes the participation of the state in minimizing the negative social consequences of economic crises.

After the second war, large transnational structures of industrial and banking capital arose. Issues of corporate communication, information and operational decision-making have become important for them. Electronic computers were developed. Their development went along the path of creating supercomputers, as well as creating the production of compact electronic computers for professional use in the corporate space of a company and organization. The integration of desktop computers into a single network has created the phenomenon of information technology and the Internet space.

Machine tools were combined with numerical control. But due to the high cost of existing equipment, its use was local. Of greatest interest are the military-industrial complexes of nation-states. They were interested in development.

The locality of the use of digital technologies did not give grounds to consider the third industrial revolution as a full-fledged project for the development of the world economy. On the status of implementation of the determinants of the formation of the digital economy, it claims the fourth industrial revolution

The digital economy is based on Internet and mobile communications technologies. These technologies will initiate the third industrial revolution. The turning point is connected with the achievement of the quality and speed of information transfer. This leads to decisive changes in digital technologies and speaks of their effectiveness in the modern economy. There has been a transition from high-performance digital technology to multimedia, from semiconductors to microprocessors, from computing to client-server architecture, from sharing access to data, text, image and sound to multimedia, from specialized systems to a computing system. The process of formation of an ordinary society began. Signs were the availability of the Internet and the emergence of a large number of services and products combined into a single system. Given the presence of mechanisms included in a single cyber-physical structure - from refrigerators and heaters to factory machines and industrial complexes - the social system has become digital.

Digitalization is associated with the use of complex terms like the Internet of things, discovery, crypto currency and augmented reality. In turn, terms that include the importance of combining technologies and their first impact are relevant. This is the quality of acquiring digital technologies in trade. It took place not at the level of special ideologies and ideas about solutions, but at the level of specific companies and firms that identify their pragmatic tasks.

Digitalization of assessment as a rethinking of the approach to business, increasing the efficiency of the company through proximity and business processes, as well as organizing the comparison of the work of IT systems. Defining the main characteristics of the information society, in the first place put access to the source of the source, suppose that digital technologies are available to

solve the problem of their discovery. E. Masuda concludes that complete anarchy is necessary due to the high and complete availability of the production of information market agents. The problem of obtaining complete and complete information, according to E. Masuda, is important from the point of view of the economic behavior of individuals, and from the point of view of the behavior of large and large economic agents. We are talking primarily about the agents of the market environment. They are the main social need interested in digitalization and realizing it.

State Program "Digital Service for Belarus" for 2021–2025 It provides for the use of digital technologies in education, healthcare, manufacturing and construction, as well as the integration of the Belarusian economy into the global economic and digital space. The tasks set are already being implemented. On the basis of the existing Ministry of Communications and a new state body is being created - the Ministry of the Ministry of Development and Communications.

The first level of digitalization associated with the preparation of personnel for a specific process, training employees and increasing the level of intelligence of the company. The second level of digitalization involves the installation of CRM, ERP, the correct collection and analysis of data. To get to the third level of digital transformation, companies need a correct description of business processes and a clear IT strategy. For most companies, the third level of digitalization provides the necessary benefits to run a successful business. But to become a digital leader and move to the fourth and fifth levels, it is not enough just to prepare an IT strategy, it is necessary to lay in this strategy advanced automation tools - predictive self-correction and open interfaces.

Digitalization technologies promoted by manufacturers are products that can provide certain convenience, speed and efficiency in the field of management operations, as well as in everyday life. But digital technologies will not become a means of guaranteeing economic growth and overcoming the crisis. They are mainly used in the management and maintenance of production.

Digital modernization in the concept of the fourth industrial revolution

Behind the terms "fourth industrial revolution" and "digital modernization" lies the same strategy. It consists in completing the digital modernization of all sectors of the economy. In fact, the fourth industrial revolution as a term aims to draw the attention of government agencies to supporting an expensive project to saturate technological processes with digital components. Judging by the way government structures responded to this request, the strategy was justified. An example is the concept of Industry 4.0. It declares the transition to a fully automated digital production, controlled by intelligent systems in real time in constant interaction with the external environment, going beyond the boundaries of one enterprise, with the prospect of joining a global industrial network of things and services.

At the applied level, this is the name of one of the ten drafts of the German state strategy until 2020, which describes the concept of smart production based on the industrial network of the Internet of things and industrial services. This is a trend in the development of automation and data exchange, which includes cyber-physical systems, the Internet of things and cloud computing. This is the management of the value chain throughout the life cycle of products.

Industrial automation, which began at the end of the 20th century, was predominantly local in nature, when each enterprise or divisions within one enterprise used its own proprietary control system, or a combination of them, which were incompatible with other systems. Now we are talking about the use of open information systems and global industrial networks that go beyond the boundaries of a single enterprise and interact with each other.

Such systems and networks have a transformative impact on all sectors of the modern economy and business, and take industrial automation to a new fourth stage of industrialization.

To implement such a strategy, the developers created the components of "Industry 4.0". These are elements of the Internet of Things such as artificial intelligence, machine learning, robotics, cloud computing, Big Data, additive manufacturing, augmented reality, cyber security. It was only necessary to develop an integration system and use modeling.

Many of these elements have been successfully used in practice for a long time, but it is their combination into one coherent system that will allow us to develop the concept of Industry 4.0 and provide a new level of production efficiency and additional income through the use of digital technologies, the formation of networking between suppliers and partners, as well as the implementation of innovative business models.

Discussion on the topic of digital modernization became intense after the Davos Economic Forum and the speech of the president of this business club, Klaus Schwab, in January 2016. Managers and engineers who directly carry out digital modernization usually profess technocratic beliefs. For them, the revolution comes down to the sum of new, but already well-known technologies, including: cloud computing, big data, cyber-physical systems, artificial intelligence, 3D printing and the Internet of things.

If we analyze the specific features of the four industrial revolutions, we can identify a characteristic trend. The first industrial revolutions formed the raw material and energy basis of the industrial economy. These are raw materials, as well as sources and methods of energy transfer, technologies. Then the organization of production and management became a priority. There were works on the theory of automatic control and various kinds of tabulators. At the end of the 1940s, cybernetics emerged, specializing in control. In the 1960s, with the advent of computers, technological and organizational management systems became even more important. At the end of the 20th century, the role played by control systems became comparable to the importance of the technologies they

control. Such technologies have appeared, the existence of which is impossible without automation.

The difference between the latest control systems of the era of the fourth industrial revolution can be called quantitative. The sensory revolution, which began with RFID sensors, computer networks, media data collection and accumulation, and other technologies have made it possible for control systems to receive almost any information about the world around them. The idea of "data-driven" arose when it became possible to collect data in sufficient volumes and analyze them to make objective decisions. These values do not have, and the added value is obtained by analyzing them for the emergence of useful and consumable information.

The centerpiece of the new economy is data science and data scientists. Under the name of Data Science, there are many different, not yet systematized methods and technologies for analyzing large amounts of data, but genuine data science. Data Science denotes the generalized name of the sum of technologies for the production of data products. Data products are known by search engines. Selling content is becoming big business. The Internet contains a huge number of data-driven applications. This is passive use of data. Active data products can be called those where there are people involved in the process of creating such products, and there are technologies for their creation.

Data scientists perform four main tasks. They include the transformation of the original data into a form suitable for analysis; data analysis; data interpretation; application of data to practice. When using data, their number does not decrease, but increases. The same can be said about Industry 4.0 information systems. They are distinguished from the past by the absence of noticeable restrictions. They have extreme productivity (extreme productivity), providing extreme automation (extreme automation) and extreme connectivity (extreme connectivity).

Extreme performance is provided by multi-core processors, in-memory computing, SSD, clouds, big data analytics. Extreme connectivity is understood as the conditions under which barriers associated with distance, time, or some other restrictions on the interactions between people and machines, people and people, machines and machines disappear. This process began in 1982 with the creation of the Internet using the TCP/IP protocol. The term internet is short for internet working.

Later, the term Internet of Things (IOT) was proposed, then "industrial Internet" Industrial Internet of Things, in connection with the advent of block chain technology - "Internet of Value" Internet of Value and, finally, "Internet of Everything" Internet of Everything (IoE). IoE connects people, data, processes and things. Extreme automation refers to artificial intelligence methods in business, government, and private life. We are talking about weak artificial intelligence, which does not imply the creation of smart machines that represent a danger to humanity of robots.

Weak AI is a system that does not have a mind and computer mental abilities (Non-sentient computer intelligence). They are focused on solving applied problems. As an example, the question-answer system (Speech Interpretation and Recognition Interface) can be considered. This app uses natural language processing to answer questions and make recommendations. SIRI adapts to each user individually, learning their preferences over time.

Weak artificial intelligence includes work on automating car driving, deep machine learning and natural language processing (NLP), the Internet of things, machine-to-machine interaction, and cyber-physical systems. The combination of extreme connectivity with extreme automation on a foundation of extreme productivity opens up the possibility of creating large systems built on the basis of a cybernetic approach. The application of the cybernetic approach was limited to technical systems.

The cybernetic approach to business management, based on decision-making dictated by objective data analysis (data driven decision), will make it possible to get rid of the chronic disease of any management systems of any enterprises, for which there is a figurative name Highest-Paid Person's Opinions, "decides by the one who gets more". This decision-making rule is inherent not only in business, but also in any administrative systems where money is also accompanied by official positions. The optimality of such solutions in the overwhelming majority is questionable. There is nothing fundamentally new in this approach. Its key elements were tested back in the 80s of the twentieth century at the production and management levels.

The industrial economy at the beginning of the 21st century is using the same energy platforms as thirty years ago. Advertised alternative energy sources are also archaic, apart from the question of their profitability. There is no new transport platform. Mostly technologies of the 80s of the XX century are used. Reducing logistics costs is achieved mainly through organizational measures. There was no mass introduction of fundamentally new materials. There are achievements in the field of new materials and the creation of new material properties, but nothing revolutionary is happening in practice. There are no revolutionary changes in the field of energy efficiency of production.

Emphasis is placed on organizational decisions. It is characteristic of philosophy kaizen. It deals with the service, logistics and management components of the production process. This management is not so much resources as time and space. In the digital economy, the key type of production is the ability to generate rent from investment air. In the model of the fourth industrial revolution, real resources and production remain the source of investment rent. The trend is now new global logistics and new technologies of global finance. Of importance is the question of a radical restructuring of financial communications and financial and investment relations in the modern economy.

At the initial stage, large investment resources will be required for the technological renewal of existing assets and for addressing social issues. The first years can be investment-friendly, although socially extremely dangerous and fraught with costs. One of the most important positive factors is a relatively comfortable system in economic and managerial terms, which allows for quick operational changeover. The task of periodic complete renewal of fixed assets, the most capital-intensive element of the modern real sector, is leveled. A key component is the geographic cascading of processes, as well as the scaling of production depending on the size and dynamics of markets.

The basis is adaptability, the ability to quickly adapt to changing markets both qualitatively and quantitatively, accessible from the point of view of economically viable logistics. The main investment focus is engineering and adaptation of production to the needs of regions or macro-regions.

Key technological rent will be collected at the level of basic technologies, as well as the development and production of key components, the contribution of which to the total cost of production may be small. It will be necessary to equip the sales infrastructure, but not the production output. It's not about industry, but, above all, about financial and logistical support. As well as the possibility of the final separation of the management link from the assets.

The concept of "property" in the new economy becomes a mosaic. In the global economy, investment cycles have become burdened with a gigantic volume of investment derivatives and surrogates. Economic priorities with distorted market motivation began to play a role. Classical examples: Bangladesh and African countries. In the context of the humanization of investment priorities, it is extremely difficult to implement the principles of digital modernization.

We will have to carry out the dehumanization of the investment and operational space. The West-China relationship constitutes a key investment cycle in today's economy that has become unwieldy. But it is impossible to reset this cycle without global consequences.

After the regionalization of global finance, it will be possible to assess the consequences and prospects of the new situation in terms of their real socio-economic content.

Pandemic as a factor of digitalization

The pandemic has contributed to the transformation of economic and social life in many countries. One of the consequences was the accelerated introduction of digital technologies in various fields of activity. As part of government-imposed travel restrictions and social distancing measures, businesses and consumers are actively embracing digital solutions to continue working remotely. Digitalization facilitates the transition to the online environment of medicine, work, education, allows you to make online purchases, get more data on the spread of the virus and share information about research. The development of this trend speaks not only of an urgent need, but also of the created material base for the widespread use of digital technologies.

Compared to the situation of the global financial crisis in 2008, the number of Internet users has grown from 1.6 to 4.1 billion people. The number of smartphones in use has reached 3.2 billion. The proportion of Internet users among the world's population has grown from 23% to 54% over the same period. The number of people using online shopping services has doubled. The volume of retail trade on the Internet has grown from 1 to 3.8 trillion. USD. Of the six major digitalization trends in the context of the COVID-19 crisis, three are directly related to accelerating the transition to a digital economy. This is remote work and the use of communication technologies

More and more people are working remotely, using video conferencing services and instant messengers. Demand has increased for the use of programs such as Microsoft Teams, Skype, Cisco's Webex, and Zoom. In China, the use of remote work services from We Chat, Ten cent, and Ding increased significantly at the end of January 2020, when restrictions related to COVID-19 came

into force. The use of online platforms stimulates the development of cloud technologies for data storage and analysis, increases the demand for rental services from technology companies (Amazon Web Services, Microsoft, Ten cent and Alibaba). The crisis also contributed to the transition of schools and universities to distance learning. Digital tools and online training keep teachers and educators connected with students.

The COVID-19 crisis has had a negative impact on digital platforms, mainly in the field of movement and travel. This group includes transportation-related services (Uber, Lyft, Didi Chuxing), as well as housing rental services (Airbnb, Booking.com). This trend reflects the overall decline in the travel and tourism industries during the pandemic.

The spread of COVID-19 has led to an increase in e-commerce sales. There has been an increase in online sales in the field of food delivery, pet food. Significant growth touched some positions of medical goods. There has been an increase in inquiries related to the purchase of hand sanitizers and antibacterial soaps. The growth of e-sales is helping to accelerate the digital transformation of enterprises, especially small and medium businesses that are forced to expand their online presence in order to survive in the current environment. SMEs account for 99% of all companies in Europe. While 77% of these businesses have their own websites, only 17% sell products online. 41% of Europeans are concerned about the security of online payments.

The trend of increasing user activity is represented by streaming services. The closure of theaters and cinemas has attracted a new audience for streaming services and video hosting services like Netflix, HBO, You tube. School closures are driving demand in the area as children and teenagers spend more time at home. Most digital solutions are offered and supported by a small number of major platforms built in the US or China.

Thus, Google accounts for 90% of the total search queries market on the Internet, Facebook accounts for two-thirds of the social networking market, and

Amazon accounts for 40% of the global retail market. Accelerating the pace of digitalization contributes to strengthening their positions in the markets. The network benefit effect, as well as their ability to track, extract and analyze information has allowed such companies to gain an advantage.

Subsequently, the obtained data can be transformed into digital knowledge and monetized in various ways. The changes in societal behavior that have taken place during the spread of COVID19 will have long-term consequences. Many organizations and users will increase their use of digital solutions as they develop a habit during the crisis.

The use of data and digital platforms provides countries with additional opportunities to overcome development challenges. At the same time, despite the rapid uptake of technology, significant digital divides remain. These are significant differences in the speed of implementation and development of digital technologies. Least developed countries face significant constraints in a variety of digital-related areas, from information and communications technology infrastructure and payment services to worker skills and regulatory frameworks. Responding to these challenges, they are trying to use available digital opportunities to overcome the crisis caused by the spread of COVID-19. Even when the governments of these countries take measures to provide education online, they do not reach the majority of students, since only 36% of the inhabitants of these countries have access to the Internet.

The digital divide also exists within countries. Every student in an economically prosperous school has access to a home computer, but only three out of four students in disadvantaged schools have this opportunity. Lockdown conditions exacerbated these problems. One of the most visible impacts of the COVID-19 crisis has been the widespread use of technology solutions to collect information about the spread of the virus and the physiological state of citizens. This became possible due to the reduction in cost and, accordingly, the widespread use by citizens of smartphones and portable devices that collect data on

the lifestyle of their owners. During the COVID-19 crisis, there has been a surge in the use of social contact tracing technologies. In order to attract as many users as possible to the tracking program and prevent the spread of coronavirus infection, global technology leaders Apple and Google have reached an unprecedented agreement to remove technical barriers to data exchange between iOS and Android platforms.

Compatible developer tools have been launched to make official healthcare applications available to users of both platforms, and in the medium term, manufacturers plan to integrate common Bluetooth close contact tracing technology into their devices. The companies emphasize that confidentiality transparency and voluntariness are the main priorities in the development.

The success of mobile applications used in the PRC is due to deep integration with the databases of the Ministry of Transport, Railways, Civil Aviation Administration and the State Health Commission, as well as the use of previously created infrastructure to track the movements of citizens. In Singapore, potential contact tracing is based on the proximity analysis of devices using the Bluetooth wireless protocol, without regard to the identity of the user and movements. The data is not sent to the authorities on a permanent basis, but only if the diagnosis is confirmed by any user and with his consent, and the data not requested within 21 days will be automatically deleted. This raises a whole range of issues related to privacy and protection of personal data.

In order for citizens to have confidence in the safety of sensitive information and not undermine the massive use of such technologies for contact tracing, which will deprive them of any meaning and effectiveness, competent information support from the government will be required.

Sharing data with private companies, even in the interest of public health, is a concern because the data is of significant commercial value. For example, they can be valuable for advertising agencies that work with pharmaceutical and medical companies. They can also be used by insurance companies to track

medical history when making decisions. Databases containing personal information linked to a mobile phone are also valuable, especially for the consumer goods market. It is assumed that the application of block chain technology can ensure that the data is not used for other purposes. A scenario is possible in which users will provide anonymous data to speed up the search for medical drugs, and then provide part of the data for free to businesses.

By processing the data, machine learning algorithms will identify trends that humans could not detect and make recommendations. The value of such data can be determined on a special exchange, and the information itself can be encrypted using a token to preserve the anonymity of the owner. The problem of protecting personal data and using it exclusively for the stated purposes is one of the most pressing issues in the situation with the COVID-19 crisis. It can be predicted that its solution will become a new form of social contract between states and their citizens, and changes will occur in almost all countries of the world. The market for goods and services offering solutions for both data collection and data protection will change significantly.

Providing society with open and accessible information becomes a key value in times of global crises. The requirements for relevance and regular updating are imposed on the data. Data must be collected from verified official sources. The coronavirus has led to a rise in practical interest in robots, drones and artificial intelligence. The pandemic has created an unprecedented demand for digital health technologies and has identified successful solutions such as population screening, infection tracking, prioritization of resource use and allocation, and development of targeted responses.

Robotic assistants in the field of healthcare are gaining more and more popularity. Robotic assistants have appeared in Chinese hospitals. They deliver medicines to the sick, collect garbage, bed linen. Robots based on 5G technology have taken to the streets in Jiangsu province. They independently move in

crowded places, recognize faces remotely measure the temperature, tracking up to 32 people at the same time.

The robot is able to destroy 99% of bacteria, viruses and fungi in the room. Singapore scientists have invented a remote-controlled cleaning robot using a laptop or tablet that can clean and disinfect hard-to-reach surfaces under tables and beds. Drones have become very popular. Drones with loudspeakers have appeared on the streets of Chinese provinces, thermal imager drones are also involved, which can determine the body temperature of a person even on their balcony and report the data to a medical facility. Drones light up construction sites, inform people in remote areas about the situation in the country, and deliver food. Drones are used to spray disinfectants in crowded places and public transport. For these purposes, XAG Technology drones are used. In Spain, drones are being used to disinfect the streets.

In China, medical facilities are using artificial intelligence-based tomography analysis systems, which can quickly distinguish ordinary pneumonia from pneumonia caused by 2019-nCoV. Public transport in Chinese cities is equipped with smart thermometers and facial recognition systems for a person wearing a mask. An application has been launched that allows screening for the presence of coronavirus. By analyzing responses to various questions based on CDC recommendations, the app suggests what actions to take, including whether a user should be tested for coronavirus if they think they have symptoms of COVID-19. The application will be regularly updated in accordance with current CDC recommendations.

CDC will provide all the algorithms used in the application in an open source format so that any developer companies can use them when creating and improving their programs. Police officers in Shanghai and some other cities in China were given AR helmets (helmets using augmented reality technology), developed by Kuang-Chi Technology. The gadget allows you to check the temperature of people at a distance of up to 5 meters in a few seconds using infrared

cameras. If the helmet shows a person with a fever, an audio alert is activated. The device is equipped with a camera with a face recognition algorithm and a QR code reader. Citizen information will be displayed on a virtual screen inside the helmet.

One of the solutions to the problem of the shortage of medical masks is 3D printing. 3D printing material manufacturer Copper3D has published an open source digital STL file of the N95 respirator for 3D printing. Many international cloud computing projects have been repurposed for COVID-19 research. Digital platforms are also taking steps to support efforts to find new treatments for COVID-19. For example, Alibaba Cloud announced free access to the capabilities of artificial intelligence for the purpose of scientific development of new drugs and vaccines against the virus. Many countries have launched government programs to select and finance startups that offer innovative developments in the field of diagnosing and treating coronavirus, as well as solving related problems.

Projects applying for funding may use satellite communications and navigation, satellite earth monitoring technologies, as well as any other technologies related to human spaceflight.

Full or partial lockdowns due to the coronavirus pandemic are affecting 2.7 billion workers, or 81% of the world's workforce, resulting in forced employment cuts, both in the form of layoffs and reductions in paid hours. Against the backdrop of a reduction in demand for labor in many sectors of the economy, there have been several areas where the need for new employees, on the contrary, has increased. Software makers for remote teamwork are posting jobs in all areas, including programming, accounting, sales, and customer support.

Online service Support.com announced an unlimited recruitment for remote technical support positions due to a sharp increase in calls and requests, as it turned out that few users who are forced to work remotely have the necessary technical skills. On the one hand, this mode of operation reduces harmful emissions and office costs and promotes the possibility of combining work and fami-

ly responsibilities, but its reverse side is a negative effect on the productivity of personnel management and the professional growth of employees.

If the new culture of telecommuting takes hold, the pandemic will greatly accelerate the earlier trend towards more remote work. Before the pandemic, about 70% of companies were already working towards the digital transformation of their business, in which the possibility of remote work is on par with such key elements as the delivery of goods, hosting virtual events and the use of cloud technologies.

The capitalization of the healthcare sector (the market value of companies) represents about 50% of the total amount spent worldwide on healthcare (5 out of 10 trillion US dollars). In education, this figure is less than 2% (0.15 out of $6 trillion). The field of education has already undergone significant changes due to the transition of educational institutions to a distance learning format. From a technical point of view, the process has not yet been optimized. There is an increase in public-private cooperation in education. Within a few weeks, educational consortiums were formed with the participation of various stakeholders, including governments, publishers, educators, technology developers and providers, and telecommunications network operators. Their goal was to provide temporary technological solutions, including for the education sector.

As the shift to online learning is forced, the magnitude of the digital divide and the disproportionate number of students without home broadband Internet access are becoming more apparent. Another problematic issue of the digitalization of education was the preparedness of the teachers themselves for the new format and the need for their training.

Three scenarios for the development of situations after overcoming the COVID-19 crisis are considered. The first involves a return to pre-crisis times, as far as possible. The second scenario looks at trends through the prism of sovereignty: will countries be ready to use online learning services and tools that are provided by companies from a limited number of countries, given that the

world's largest digital platforms are located in the US and China. The third scenario sees the crisis as a new opportunity for international cooperation. Closer collaboration – both between companies and through international public-private partnerships – can help create more accessible digital learning experiences. It is this approach that is in demand in the healthcare sector to find a quick solution to the problem of coronavirus.

Digitization and cybercrime

The coronavirus outbreak has forced many people around the world to work and study from home, and businesses and institutions to move their activities online. Cybercriminals are actively using these difficult circumstances to find new illegal ways to earn money. They expand and diversify their activities, taking advantage of the atmosphere of fear and uncertainty. The information sphere is understood as a set of information, objects of information, information systems, sites in the information and telecommunications network "Internet", communication networks, information technologies, entities whose activities are related to the formation and processing of information, the development and use of these technologies, information security, as well as a set of mechanisms for regulating the relevant social relations.

The security of a virtual environment is the state of protecting networks, computers, programs, and data from hacking, damage, or unauthorized access. For these purposes, the concept of cyber security is most often used.

One of the key characteristics of cyber security involves the rapid and constantly evolving nature of threats. International organizations (Interpol, Europol, European Commission, Computer Incident Response Team within the institutions, institutions and bodies of the European Union - CERT-EU) in contact with each other monitor criminal activity in cyberspace, raise awareness among political decision makers, as well as citizens, and are ready to coordinate their actions if necessary.

The level of cybercrime is influenced by high demand for certain goods, protective equipment and pharmaceutical products; reduced mobility of citizens. Citizens stay at home and increasingly work from home using digital solutions. Restrictions in public life make some criminal activities less visible and transfer them to the online space. They are facilitated by increased levels of anxiety in society and reduced supply of certain goods. The types of crimes are constantly evolving, using the features of online behavior and the new needs of citizens in the context of the COVID-19 epidemic. With one third of the world's population currently in some form of lockdown, changes in the pattern of crime have already taken place. Home burglaries have declined, but thieves are increasingly targeting factories or offices that are empty.

Cybernetic attacks represent malicious domains, malware, and online ransom ware. Cyber criminals create thousands of websites every day that contain the words “coronavirus”, “COVID-19” various spellings of these terms and use them to conduct spam campaigns, phishing, spreading malware or hacking into command and control servers. Cyber criminals are taking advantage of coronavirus reports to mask their activities. Malware, spyware, and Trojan horses are commonly presented as interactive maps and websites about the coronavirus. Spam messages cause users to click on links that download malicious software onto computers or mobile devices. Hackers and cyber scammers are taking advantage of the coronavirus pandemic by sending phishing messages via email and instant messengers, ostensibly on behalf of an organization. With their help, attackers can install malicious software or steal confidential information.

Cyber criminals expose the servers of hospitals, medical centers and government agencies to attacks and extortion. Their access to vital files and systems is blocked until the ransom is paid. Since hospitals cannot afford to have their systems shut down in a health crisis, they are forced to pay the criminals.

The shutdown of hospitals and their critical systems not only delays the operational medical activities much needed during a pandemic, but can also directly lead to deaths.

Ransom ware can infiltrate systems through emails, compromised employee credentials, or through a vulnerability in the system. Phishing is a type of Internet fraud, a set of methods that allow you to deceive the user and force him to reveal his password, credit card number and other confidential information. Trojan virus refers to a type of malware. It penetrates the computer under the guise of legitimate software, unlike other viruses that spread spontaneously. Attackers very quickly adapted well-known fraud schemes to new conditions.

As surgical masks and other medical supplies are in high demand but difficult to find in retail stores, fake shops, websites, social media accounts have sprung up on the internet claiming to sell these items. Fraud is aimed at obtaining bank details of citizens.

A separate type of threat is associated with an increasing load on digital services and technologies. So, along with the rapid growth of the audience, some services faced difficulties caused by a sharp increase in the load on their technological capabilities. The global Internet has experienced an unprecedented increase in traffic as the population shifts to remote work and education, but its bandwidth has so far been able to meet all the increased needs. This is partly because the maximum throughput of the links has been calculated and provisioned to accommodate the massive use of streaming video services like Netflix during peak evening hours.

Social exclusion measures applied in most countries of the world forced a significant part of the world trade in goods and services to go online. It is likely that in the near future the world will see a further explosive growth in the capitalization of online service providers against the backdrop of a decline in the positions of companies in the primary industries. Consumption patterns will change dramatically. A significant share of work and education will also go into

a remote format. On the one hand, these changes will make human life even more convenient. Nevertheless, there is a huge set of risks and questions to which there is no clear answer yet.

Microeconomic parameter of digitalization of the economy

In order to compete successfully, it was enough for the enterprise to periodically modernize part of its equipment and technological processes. At the same time, the workers of the modernized sections and related services were mainly involved in the changes.

Industry 4.0 requires enterprises to fundamentally change their production, technological, organizational business processes and business models. This is usually a combination of advanced technologies, among which the Internet of Things, cloud computing (cloud computing), autonomous robots, digital twins, virtual / augmented reality, 3D printers are often mentioned. Industry 4.0 in an industrial enterprise involves a symbiosis of technical and software solutions that minimizes human participation in the management of production and related processes. Humans will continue to play key roles: developing development strategies, making key decisions, designing new products, performing actions beyond the power of machines. The bulk of the processes will be fully automated. In fact, digitized processes will go into the mode of constant self-optimization, self-adjustment to changes in the external and internal environment of the enterprise.

In smart factories, smart digital control systems will process data streams from smart machines in real time. The digital system will analyze this data, identify meaningful trends, patterns and respond to them at such a speed and on such a scale that people are not capable of.

Data transmitted to the manufacturer from diagnostic sensors will improve the quality of products and, with high accuracy, predict the failure of certain components during operation. Manufacturers will be able to track the perfor-

mance of their products and how consumers choose to interact with them. This will make it possible to fine-tune production to demand and create more reliable models with new, obviously in-demand functions.

Their parts supplier partners will be able to adjust their production plans in real time. Knowing the real needs of the market will help them use their resources as efficiently as possible.

Service companies, thanks to complete information about the life cycle and weaknesses of each specific product, will be able to significantly speed up the provision of services and improve their quality. In addition, they will have a powerful channel to promote their business and increase customer loyalty.

Retail chains, followed by food manufacturers, will see in real time the drift of mass consumer preferences and will be able to not only follow it, but also set consumption trends. Access to external and internal information, along with purely technical solutions, will ensure stable operation and steady business growth for manufacturers, sellers, and service organizations. Enterprises need to go through at least three stages of development.

Participants in the processes of Industry 4.0, thanks to information exchange, must interact with each other with the precision of a clock work. At the first stage, it is necessary to find and eliminate all bottlenecks that interfere with the harmonious work of production, design, technological, logistics and other services, lead to equipment downtime, reduce labor productivity and product quality, and generate loss of time, resources, customers, and income. Only in optimized production does it make sense to add robots, 3D printers and other advanced equipment.

At the second stage, it is important to create a product and equip it not only with new consumer functions, but also with all the necessary sensors. Internet of Things technologies will allow the device to automatically interact with other devices, for example, within a smart home, smart city, smart enterprise, and even smart industry. Also, the product will provide its consumers, developers,

repair and other organizations with all the necessary information for analysis and decision making.

For efforts to bear fruit, partners must implement similar changes at home. This will allow at the third stage to combine information resources with them. Only then will the enterprises involved in the production, maintenance and filling of the device receive all the benefits that Industry 4.0 can bring.

If an enterprise is counting on results, then by introducing modern digital and technological solutions at home, one should push its partners to them as well. This will allow to starts a mutually beneficial exchange of accurate and reliable information.

Traders, service companies and component suppliers may know a lot of important and useful information for manufacturers of the final product. As a result, you can come to the integration of operated information systems or the creation of a joint interaction platform to work together like clockwork. Only when all three stages are completed, it can be said with confidence that the work of the enterprise corresponds to the concept of "Industry 4.0".

The main purpose of the platform is to unite in one information field support, within the framework of warranty and post-warranty service, equipment and machinery of domestic manufacturers, end users and service organizations.

Digital economy

The digital economy is an economic activity in which the key factor of production is digital data, the processing of large volumes and the use of the analysis results of which, in comparison with traditional forms of management, can significantly increase the efficiency of various types of production, technologies, equipment, storage, sale, and delivery of goods and services.

The main elements of the digital economy are e-commerce, internet banking, e-payments, internet advertising and e-access to public services. The degree

of accessibility and active use of these areas is determined by the digitalization index of the state DEI, Digital Evolution Index.

Digitization on an industry and production scale is assessed in terms of such aspects as end-to-end inter-process integration of data and products; continuous information management, including automated collection, storage, processing and analysis of different data; product life cycle management; cyber security; predictive management of production and business processes; replacement of full-scale modeling of production facilities and processes with their digital twins; automation of manual labor with the help of robots and electronic document management; flexible corporate culture based on the Internet - the interaction of geographically distributed employees and departments.

The digital economy is characterized by an increase in labor productivity; increasing the competitiveness of companies; reduction of production costs; creation of new jobs; increasing the degree of satisfaction of human needs.

The development of the digital economy is accompanied by unauthorized access to information and other threats to cyber security; mass unemployment; digital divide; low level of digital literacy of the population; lack of IT infrastructure; lack of IT specialists; consciousness focused on working with material rather than digital objects; inertia of corporate structures; the need for a radical restructuring of business models and management paradigms.

Technologies of the digital economy

The tasks solved using big data and processing platforms differ significantly depending on the industry. So, in retail and the financial sector, Big Data is used to increase customer loyalty (targeted marketing campaigns, individual offers (Next Best Offer)). Industry generates vast amounts of information. These data are used to build models for process optimization.

There will be new storage formats that allow even more efficient compression of information. The issues of processing big data in a virtual environ-

ment are being addressed. Big Data management methods and the concept of "data as a service" are being introduced. It will allow companies to freely exchange analytical data with each other using common protocols. This will lead to a further increase in the volume of processed information.

Machine learning algorithms become more efficient as training data grows. Machine Learning algorithm help you deal with the continuous flow of data. The volume and variety of data streams pump algorithms, making them more perfect. By passing large amounts of data to the machine learning algorithm, certain results are obtained, for example, patterns and patterns hidden from less advanced tools that can help in further modeling. Some companies use the data to automate workflows, but more often than not, analysts look at the results of the algorithm and look for valuable information in them that can help optimize business schemes. And this is actually correct.

Computers have yet to acquire many of the qualities inherent in humans, but so far critical thinking and flexibility in analysis are not characteristic of them. Without an expert loading the correct data, the value of the results generated by the algorithm is greatly reduced. And without an expert to interpret the output, the suggestions made by the algorithm can endanger the company's well-being. Modern artificial intelligence is an assistant to an expert and will remain so for a long time.

Research companies in various fields have large amounts of data, such as medical data, that they want to analyze in depth. But for this they need servers, online storage, network resources, and they also need to take care of privacy. This results in significant expenses. Cloud services come to the rescue, offering the necessary infrastructure and machine learning models for data analysis in a managed environment. Machine learning models include image recognition and GPU-accelerated text analysis. These algorithms are most often not trained after deployment, but they can be distributed and maintained using Content Delivery Networks (CDNs).

Scraping is the extraction of data from the pages of various web resources. For example, an electronic device manufacturer learns about market conditions and customer feedback from a retailer's quarterly reports. In their desire to find out what may have been missing from the reports, the manufacturer decides to extract certain data from the network, including product reviews left on various sites. By collecting this data and feeding it into a deep learning model for analysis, plant management can understand what needs to be improved in the manufacturing process to increase sales.

Web scraping involves obtaining quite heterogeneous data packets from many sources, so filtering sources and data types is an equally important part of the process. To work with filtered qualitative data, intellectual analysis technologies and Data Mining are used to discover valuable information. Data Mining presents trained algorithms on Machine Learning models. Smart recommendation systems and real-time forecasting use Big Data to accumulate the history of visiting web resources by thousands and millions of users. And machine learning algorithms are used to analyze data and generate recommendations, followed by adjustments depending on new introductory tasks. This is how You tube recommendation systems work, for example.

Self-driving car manufacturers are implementing Big Data and Machine Learning technologies into their real-time situation prediction systems, on the basis of which their technology works. Tesla vehicles respond to external stimuli using constantly updated datasets to make decisions based on continuously improving machine learning algorithms.

The Internet of Things is based on three technologies - Big Data, 5G and AI based on ML. IoT involves connecting many gadgets over a network and ensuring that devices communicate seamlessly, and this requires wide communication channels and technologies for storing and processing large amounts of data. In this way, the IoT acts effectively as a digital "nervous system". And AI al-

lows you to extract the right information from the data, which makes IoT systems much more intelligent.

If you use trained Data Mining algorithms, there are opportunities for high-quality in-depth analysis of huge amounts of IoT data. And this opens up opportunities to study the behavior of service users or buyers. The new technology, which is the result of the joint work of Big Data and AI based on ML, is called IoB, Internet of Behavior or Habits (Behaviors). Using machine learning algorithms, marketers are trying to understand when and under what conditions users make purchases by analyzing huge amounts of IoT data.

Big data needs to be protected, especially if it is related to finances. This is especially important given that ML and AI are increasing the amount of data being processed. An example of how machine learning is being used to improve cyber security is the development of intelligent antivirus software that can recognize any malware or virus. Smart antiviruses are designed to identify threats.

The combination of Big Data and Machine Learning is effective in IT projects. These technologies complement each other, making the work of individual applications and entire systems efficient. Therefore, in-depth knowledge in these areas, understanding how these technologies work in conjunction, is a competitive advantage when working in companies involved in the processing and analysis of large data sets. Learning projects help to get this knowledge, which can grow into something more than educational material.

The Industrial Internet of Things is used in industrial environments to automate production, while the IoT is focused on solving simpler household tasks. For example, a smart home within one household is the scope of IoT, and the effective management of a multi-storey building, a residential area or an entire city is already a task for an IIoT system. At the same time, the main value from the implementation of IIoT involves achieving maximum efficiency and cost-effectiveness (energy efficiency) of production by optimizing its cost with the help of IT. To do this, IIoT systems take into account industry or corporate spe-

cifics, uniting all production facilities into a single network, in accordance with the Industry 4.0 concept.

The Industrial Internet of Things is a coordinated system of IT tools for automatically collecting and transmitting Big Data streams from technological equipment to a cloud server in order to analyze data and generate recommendations, including using Machine Learning methods. The Industrial Internet of Things is used to control energy consumption and the progress of work, manage transport track the location of moving and stationary objects.

The IIoT system includes intelligent end devices (sensors, sensors, controllers); software for collecting and processing information; cloud IoT platforms with specialized data exchange interfaces and message queue management (AMQP, STOMP, MQTT); wired and wireless data transfer protocols at the transport level of the model. IIoT systems are representatives of Big Data technologies due to their architectural features. This is a set of data sources - sensors, sensors, controllers and other peripheral end devices with a high response rate to events and low power consumption, as well as with low computing power. These are continuous streams of data from end devices with a high level of interference in the signal due to the specific conditions of the production environment (extremes in temperature, humidity, electromagnetic disturbances, vibration visual and sound noise).

This is the use of SaaS / PaaS / IaaS solutions. Their tasks include collection, automated processing and data mining. Including using Machine Learning, they are performed on cloud servers with high computing power.

Due to these architectural features, developers of IIoT solutions and DevOps engineers are faced with the need to use distributed systems for accessing objects, in particular, messaging through a queue. For this, the AMQP, STOMP, MQTT protocols implemented in the software brokers RabbitMQ, Apache Qpid, Apache ActiveMQ are used. Apache Kafka's distributed replicated commit log is the best at scaling. This message broker provides throughput

scaling as the number and load of data sources grows, as well as the number of applications processing them.

IIoT systems for fast online data processing actively use applied Big Data solutions. For example, the Apache NiFi event (message) processing platform is often used to quickly download data from end devices, and cloud servers based on Apache Hadoop are used to store information. One of the most popular examples of the application of IIoT in mechanical engineering is the Harley Davidson case. Thanks to the implementation of the IIoT system, the company increased its shareholder value by seven times and reduced the production cycle by almost 20 times. As part of the technical reconstruction of the work sites, sensors controlled by the MES class software (Manufacturing Execution System, production process control system) were installed at each production stage. This made it possible to speed up the process of reconfiguring equipment for customizing manufactured models.

The Ulyanovsk Automobile Plant has optimized the routes and schedule of inter-shop transport by equipping it with GPS sensors. The company invested only 100,000 rubles in the project, and now it saves 2.5 million rubles a month when using the company's five GPS sensors.

The technological equipment of at industrial sites is equipped with tens of thousands of sensors that transmit information to one of the largest industrial companies in Russia, the Data Lake hybrid data warehouse. The collected data is automatically processed and analyzed using machine learning algorithms. At the Cherepovets Metallurgical Plant, two predictive Machine Learning models are in commercial operation, which allow predicting breakdowns at the hot rolling mill. For eight months of operation, these models have prevented ten emergencies. By analyzing big data received online from technological equipment at each stage of production, Machine Learning algorithms predict how the product meets the stated parameters of the customer order.

System technological parameters are fixed by the ecosystem of the digital economy. This is a partnership of organizations that ensures the constant interaction of their technological platforms, applied Internet services, analytical systems and information systems of public authorities, organizations and citizens. The digital economy includes three components: infrastructure (devices, software and telecommunications), e-business (digital processes in organizations) and e-commerce (selling goods online).

Information and communication technologies include a huge number of tools and developments: from various state sensors to theories that substantiate the areas of optimal application of architecture. Defining technologies include clouds, distributed computing, big data and the internet of things. The second most important group of technologies includes block chain, digital twins, augmented reality, additive manufacturing, robots and cognitive technologies. These are also centralized storages and data processing centers, broadband Internet access. The defining technology is the digital platform.

The platform as a software product accumulates all other necessary technologies, providing a huge number of users with access to information, high-quality planning services, analytics and, most importantly, access to the market (to customers, manufacturers, service organizations).

There has been a qualitative leap in the development of information and communication technologies. Digital technologies are constantly expanding the scope of their own application. The cost of implementing and operating the appropriate tools is constantly falling. The degree of digitalization of economic activity is constantly increasing, including due to the influence of the first two factors. The availability and prevalence of digital devices (computers, phones, smart devices and machines connected to the Internet of things) is constantly growing. Under these conditions, priority is given to the development of digital ecosystems supported by digital platforms.

Digital Economy Technologies: Digital Platform

A digital platform is a system of algorithmic relationships between a significant number of market participants, united by a single information environment, which helps to reduce transaction costs through the use of a package of digital technologies and changes in the division of labor system. The platform operator maintains the functionality of the platform and manages the process of developing the functionality. Suppliers provide goods and services advertised and sold through the platform. Consumers buy goods and services. Service providers create functional modules that provide value to providers and customers. The regulator monitors compliance with the legal framework.

The digital platform enables the interaction of consumers and suppliers. Uber is the interaction of taxi drivers and taxi users. Car Sharing is the interaction of car owners and renters. Airbnb - the interaction of landlords and tenants of residential premises. Uber users get a faster, safer and cheaper taxi service with guaranteed quality. Drivers receive a stream of orders based on their current location, which allows them to increase taxi utilization by up to 90%. By placing your product on Ali Express or e-Bay, the manufacturer gets the opportunity to demonstrate it to billions of buyers around the world without building their own logistics system. The buyer, using these marketplace platforms, can choose the best product in terms of price and quality from all possible.

The platform limits the variability of user actions by its current functionality. For example, a marketplace platform may provide purchasing functionality but not support installment or credit purchases. The functionality of developed industry platforms can be very flexible and diverse, provide for many forms of interaction: for example, a smart contract with a large number of parameters. But in any case, the range of possible interactions is strictly defined. The platform naturally captures and remembers all transactions. The processes implemented on the basis of platforms are transparent and amenable to analysis. With significant platform, the entire economy of the country is naturally digitized and

becomes transparent. A multi-level digital model of the state economy is being formed, detailed to each individual transaction.

The use of technology guarantees product quality, firstly, and secondly, the platform allows you to check the absence of violations in the production process after the fact. Without a platform, it is impossible to understand who and to what extent uses this technology. Replicating technology without a platform is difficult. Without a platform, it is impossible to monitor compliance with the process; and, secondly, this scheme is beneficial to all participants in the process. The developer gets the opportunity to monetize their developments. Producers receive guaranteed demand and raw materials of guaranteed quality.

The digital platform is considered as a system of algorithm mutually beneficial relationships between a significant number of independent participants in an economic sector (or field of activity) carried out in a single information environment, leading to a reduction in transaction costs through the use of a package of digital technologies for working with data and changes in the division of labor system. This definition allows, at an abstract level, to highlight the criteria for classifying an entity as a “digital platform”. This is an algorithm of the interaction of platform participants. The procedures for the interaction of participants are determined and implemented within the framework of the established algorithm. The set of these interaction procedures is limited and described.

Benefits can be more than just economic. The significance of the number of participants in the activity (scale) using the platform for interaction. Significance is assessed in relation to the entire set of potential platform participants: communities, sectors of the economy, countries, and the world.

The presence of an effect in the form of a reduction in transaction costs when interacting with various platform participants compared to the same interaction without a platform.

When discussing individual types of digital platforms and examples of their implementation, it is important to highlight and evaluate the following

characteristic features of digital platforms. 1. The purpose of the platform is the main activity that is carried out using digital. 2. Groups of participants, or parties using the digital platform, as well as the main beneficiary (beneficiary) of the existence and use of the platform, contributing to the digital economy by the results of activities using the platform. 3. The level of information processing in the platform is the execution of a specific technological process of information processing (aggregating the execution of a number of technical operations specific to a particular information processing technology). This is the receipt of information for decision-making (aggregation of the use of a number of technologies as part of the automation of a business process of an individual economic entity) and the business effect of providing a product/service to a consumer (aggregation of the use of a number of individual automated business processes as part of an economic transaction between economic entities).

An instrumental digital platform based on a soft or hardware-software complex allows you to accelerate the development of software or hardware-software solutions for information processing by providing predefined standard functions and interfaces for information processing based on end-to-end data processing technology, as well as development and debugging tools software or software and hardware. The infrastructure digital platform aims to accelerate the launch to the market and provide consumers in sectors of the economy with solutions to automate their activities (IT services) using end-to-end digital technologies for working with data and access to data sources.

The applied digital platform is a business model for providing the possibility of an algorithmic exchange of certain values between a significant number of independent market participants by conducting transactions in a single information environment, leading to a reduction in transaction costs through the use of digital technologies and changes in the division of labor system.

The digital platform involves the development of software and hardware solutions. The result of activity on the platform reflects the product (software or

firmware) for information processing, as an IT service tool and the result of its work - the information necessary for making a decision in economic activity.

A transaction is formulated as a transaction fixing the exchange of goods and services between participants in a given market of a group of participants. The platform developer, solution developers, information providers, platform operator, platform developer, IT service developers, IT service consumers stand out as actors. The main beneficiary and his requirements are singled out.

Understanding the essence of a particular digital platform is difficult because one market player can simultaneously implement several digital platforms of different types, but from a marketing point of view, do it under one brand. An illustrative example is Apple, which created and brought to market an instrumental digital smartphone platform with the Apple iOS mobile operating system, while at the same time ensuring the interaction of application developers for it with consumers (smartphone owners) based on the Apple AppStore digital application platform. The field of activity is the development and sale of software. In this case, one brand is used - Apple iPhone.

Instrumental digital platforms provide technological work with data. But they do not provide access to the data itself. Infrastructure digital platforms contain both technological data processing tools and data sources. This allows, within the framework of the relevant ecosystems, to build useful IT services in an applied sense, saturated with data necessary for decision-making within a separate economic entity. Applied digital platforms operate with processed data at the level of business processes of a separate group of economic entities or the industry as a whole. They make it possible to achieve beneficial effects for the economy not by using a data stream, as is the case with an infrastructural digital platform, but by combining and crossing many such flows from economic entities within one information environment outside these economic entities.

The selected types of digital platforms can form a hierarchy within which instrumental digital platforms are included in the ecosystems of infrastructure

digital platforms, and infrastructure digital platforms, in turn, ensure the functioning of applied digital platforms in various sectors of the economy.

The interpretation of the concept of “platform”, which has historically developed in the market of information and communication technologies, came into general use several decades ago and still dominates in the mass consciousness in the form of “programming platforms”, “hardware platforms”. Instrumental digital platforms provide a contribution to the digital economy and its efficiency by reducing the cost of developing software and hardware-software solutions based on end-to-end digital data technologies. Infrastructural and applied digital platforms, having a single information environment for the interaction of platform participants and data sources connected to the platform, reduce transaction costs. Marginal costs for each additional unit of access, copying and distribution (for infrastructure platforms - information, for application platforms - goods / services) in such platforms tend to zero.

Instrumental digital platforms provide access to a wide range of developers of software or software and hardware solutions to end-to-end digital technologies for working with data due to the fact that they contain means of technical implementation of these technologies and documented interfaces for accessing such tools. Due to the use of instrumental digital platforms, the development time for software or software and hardware tools is reduced, their cost is reduced by repeatedly reusing once developed and permanently supported tools for working with data. Instrumental digital platforms include both software libraries and software and hardware devices used to build on their basis or with their use more complex application complexes. Integration of instrumental digital platforms into market relations occurs by providing the owner (usually the developer) of the platform with the rights to use it to developers of solutions based on it through the distribution of licenses or providing access to the platform according to the service model.

The purpose of the platform (type of activity), which is carried out on the basis of an instrumental digital platform, is the development and debugging of applied software or software and hardware for information processing based on one or more end-to-end technologies for working with data.

The main participants in relations related to the instrumental digital platform are the developer/owner of the software or hardware-software complex at the heart of the platform; developers of software or software and hardware solutions based on this complex.

The main beneficiary of the activity based on the instrumental digital platform is the developer of applied software or firmware, as he determines the technical requirements for the capabilities of the platform and applies it to develop tools that are in demand in the next stages of creating additional value. The type of requirements imposed by the beneficiary on the instrumental digital platform is technical requirements. Examples of instrumental digital platforms are: Java, "x86-64 platform", DBaaS, Android and iOS.

The technological elements of the ecosystem of a digital infrastructure platform include: sources of information, means of delivering information, means of storing, aggregating and enriching information, an instrumental digital platform (or a set of such platforms) and infrastructure for its deployment, IT services (software solutions based on an instrumental digital platform), development tools, debugging and integration of IT services with the platform and among themselves. An IT service is a specialized software solution created and operating within the ecosystem of an infrastructural digital platform that solves the core tasks of an economic entity based on digital information accumulated in the storage of an infrastructure digital platform and received both from an enterprise-consumer of the service and from external sources.

An IT service uses functions and interfaces for information processing, including the use of end-to-end digital technologies for working with data, im-

plemented in an instrumental digital platform that is part of the technological basis of the infrastructure digital platform ecosystem.

The main participants in relations related to the infrastructure digital platform are: the platform operator, information providers, developers of applied IT services based on platform services and information sources, consumers of solutions in various sectors of the economy.

The platform operator performs, among other things, the following functions: managing relations with the owners of information sources, operating the platform data warehouse and the corresponding data model, supporting platform business processes for IT service developers (consulting, debugging, deployment), managing relations with the developer of the instrumental digital platform (consolidation and transfer of development requirements, updates, etc.

Accelerated market launch of IT services within the ecosystem is achieved by reusing existing functions and interfaces for information processing; standardization of protocols for interaction between technological elements; seamless integration of services among themselves based on the unity of the technological architecture of the platform. Industry specificity is manifested overwhelmingly in the IT services of the ecosystem.

The underlying levels of the platform are universal in this aspect, but specialized in relation to the type of information processed in the platform, for example, biometric, geospatial, navigation.

The main activity, which is carried out on the basis of an infrastructural digital platform, is the provision of application solutions to industry consumers for automating their activities (IT services) based on access to information of a certain type and the results of its processing within the framework of applied solutions. The main beneficiary of the activity is the customer of IT services, who determines the relevant functional requirements for the service, which, in turn, are implemented by developers based on the platform and information sources connected to it.

In some cases, an infrastructure digital platform can act as a basis for building application digital platforms, the main activity of which is to provide consumers with access to IT services developed within the framework of the infrastructure platform ecosystem. Such applied digital platforms are "application stores", which allow you to combine on one site the demand and supply of digital services that specialize in processing information using the infrastructure digital platform. One example of the connection of infrastructure platforms with application platforms is the General Electric company and its infrastructure digital platform GE Predix, on top of which the Predix Developer Network App store is “added”, which implements the applied digital platform model in the field of providing digital services developed by many developers to many consumers, using the GE Predix infrastructure platform.

The presence of an applied digital platform is not a necessary extension of the infrastructure digital platform, for example, the Google Maps infrastructure platform does not have a corresponding application store. The exchange of values within the framework of the platform occurs between suppliers and consumers of certain production resources or goods/services in a given sector of the economy. The value of the application platform lies in providing the very possibility of exchange and facilitating the procedure for its implementation through algorithm and increased transparency.

The use of application platforms reduces transaction costs in the economy due to the fact that it provides consumers with access to information about production resources or goods / services, and also allows bringing suppliers and consumers closer. The application platform is a link, without which consumers and suppliers would not have found each other or would have found each other with relatively large time and financial costs, as well as a mechanism for simplifying the settlement process between suppliers and consumers.

The principles of the business model of the platform are the foundation of many companies. This makes it possible to conduct transactions between plat-

form participants within its information technology infrastructure. In this case, a transaction means a deal (agreement), from the point of view of information technology, described as a group of logically combined sequential data operations, processed or canceled in its entirety. The transaction may not necessarily be of a legal nature and provide only for the economic interaction of the parties to the platform. Some platforms only provide a formalization of the preliminary intentions of the parties to complete the transaction, such as Avito, which can be carried out in reality outside the platform. And some platforms use intangible incentives to engage users while monetizing the user base through the provision of advertising services.

The target model for the development of all applied digital platforms is to involve the maximum number of participants in the platform parties and to maximize the number of transactions between them. The effectiveness of the business model determines the existence of a network effect. The size of the costs associated with the transition of the user from one platform to another platform is taken into account.

How difficult it is for a user to migrate from a current platform to a new platform, or how difficult it is for a user to use multiple platforms at the same time. If there are more consumers, does this lead to the fact that there will be more suppliers on the platform, and vice versa.

The main participants in the relationship associated with the applied digital platform are suppliers and consumers in a specific industry market, as well as the platform operator. The main activity, which is carried out on the basis of the applied digital platform, is the exchange of values between suppliers and consumers. The main beneficiary of the activity is the consumer, who receives a product / service or access to a production resource in a given sector of the economy with lower transaction costs and at a more competitive price.

The creation and development of applied digital platforms can take place both in the market way and on the initiative and under the control of state regu-

lators. In the second case, the platform being created has industry-level scale. It is intended not only to combine supply and demand for certain types of goods / services in one information space, but also to generate and digitally structure information flows between various industry participants that are not necessarily involved in direct market relations with each other, for example, between a subject economic activity and control and supervisory authority.

Such a platform is a tool for the regulator to build the most objective information picture of the state of the industry and manage it. The circle of participants in such an industry digital platform is wider. These include participants in the business processes of a given industry. These are production, trade enterprises, their customers, service enterprises, government regulators that monitor and regulate the industry using the platform, and other economic entities.

In technological terms, an industry digital platform is an information system for accumulating, exchanging and managing data in a structured form, as well as for calling business functions with information systems of platform participants connected to it through technological interfaces. The rules and procedure for exchanging information using the platform (and hence the interaction interfaces - API, and database structures) are determined by the industry regulator based on the reference industry data model and the reference description of the industry's business processes, which, in turn, are derived from the industry ontological model.

The digital platform provides horizontal integration of information systems of market participants in a given sector of the economy. Both information systems of individual economic entities and applied digital platforms that act as aggregators of information flows from a significant number of independent market participants can connect to it. The platform closest to the implementation of such a model is the e-government infrastructure, which, however, does not implement a full-fledged reference data model and tools for designing and programming business processes based on such a model.

Digital technologies and digital generations

Digital technologies have already managed to form several digital generations for their social environment. In total, this demographic group makes up 57% of the world's population. According to the age classification, these are generations Y, Z and little Alfiks. The construction of a working model of digital socialization is based on the hypothesis of "new normality". It arose during the economic crisis of 2008. It was proposed to analyze and explain phenomena in an era of change, growing uncertainty, and the unpredictability of the world. During the period of the corona crisis, this hypothesis became very popular, came to the fore, and today it is understood not only as economic, but also social, psychological changes in various spheres of human life.

The optics of the new normal requires a change in the usual view of the world around us, a new set of rules and ideas. Of key importance is the thesis of the "new normal" that the norm is dynamic and changeable. In this context, the understanding of "normality" in the former sense ceases to exist. One of the most important trends of the "new normal" is digital transformations that change everyday life and the picture of the world. The result was a new ecological system of child development. It is considered on the basis of the cultural-historical approach of L.S. Vygotsky and his followers, including Uri Bronfenbrenner with his famous theory of ecological systems.

In the context of digital transformations, a particular interest in the phenomenon of childhood has arisen. The changed social situation of the development of the child leads to the fact that not only a significant adult, but also the online environment competes for his development zone.

They started talking about digital childhood. The question arose about the application of the norms of pre-digital childhood to the modern child. Since differences were found, the concept of "digital socialization" was introduced. It denotes the process of mastering and appropriating by a person of social experience acquired in online contexts, mediated by communication technologies, re-

producing this experience in a mixed offline/online reality and forming his digital personality as part of a real personality.

Digital socialization is adjacent to traditional socialization. These forms combine, compete, displace, replace each other. Digital socialization can be viewed as a process of continuous adaptation of a changing person to the opportunities and risks of a changing socio-technological environment. This adaptation reflects the process of social evolution of the psyche of the individual, when consciousness merges with digital devices as external cultural tools. The techno system, as an important part of the external environment, is built into the human cognitive social system, integrated, acts as a part of it, and changes this system. The study of digital socialization takes place in such areas as psychological well-being and mental health, individual personality traits, user activity, the image of the digital world, and digital citizenship.

The following key dimensions of the digital socialization of a modern person have been identified: hyper connection mixed (combined) reality, extended personality and new sociality. Hyper connectivity is synonymous with screen time or user activity. This is the time a user spends using a digital device connected to a social network. Screen time is increasing. An important dimension of digital socialization is mixed reality. The lines between online and offline are blurring. There is a constant convergence. Mixed-reality existence and hyper connectivity to the internet have shaped the basic and defining characteristics of the "new normal".

The dimension of digital socialization is directly related to the digital personality. The phenomenon of personality appears to be even more complex than it was before the digital age. The personality of almost every modern person who has at least one digital device acquires its own digital side. There have been various attempts to conceptualize this phenomenon: digital twin / double, digital being (avatar), network identities. The digital personality is considered, firstly, as a process and result of the constant digitization of a person. Accounts, ac-

counts, details complement the personality. The above became external extensions, extensions and completions of man. The Expanded Man has become a dimension of the new normality.

Another dimension of digital socialization is the new sociality. Consciousness, expanding, merges with external tools (various digital devices) and online spaces of sign reality, which mediate not only mental processes, but also new types of interaction, activity formats, social order, social and cultural practices, as well as the dynamics of their constant changes. . Digital expansion occurs in such areas as memory and knowledge (Wikipedia, Google, cloud storage, folders with files on a computer, electronic "key chains", photos, contacts); self-regulation (time control apps, smartphone reminders, reminder chat bots, spending tracking apps). As well as health (applications that track physical activity, cycle, weight, sleep, nutrition); self-presentation and communication (profiles in social networks, posts, stories, likes / dislikes, comments, list of friends, correspondence in instant messengers); professional identity (programs and applications for work, individual settings, profiles in social networks).

The younger a person is, the more often he perceives digital objects as part of himself. A smartphone is one of the first and most significant types of property a teenager has, the gadget is always there. A third of teenagers have a smartphone at hand even at night. At the age of 7–16 years, a greater emotional attachment to gadgets. The significance of the digital world is manifested in the emergence of new fears. This is phobia (fear of being left without a phone), fear of reputational losses in social networks. Teenagers are characterized by a high level of trust in applications and programs.

The new sociality implies the need for a different look at the norms of cognitive and personal development. It confirms the importance of not only instrumental mediation of activity as one of the essential conditions for the development of the psyche, but also the mechanisms of remediation. A trend has been

formed to analyze the processes of exteriorization, in particular, the effective mastery of digital devices and the techno system as a whole.

In the center of research is the stage of social and cognitive evolution of the human psyche, when the developing consciousness of the individual in cognitive and communicative terms merges with external tools (gadgets) and the iconic reality of the Internet.

Digitalization as a corporate culture trend

Initially, the digitalization of offices meant the introduction of a centralized equipment management system, in which most of the routine processes are automated and can be controlled even through remote access. But the notion of "digital office" has gone far beyond the control of equipment. Digitalization has given a new approach to corporate culture and generated a dynamic trend. This was the result of using principles developed by IT professionals when creating business spaces.

Offices in the spirit of sharing economy (in literal translation - "sharing economy") are called hybrid. Next to the workplaces, you can see hammocks for relaxation, noise-insulating capsules, sports equipment, musical instruments and many other things that are unexpected for the office. Video game developer Mojang invites employees to play pool. Hilti found a place for a massage room among business spaces. The working area of hybrid offices is far from the strict rows of classic tables and chairs. Usually these are transforming halls, where you can both work in a team and split into separate places.

The mission of the new trend is not only to win the loyalty of employees. The main goal is to build business processes and interactions within the company in such a way as to result in increased productivity while saving costs. This is the reasonable use of office space, the comfort of employees, the automation of routine processes. For example, the technical condition of a building and its engineering networks is controlled by digital sensors.

Attention is paid to energy efficiency as the main way to reduce operating costs. This is the replacement of conventional incandescent lamps with LED lamps, the use of light sensors and climate control, smart heating and the elimination of heat losses.

In the office, energy savings are achieved by replacing laser printers with modern inkjet devices. This decision has a long-term advantage. Most legal documents involve archival storage, while the toner of laser devices tends to crumble from paper after a few years, and this will not happen with documents printed with pigment ink on an inkjet printer.

An important feature of the modern digital office is its environmental friendliness. When decorating business spaces, natural materials are used. The interior is decorated with wooden furniture, and panoramic windows provide natural light. Eco-friendly printing has become a trend. In laser printers, the toner, when interacting with heating elements, releases toxic micro particles that disperse in the air and, together with ozone, create the very specific smell that is characteristic of rooms with printing and copying equipment. Inkjet printers are environmentally friendly and do not have this drawback. Modern models in terms of printing speed are not inferior to laser equipment.

Many companies are moving away from traditional offices, moving towards open space layouts and flexible, easily transformable spaces. There are many informal jobs, and the schedules of employees are increasingly not tied to the time of day. Digitalization allows you to effectively manage many processes, being miles away from the office, for example, remotely launch documents for printing. Modern automated control systems maintain the microclimate in the building without human intervention and signal in time about possible malfunctions of engineering networks.

Like all ergonomic solutions, a smart office saves time, money and human resources. Automation reduces the need for maintenance personnel. Modern technology reduces energy consumption. Transforming rooms make the space

multifunctional. Eco-friendly printing improves and heals the microclimate. Office transformation costs have a long-term effect. They allow companies to save thousands and millions of dollars a year.

Philosophy of digital marketing

Those advertising figures have certain knowledge in the field of human philosophy enjoy the greatest success. Marketers are not dealing with some new kind of people, but with ordinary people who have the usual desires and needs that will be characteristic of them. The Internet only changes the style of communication and work, but the old approaches remain. Internet marketing and advertising media change, only the most effective of them do not change, because they are based on the knowledge of human nature.

The basic principle of advertising says that all people are selfish and greedy and the first question they ask when visiting a new site is: "What is there for me here?" And this is the question that the site should answer in the first place. It should popularly tell and show visitors what is useful for them and what they can buy. Here are four aspects of the visitor approach that should guide Internet marketing and other online promotional activities.

Curiosity can be identified as the first aspect of Internet marketing. People usually tend not to lose sight of any secrets and they, as a rule, will be interested in such advertising, if only to find out what these secrets are. This shows how important it is to use the factor of human curiosity. It is necessary to show a person what results he can achieve with the help of an information product, but not to disclose the ways in which these results are achieved.

The bargain price factor should be taken into account. People want the best, but at the same time they want to get the best as cheaply as possible. No one wants to think that he has paid an excessive price for the object of his desire. Therefore, it is necessary to create the impression that the product is much more expensive, but it is for this buyer that the product is available at a low price. This

method of work usually boils down to a precise explanation of the procedure for creating a product. For example, to create any information product, it took a study that took about five years and a certain amount of expenses. Clearly explain this to customers. Think about which steps in the manufacturing process you need to demonstrate to potential customers in order to convince them of the value and resource-intensiveness of the proposed product.

In the psychology of the buyer, it is important to take into account the fear of making a mistake and making the wrong decision. This is a barrier that an entrepreneur must overcome in order to make a sale. People are afraid to make a mistake in the correctness of their decision to purchase a product. They are afraid that they will become a victim of deception and their hopes placed on the product will not come true. Buyers are looking for a catch. People were constantly being deceived long before the lies leaked into advertising. They look at advertising in terms of how it differs from other ads.

There are two main aspects to overcoming this resistance. The first is to give more respectability and credibility to advertising. This can be achieved by proving the benefits of the product in real ways and providing recommendations. It is impossible to build a trusting relationship with customers without providing them with product recommendations. The second involves the provision of guarantees to buyers, up to a guarantee that they will return the goods without explaining the reasons. In addition to the above, it is desirable to provide customers with various gifts that remain with them, even if they return the goods and receive a full refund. The best way to build consumer confidence in products and businesses is to provide the product for free for a so-called trial period, after which buyers can either return the product or pay for it if they like it.

Exclusivity plays an important role. People prefer to make special deals that are provided exclusively to them. They love to be told that they are special, not like other clients. They love it when their names are mentioned, especially. When their names are imprinted on the goods they buy.

Newsletter subscribers regularly receive special offers addressed only to them. People love it. They receive a product at a special price or with a special bonus just because they are subscribers to the mailing list, and they know that these offers are not available to others.

Collaborative projects that function successfully are also based on exclusivity. Special offers are made by partners in a joint project only to their clients and to no one else. Discounts in such offers often reach quite impressive rates. Often they talk about a fairly common advertising technique using the word "free". Using the word "free" without demonstrating the true value of the goods is dangerous and will only result in losses.

This goal is unattainable by providing a mass of free goods and services. This goal can be achieved only by explaining to the visitor the true value of goods and services and then offering them something for free.

If there is no way to show the buyer the value of the product, then it seems that it is worthless. It is necessary to show why the product costs so much, and why it is provided free of charge. It is important to explain that this product is provided so that potential buyers are convinced of its quality and reliability and in the future they come to buy. Either explain the reason for providing the product for free, or don't offer anything free at all. Some experts argue that it is necessary to provide visitors with something free without fail others say that this should not be done. The key to understanding the problem is to show and prove the real value of what is offered for free and explain why it is being done. This factor will help increase the number of sales.

Philosophy of digital logistics

The digital transformation of business processes is aimed at ensuring that organizations make quick decisions, quickly adapt work to the requirements of the current moment and satisfy the needs of customers. The significant changes that have taken place have also affected the sphere of logistics activities. Cloud

technologies, effective management systems have firmly entered our lives and have changed not only approaches to business, but also the very content of the business. Modern innovations reflect not only the latest innovations offered by scientific and technological progress, but also bring economic sectors to a new level of business process efficiency, introducing a new architecture for their content and purpose. In logistics, the use of innovative technologies has changed the speed of implementation of logistics processes.

This made it possible to automate warehouse processes, bringing some of them to full robot. The greatest changes have affected the organization of information flows that accompany material and financial flows throughout the logistics chain of movement. The high efficiency of logistics activities in the chain directly depends on the quality and speed of information processing, its timeliness and completeness.

For a logistics organization, the issue of daily collection, generation and processing of information remains relevant. Using various application solutions, logistics companies effectively processed streaming data. The emergence of applications that allow you to perform actions on data without human intervention have become a breakthrough in the field of information technology and in the future will allow you to optimize these works, increasing productivity in the preparation of logistics schemes and calculations of delivery routes, as well as organizing transportation in which only monitoring functions are assigned to a person and control.

An example is the Software-as-a-Service transport management system. This cloud computing program is not unique. Such programs are constantly being developed and upgraded. But in this software product there are quite a lot of optimized areas: from warehouse management to calculating the optimal capacity utilization. Mobile applications are valuable for enterprises in terms of accessibility and serviceability. They are diverse and allow not only to draw up traffic routes, but also to dispatch orders track their sequence and execution.

Software solutions provide effective planning of vehicle routes, optimal load distribution between all transport units calculation of the schedule of vehicles by delivery points, tracking the location of vehicles and couriers, and generating an analysis of completed routes. Companies that have implemented and use such online systems reduce the cost of transportation and improve the quality of customer service through faster and more punctual delivery of goods.

The online systems market is represented by such services as DELLA™ (della.by); FLAGMA (flagma.by); All Routes (all-routes.ru); Votpusk.ru (routes.votpusk.ru). The systems given as an example are software solutions used to solve the tasks of planning movements over medium and long distances. They are distinguished by the relevance of information, accurate calculation of distances between cities (objects) and travel time. In each of them, the duration and distance of the route, as well as fuel consumption are automatically calculated in real time.

Modern dynamic models and smart technologies for organizing production and transport management unite all types of transport in a single digital technology. Electronic document management has made it possible to implement digital corridors and use Big Data technologies. Unmanned vehicles are actively developing, becoming a new direction in logistics.

Modern digital technologies make it possible not only to create unmanned vehicles, but also to use them in the interests of business. Unmanned vehicles can change the economy of both logistics and transport companies themselves, as well as entire industries.

Another actively developing area is the integration of mobile and collaborative robotic systems into warehousing processes. Autonomous mobile robots (AMRs) move loads in a dynamic environment without operator intervention and do not require building preparation for their integration. AMR allows you to get rid of the construction of extended conveyor systems, characterized by the complexity and duration of deployment and reconfiguration. Automated mobile

robots make it possible to exclude workers from the low temperature zone with harmful working conditions. The use of collaborative robotic manipulators implements the automation of routine operations for product picking for wholesale and small wholesale trade. The integration of such solutions allows you to increase the productivity of staff, through the joint work of robots and humans.

A collaborative robot takes on routine tasks, increasing the accuracy and quality of their execution, but retaining the right of a person to make decisions regarding complex and intelligent tasks. This approach improves the working conditions of a person and reduces the time for the implementation of all types of warehouse activities. Using the capabilities of robotic systems and software makes it possible to implement work through software control of all processes and stages of warehousing in real time.

Collection and monitoring of data at all stages for each unit of the product reduces the time for order processing by several times and significantly increases the accuracy of its formation, while minimizing the likelihood of damage to cargo units. With the introduction of robotics into intra logistics, the organization of logistics warehouses is changing, allowing you to increase the usable space for storing goods and make it more adaptable to the needs of users.

Unmanned aerial vehicles are actively used in warehouse activities and in the delivery of small-sized cargo. The development of technology allows testing a variety of delivery options by drones. Warehouse logistics is a promising area for drones.

Digital production

Previously, the term "digital production" was understood as a set of applied systems. They were used at the stage of technological preparation of production to automate the development of programs for CNC machines. Also for automating the development of workflows for assembly, for automating tasks related to job scheduling in robot programming, and for integration with shop

floor systems (or MES systems, Manufacturing Execution System) and ERP resource management systems.

In the industry 4.0 paradigm, digital manufacturing refers to the use of digital modeling and design technologies for products and products and production processes throughout the life cycle. We are talking about creating digital twins of the product and its production processes. The concept of the digital twin is being developed. This is the manufacture of a product in a virtual model, including equipment, the production process and the personnel of the enterprise.

Big data and business intelligence play an important role. Autonomous robots will gain greater industrial functionality, independence, flexibility and performance. Most of the information systems currently in use are integrated. But it is necessary to establish closer interaction at various levels within the enterprise, as well as between different enterprises. As a result, information coming from production from a large number of sensors and equipment is combined into a single network.

One of the signs of digital production is associated with the presence of an intelligent control system. It includes the ability to integrate existing process equipment and obtain a wide range of process information from anywhere in the manufacturing ecosystem. Data comes from many different sources, these are data from GPS navigators, satellites, Internet requests, social networks, data received from IoT (Internet of Things, Internet of things). The main Big Data technologies and tools include Hadoop & MapReduce; NoSQL databases; advanced analytics (statistics, predictive analytics and data mining, linguistic word processing); tools of the Data Discovery class.

The practical implementation of Big Data technologies is carried out by neural networks and systems derived from them, such as pattern recognition systems, simulation modeling, machine learning, and predictive analytics.

The technological functioning of a highly automated, including, with the widespread use of industrial robotics, digital enterprise is as follows.

With the help of Internet of Things technologies, huge amounts of information are collected in the physical space, which are sent to the cybernetic space, where they are analyzed using artificial intelligence. The results of this analysis are returned back to the physical dimension, and management decisions are made on their basis.

Manufacturers install sensors on key pieces of equipment to collect real-time information. The received and processed data is sent to all divisions of the enterprise to ensure interaction between structural divisions and the adoption of appropriate management decisions. This information can be used to improve service (prevention of downtime, equipment breakdowns), to create targeted marketing offers.

Continuous monitoring of key indicators makes it possible to identify the problem and take the necessary measures to solve it. Modern systems allow you to monitor the process and identify factors influencing it using any Web browser. These solutions turn production data into the information you need to effectively manage your business.

Digital modeling allows you to find digital twins not only of technological objects, but also of business processes. When a specialist has a digital twin, he can quickly find the best standards, technological regimes, procedures, regulations. Digital twins make it possible to implement end-to-end operational planning of the value stream in accordance with strategic goals, which ensures both operational synchronization of stream objects and their optimization.

The use of Big Data also has a number of problems. The main one is the cost of data processing, which includes expensive equipment and the cost of wages for qualified specialists capable of servicing huge amounts of information. The second problem is bias. If the study has a large number of results, it is very difficult to remain objective and select from the general data stream only those that will have a real impact on the state of a phenomenon.

The third problem is the protection of Big Data. The methodologies for protecting information systems of the classical three-tier architecture are not applicable to new technologies. There is a need to create and train a new class of Big Data security specialists.

Philosophy of block chain technology

The market for financial instruments on the block chain is infinitely diverse, and there is a solution for any problem. The role of crypto currencies in the financial sector is often associated with the role of intermediaries. Decisions based on them are often referred to as DeFi - decentralized finance. These can be loans, insurance, investments, various financial instruments for trading, digital identity management solutions and gambling. The main advantages of block chain are transparency, openness and immutability of data. Therefore, this technology is also used by traditional banking systems of many states.

But the endless opportunities for investing and trading have a downside. Some major DeFi services, such as Uniswap for token exchanges or Compound, a platform for financial markets, lock up a significant amount of Ether in order to support financial transactions with it. This can affect not only the amount of ether in free circulation, which is finite, but also the speed of transactions. The philosophy of block chain technologies has become the subject of numerous theoretical and practical studies. If we imagine the crypto currency market as a smart creation, then over the past ten years it has not shown any special mind. He survived many crises and did not even come to a temporary equilibrium. An anonymous decentralized system that is not subject to control itself contributes to such behavior, since this is the easiest and most profitable way to use it.

The ideology of crypto currencies and bit coin in particular is closely linked to Californian-style neoliberalism. This is the so-called "California ideology". Its connection with the worldview of the extreme right is found. It was described by David Golumbia, a professor at Virginia Commonwealth University

at Richmond, in The Politics of Bitcoin: Software as Right-Wing Extremism (2016). He refers to Richard Barbrook and Andy Cameron's "California Ideology" article. It mentions how Californian knowledge workers, in order to subvert government control, invent the tools needed to create a free market in cyberspace, such as cryptography, digital money, and verification procedures in the mid-nineties of the twentieth century.

After such evidence, the question may arise why crypto currencies did not appear ten years earlier - and perhaps their subsequent success is due precisely to the changed political environment. According to philosopher Nick Land, the crypto-anarchist economic ideas implemented in bit coin were laid down by the Scottish Enlightenment and the Austrian School of Economics.

Right-wing radicals recognize this connection. Nick Lund believes that block chain technologies offer the emancipatory possibilities dreamed of by the early theorists and practitioners of the Internet. These are anarchic, apolitical structures capable of undermining the order of things and replacing unreliable and untrustworthy human agents in a new political project. Indeed, in crypto currencies it is easy to see the autonomy of capital and its emancipation, that is, the liberation, and the rapid acceleration of exchange and development.

Limitless acceleration is a key idea in acceleration followed by Nick Lund. From his point of view, block chain means an escape route for domesticated capital, which will lead to a chain reaction and explosive development. According to acceleration, in this way, capitalism will destroy itself. Until that happens, every bit coin user is his bank. This puts the responsibility for financial assets in the hands of the user. He becomes a self-sufficient individual who realizes his own life program. This corresponds to the most general liberal attitudes.

Crypto libertarianism assumes absolute power over your money. On the other hand, it reflects the absence of any social or legal guarantees, such as protection against fraudsters. You can defend your property rights to bit coins through the courts only by turning to the state, unloved by libertarians. Thus, the

power in the crypto currency market belongs to the richest, bravest, cunning, lucky, but not necessarily honest or fair people.

And even cunning people can lose a significant part of their capital at any time, which only increases instability and mistrust in such communities. Consequently, the philosophy of crypto represents a socio-economic utopia, which is defined by decentralization, the free market and personal autonomy and, to some extent, the autonomy of the technologies themselves.

Methodology of digital ecosystems

The digital ecosystem allows a direct analogy with the biological ecosystem. Organisms represent IT services. The medium is represented by the ICT infrastructure. Ecosystems and digital ecosystems scale similarly, from a planetary scale (Earth's biosphere, Google or Windows) to a single body of water (Loch Ness, an enterprise ERP system).

The analogy ends with the question of who created this ecosystem, and why. The emergence of a biological ecosystem is based on self-organization in a particular space. Digital ecosystems are created by people for rational reasons. Depending on national characteristics, types of digital ecosystems are distinguished, which depend on their purpose. For example, Germany is focused on coordinating the actors of economic life, using technology in production and creating production ecosystems, such as, for example, the Ruhr basin was in the industrial era. It is important for China to regulate e-commerce and move towards digital consumption.

Depending on the level of digital development, the country's belonging to one of the digital archetypes is determined. The digital archetype "innovation center" is represented by leading countries in the development and use of technologies. An effective developer and consumer in one person it represented by countries that develop and implement innovative solutions for a developed local industry. The "Service Center" represents the leading countries in providing oth-

er countries with information and communication technical services in the development of software and content.

"Service Center" fixes the leading country in the provision of information and communication technical services in the development of software and content to other countries on the basis of developed human resources. The World Factory represents countries that are leaders in the production of information and communication technical equipment due to cheap labor and production infrastructure. "Business Center" - these are countries that are trade and business centers of the region, attracting talents and companies from other countries;

The ICT savvy archetype represents countries that lead the way in ICT consumption, with relatively little input into the development of products and services. The archetype "novice in information and communication technologies" is represented by countries that are just beginning to adapt information and communication technologies in the national economy.

Other bases for classifying digital ecosystems include openness and closeness, scale and public safety. The role was played by qualified specialists with a talent for business. Their plans had state participation. Thus, the creation of Google was preceded by the "Mountain Forum", which brought together people of outstanding qualifications who solved the problem of creating an information weapon. Without the Mountain Forum, there would be no Google. All digital ecosystems in the US, from ARPANET to Star link, would not be possible without the direct participation of the state.

In the mind of a person, especially a child, when fully immersed in digital ecosystems, changes occur, up to radical ideas about values. Therefore, the creation of digital ecosystems that provide citizens with meaningful, semantic information should be based on the idea of what society will be like in a generation. This view should not be a passive forecast. It should be the goal for which digital ecosystems are designed. Anyone who today owns existing transnational digital ecosystems knows almost everything about users. He can manipulate

masses of people. The most influential digital ecosystems will be the metaverses. The purely economic side of digital ecosystems lies in increasing the commercial efficiency of marketing and logistics through the maximum convergence of all services in a single user window.

The digital economy of the metaverses

Digital metaverses represent the public space of the global network, interaction with which is carried out using digital tools. Users of the metaverse can create things and interact with each other in a reality-based world, the possibilities of which are beyond ordinary life. Metaverses imply: the presence of a publicly accessible digital space with customized avatars that represent users of the ecosystem; the presence of digital property rights, the level of which depends on the degree of decentralization of the chosen platform; the ability to interact with other users; conditions for various action within the digital world; the right to share leisure time with other participants in the ecosystem.

Digital ecosystems offer users different opportunities and degrees of control over assets. If a digital platform takes a decentralized approach, it offers more options for building applications. The digital metaverse is an online platform that creates the conditions for creating something within the digital world. It allows users to develop their characters as well as define their lives based on what they are capable of. The Metaverse mimics reality, allowing participants to build digital careers in the fashion world or look after animals and private property. The possibilities are limited only by the imagination.

Centralized versions of the metaverses are different from open-source digital platforms, which most often run on the block chain. The key differences are control, the ability to create something and the digital platform management system. What happens inside the centralized metaverses is completely controlled by one organization. Such a system is characterized by internal servers and certain rules for regulating the virtual world. For example, virtual communities of cen-

tralized projects like Fortnite and Roblox are active only within predetermined limits, and the latter limit their capabilities. Community representatives can interact with each other and share experiences. But they do not have the right to control the digital environment or own certain components of it.

Decentralized metaverses are open source. Their users independently determine their actions and what is happening in general. The digital platform is controlled by the community of participants. Accordingly, users have more control not only over their own individual assets, but also over the metaverse itself and the features of its work as a whole. Decentralized metaverses are inextricably linked with block chain projects it possible to implement the most daring ideas and opportunities.

Different metaverses offer unique features and yet depend to varying degrees on their own communities for governance. Accordingly, in some cases, it is users who determine in which direction this or that online space will develop. With full control without central intervention, the online world becomes the epicenter of interaction and development.

According to the Oxford Languages English Dictionary, the word "metaverse" is defined as a virtual reality space in which users can interact with the computer environment and other users. People are users with digital avatars. First of all, it concerns computer games.

Entering the metaverse is similar to entering the Internet. Only the user will use smart glasses attached to the head to view content, and a bracelet gadget to track movement. As conceived by the developers, the metaverse will receive signals from web browsers. The user will be able to seamlessly switch between websites on their smartphone. More precisely, his avatar will switch between platforms designed to ensure cross-compatibility.

The Metaverse functions as a virtual visualization of the processes of technical and communication interaction taking place in the ecosystems of leading IT companies. This is a complex and multi-level process that will require

significant financial, technical resources and technological solutions. Metaverses can become an important environment that allows you to combine currently existing disparate solutions such as augmented and virtual reality, digital twins, various solutions for simulating technological and technical processes and solutions in the manufacturing sector. It is obvious that cartoon presentations alone are not enough for the development of the metaverses.

To obtain an objective assessment, it is necessary to look at any solution through the prism of commercialization potential. Since the main task of any technological product is to offer the most convenient consumption pattern. That is why ecosystems include seamless transition and payment mechanisms.

Pervasive gamification should make the process of acquiring content in the form of a game and make the commercial presence less obvious. Metaverses will combine the features of both classes of solutions - entertainment and platforms, since it is impossible to create and develop such large-scale solutions without an economic component. Monetization is the main mechanism for such large-scale financing. Physical goods ordered from the metaverse and delivered by a real courier service will be consumed, while the turnover of virtual goods will increase.

Children will not sit in two-dimensional TikTok and Instagram, but communicate with friends in a three-dimensional metaworld using VR technology. Adults will join in later. The business will follow them. For a full-fledged transition of a large number of people to the three-dimensional online world, there is still not enough technical base. Not every person can afford them. As technology advances, the cost will decrease. Over time, buying helmets and augmented reality glasses will become as commonplace as buying a TV or laptop. There will be offers for different price segments.

No regulatory framework has yet been developed to protect copyright in the metaverses. There are 3D models of people, including those who are no longer alive. Like a star's page on social networks, anyone can technically create

a model of a person. Titles in the form of a certificate to the NFT itself (digital certificate) will be transferred along with the token when selling avatars and what they create. No one except the copyright holders will be able to claim the avatar itself or the results of its activities. Any user of the metaverse will be able to buy a painting by Salvador Dali and be sure that he bought it from the artist's original avatar.

The timing of when people massively enter the three-dimensional digital world will depend entirely on three components: technical, legal and financial. At the moment, a large number of people do not have the opportunity to purchase all the necessary gadgets to get into the metaworld. Even if now humanity suddenly has money for augmented reality helmets, there are still too few of them to satisfy all needs.

There are practically no legal orders in the metaverse. A large number of people will not go where anyone can violate their rights. Nobody wants a fraudster to be able to create a clone of himself or a clone of the company, commit acts that discredit honor, and go unpunished. This means that until a legal order is established, a massive influx of users should not be expected. People go where it's safe.

Corporations are investing enough money in the development of the metaverse to close all issues in the shortest possible time. The technologies of the metaverse provide projects for the creation of bases of real estate and management of transactions with it, where you can buy out plots, build them up and resell them. As part of the projects, copies of real-life galleries, houses and parks are created.

These projects will be in demand in the digital metamarket in the coming years. Like any technological project, the metaverse, its concept and the order of interaction between the players require significant improvements.

In addition to the implementation of technological solutions, this concerns legal regulation, since with the development of new economic opportunities,

there are risks associated with the unresolved issue of introducing legal norms affecting different categories of legal relations in the virtual space, since it has no physical boundaries.

Technologies are at the stage of origin and formation of the market of VR\AR worlds and tools. There was competition for the attention of users, hence the number of offers. Some of them are close to fake projects exploiting the hype around the technology. On the other hand, serious players in the IT market are investing a lot of money in the new market, and these are not only technology companies like Microsoft, but also investment funds. The gaming industry is leading the way in offering products based on these technologies.

Economics and Law of the Metaverses

The entertainment market is driving the niche to growth. In 2018, the World Health Organization included gaming addiction in the 11th list of the international classification of diseases, which was put into effect on January 1, 2022. Simulation technologies can create new problems with players disconnected from reality.

In new areas, the problems of copyright and personal data security will be especially relevant. Some assets like NFTs will be protected only by technical means they are very difficult to steal. Other intangible values, such as honor, dignity, copyrights, will require classical methods of legal protection. The same goes for criminal law. It is impossible to cause physical harm to a virtual avatar, and compositions that relate to harm to health will be irrelevant. On the other hand, slander, incitement to suicide, propaganda of drugs.

The Criminal Code will also apply in the virtual world. If a person works, lives and spends almost all his time in this virtual world, respectively, attackers can actually gain access to the entire private life of a person, and the violation of personal data will be especially noticeable.

If something happens, then the network user applies for the protection of rights and freedoms to the competent state body. It is interesting how the territory of action of state bodies will be determined. This issue leaves room for legal regulation. Obviously, an international universal agreement or agreements will be required to regulate certain categories of legal relations operating at the junction of the real world and the virtual space.

The Metaverses will get a giant boost with the ability to identify avatar owners through Multipass technology. It involves decentralized storage of personal data with a single user ID. Based on a patent for a decentralized passport using blockchain networks, the first passports of citizens of the metaverses will appear. After the use of a secure digital passport in the metaverses, real business will begin to pilgrimage there. Insurance companies, banks, rental business, car sharing, crypto currency exchanges will open their representative offices in the metaverse and provide exclusive conditions and discounts for their own services in the virtual world.

In digital ecosystems, online and offline realities merge together. There are more and more services that go beyond virtual life. It is difficult for the user to cope with the huge number of applications on his device. Ecosystem reflects an attempt to streamline a growing number of services. The line between making a purchase decision and financial gain will blur. A person needs to evaluate the feasibility of a purchase. Then choose the payment method and payment system. Many are not able to spend time on this, and overpay for goods and services. Multibanking applications will help the client with a profitable choice, which will not become isolated within one digital ecosystem or bank.

With the advent of the metaverse, tens of billions of artificial intelligence units will become potential customers for banks. This new competency will open up a thousand fold growth opportunity for banks. The amount of funds that can be stored and borrowed between artificial intelligence in one form or anoth-

er, between different things. Things will have their wallets. This is what will determine the place of each financial player in the future.

The active introduction of artificial intelligence contains not only the possibility of making a profit, but also the risk of a collision with an anthropomorphic model. These are deep learning neural networks. Between them there is a "black box". The developer understands the inputs and outputs, and the internal information processing system does not matter. It is these "black boxes" that experts call the artificial subconscious. It allows you to save computing power, solve non-standard tasks and learn faster. However, the uncontrolled processes of the artificial subconscious scare people. A person begins to be afraid of what the neural network will learn and when the confrontation between biological and silicone personalities will begin.

Limiting the use of anthropomorphic artificial intelligence exclusively for the performance of highly professional tasks and self-regulation of market participants will help minimize human fears. Market players are actively moving towards self-organization and self-regulation.

It is proposed to pay attention to automated systems and smart assistants, to whom people are increasingly inclined to delegate their affairs. It is the caretaker of people's lives. On the one hand, he is useful, and on the other hand, he knows almost everything about people.

The emerging trend towards self-regulation of IT companies can be explained. While conservative government institutions are groping for control over the industry, IT companies are signing a code of ethics for artificial intelligence. R. Kurzweil and V. Vinge believe that the world is at the point of technical singularity. This will inevitably transform the global economic space.

Integration processes become so complex and show exponential growth that they are incomprehensible. The characteristics of globalization processes are changing under the influence of the digital economy. The growing value of data and digital intelligence is reflected in their high market capitalization, and

their growing role has far-reaching implications for all economic activity. The digital economy is becoming an integral part of global processes, being an engine for the growth and development of companies, thanks to which such categories of business entities as digital companies, digital transnational corporations, digital multinational companies have emerged.

Data-supported digital intelligence is becoming the central factor of production there is a movement from traditional resources (labor, natural, capital) to intellectual and information resources. The use of digital technologies to create value and control its collection is increasingly defining the global economy, which allows digital companies to take a dominant position.

The digital ecosystem economy is transforming the fundamentals of supply and demand. Market leaders have the opportunity to reach an almost unlimited customer base, use various technological tools and maximize profits. Ecosystems become competitive units, and the struggle takes place between them, and not between individual companies.

The goals of all participants in the digital ecosystem are balanced with each other to achieve the stability of the entire architecture and obtain a certain synergistic effect from the interactions of all interested parties.

Application programming interfaces - APIs, analytics, and modular architectures - have become more mature, resulting in lower costs for coordination and information exchange. In the digital age, companies must work with a much wider range of partners to bring together innovations, applications, software platforms and services for an integrated solution. The need for partnerships is further enhanced by rapidly changing technology and growing consumer demand for a customized product.

Instead of long-term joint ventures, ecosystems use more flexible transaction structures, such as contractual partnerships with platforms. These measures ensure that the ecosystem can quickly respond to changing customer preferences, new technologies, emerging competitive threats, and other changes.

A strong ecosystem offers its SDKs and associated API for free to a large network of developers who create offerings for users. The growing number of attracted customers generates more and more user data, which is used to improve the algorithm and improve interaction. Part of the national wealth is proposed to be considered as a set of digital ecosystems.

Ecosystem E-Government (electronic government)

Electronic Government as a Service is a digital ecosystem designed to implement the idea of e-government. The term “electronic government” in eGaaS is not interpreted in a narrow sense, as just an online service for the provision of services to citizens or a mechanism for automating government activities, but is understood as an integral digital ecosystem that combines the activities of all spheres of the state in a single information space: government institutions, economics, finance, etc. social sphere. The eGaaS ecosystem includes global registries and software tools for building public, private and public user applications and platforms based on smart contracts.

The eGaaS ecosystem has a multi-level rights management system for creating and editing registries, contracts, and interfaces. To control access rights to ecosystem elements, special contracts are used - smart laws. Thanks to this, the rights control system is flexibly customizable. It allows you to automatically track the transfer of access rights. Block chain technology is used as a software solution for building the eGaaS ecosystem. The main advantages of the block chain for the implementation of e-government are the ultimate reliability of data storage, which is achieved by using crypto-algorithms and distributed storage of registries, storing the history of all changes in registries with fixing the subjects who had access to the data.

Technically, the eGaaS digital ecosystem is a peer-to-peer network whose nodes are data centers, each of which contains a complete copy of the block chain. Nodes form blocks in turn with a period of no more than a second. The

health of the ecosystem can be supported by one node. The remaining nodes ensure the uninterrupted operation of the network and protection against unauthorized data changes.

The eGaaS ecosystem deployed within one state is closed. Access to network resources is possible only for users with private keys. This does not exclude the subsequent possibility of including the state network in the international network. The basis of the digital ecosystem is the registers of objects involved in legal, financial and economic relations. These are registers of individuals and legal entities, real estate, households, securities and licenses. The most important tool for managing the ecosystem and the applications created on its basis is a multi-level mechanism for managing access rights to registries. The rights to read change and add attributes (columns) are controlled; to read, change and add records (lines); to change the above rights.

Access rights to registries can be granted to individuals by specifying their id from the register of persons, to limited roles (the presence of a person's id in the register of positions is controlled), as well as to persons and roles in combination with various conditions. It is envisaged to grant access rights to registry elements only for specific contracts/applications. By building a multi-level system of rights, the division of competencies between applications of different departments, industries and organizations is realized.

Following the tradition that has developed in the block chain community, eGaaS software modules that provide work with registries are called smart contracts, or contracts. Contracts are the building blocks in building applications and platforms. To write contracts, a scripting language developed for the ecosystem with fast compilation into byte code is used.

The language contains the necessary set of functions for creating registries and performing all types of transactions with entries in them. Contracts are functionally complete code fragments that provide input data from the user or another contract (data section); analysis of the correctness of the data and verification

of the conditions for the execution of the contract (section conditions); execution of necessary transactions (action section).

To prevent the execution of contracts that can harm the user (for example, transfer money) without his knowledge, the contract signing mechanism is used. So-called signed contracts cannot be executed without mandatory confirmation by the user. The description of the contract must include an indication of the right to change it.

A special role in the eGaaS ecosystem is played by special contracts that determine conditions for the execution of contracts; access of users and contracts to registries, rights to change registries, contracts and interfaces. Contracts that act as regulatory documents are called smart laws. Smart Laws contain conditions and restrictions prescribed by state law. The mandatory implementation of smart laws is guaranteed by using them as general conditions for accessing registries for the ecosystem. Operations controlled by smart laws cannot be performed by any user application ignoring the restrictions prescribed in laws (for example, license control, etc.) and / or bypassing the execution of special transactions (for example, making tax deductions).

If necessary (in case of legal ambiguity), a special condition is included in the smart law requiring a decision to be made by an authorized person with confirmation of the decision by a digital signature.

To protect the ecosystem from the consequences of bugs and vulnerabilities (inevitable in the user application code), a procedure is provided for stopping the execution and changing any contracts, ignoring the rights assigned by their authors. These are the so-called exclusive rights granted to certain roles or collegiate bodies with the help of smart laws. To exclude manipulations with the reflection of data on the side of users, the interfaces that ensure the operation of smart contracts are also stored in the block chain. Pages and menus of applications, as well as registries and contracts, have an indication of a smart contract, which specifies the conditions for changing them.

Page templates are created using a feature set that can be thought of as a specialized language for creating interfaces, the eGaaS application tem plating engine. The functions of the template engine are consistent with the language of writing contracts, which greatly simplifies the creation of applications. The tem plating language provides for obtaining data from registries; presentation of data in the form of tables and charts (with the connection of additional widgets); building data entry forms for contracts; creation of a multi-level menu; implementation of multilingualism. The tem plating language creates interfaces that are initially adapted for applications on mobile devices.

An eGaaS ecosystem application provides a stand-alone software solution to perform a particular action or multiple actions within an activity. An application consists of contracts that implement its functionality; database tables needed to store operational data; pages and menus for data entry and display. The execution of contracts in the application is triggered by user actions, other contracts, and access to registry data (to check access rights).

Applications are written using the eGaaS software client, which, using system interfaces and editors, provides the creation of tables / registers; creating and editing contracts; creating and editing pages and menus; setting and editing conditions for access to tables, contracts, pages and menus; input and editing of language resources for the implementation of multilingualism.

The eGaaS software client is also used for user access to applications, providing their identification by entering a private key.

The security of the eGaaS ecosystem is ensured by the previously described mechanisms. As well as support for a multi-level system for managing access rights to resources using smart laws, containing an exclusive rights mechanism; protection against unauthorized launch of contracts using a special signature; preservation of interfaces in the block chain. To protect the ecosystem from attacks and overload, a mechanism for paying for resources with tokens is used. The execution of the contract requires the withdrawal of tokens from the

wallet specified during its activation. For end users, working with applications is free (if we are not talking about paid services). The eGaaS digital ecosystem, built on block chain technology, containing a multi-level and flexibly customizable mechanism for managing access rights to resources based on smart laws, is a modern tool for implementing e-government and the digital economy, both in a separate country and at the interstate level.

Fin tech ecosystem (financial sector)

The financial industry is also undergoing a fundamental transformation. The main driver of digital transformation is a dramatic change in consumer behavior and the resulting change in requirements that traditional players in the financial sector are often no longer able to meet, and which, not least, have been driven by the fundamental digital transformation in other sectors. The Corona pandemic and related distancing measures have accelerated this trend.

Customers can receive information digitally on their own. Thanks to faster mobile networks such as 5G, increasingly powerful smartphones and, above all, applications that provide information about financial services and allow you to quickly complete transactions or conclude contracts, customer expectations have risen significantly. A consultative meeting at a local branch on the range of services and products offered by the respective supplier, in many cases, can no longer meet these customer needs. Instead, customers expect a more complete and flexible range of services, and that advice and products are available outside of traditional branch office hours.

Compared to other sectors such as e-commerce, where digitalization has advanced far and a functioning ecosystem has been created, the financial services industry still has to catch up. Banks, insurance companies, and especially well-established financial platforms with a large number of clients (such as comparison portals) are alike vying for the role of pioneers in the Fin Tech ecosystem. Some startups have already failed to become the focal point of the eco-

system due to the lack of a sufficiently large end user base and the fact that acquiring new customers is not only expensive but also time consuming.

At the same time, traditional banks and insurance companies are facing increasing competition from the expansion of large platform providers into the traditional financial products business. Both established banks and insurance companies, as well as emerging Fin Techs, face the challenge of how they can win in the long term in a market shaped by changing customer needs.

In the long run, successful providers will be those who have a large number of permanent touch points with their customer base and who also manage to build long-term trust with the end customer. Products and their interfaces should be designed to be user friendly. In addition to ensuring that all sales channels, both online and offline, must be available outside of traditional store hours. It is important that digital solutions are easy to use.

They had a high degree of flexibility and could be integrated into existing IT landscapes through frictionless interfaces. Another success factor will be the high degree of product flexibility. Younger customers in particular expect to be able to choose the terms and available product features. For many financial products, there is a trend towards pay-per-use. The customer pays for a certain amount of use only when using the product.

Although many start-ups are already successfully implementing this, traditional banks and insurance companies often still have old structures that cannot adequately accommodate changing behavior and new customer needs. Another key factor in achieving high customer loyalty is trust. Key points for this are additional services, targeted investments in the brand and its digital presence. Last but not least, a high level of data security and performance compliance that meets regulatory requirements and guarantees security. The strengths of traditional market players come into play, often with both a broad customer base and well-established data protection and compliance processes.

The path to meeting radically changed customer needs and increased demands for products and services lies in the consistent collaboration between financial services providers and Fin Techs, as well as in the creation of a functioning ecosystem. Such ecosystems combine the best of both worlds and allow a clear focus on the future. Fin Tech ecosystems also mean a change in mentality. Whereas banks used to concentrate on doing everything on their integrated and on site as much as possible. This model is breaking down. Banks are ready to work together with digital platforms. This is because only a functioning Fin Tech ecosystem can meet the increased demands of customers and thus compete with Big Techs.

The smart ecosystem not only provides opportunities for closer collaboration between established financial service providers and innovative Fin Techs, but also for greater integration between traditionally separate products and services. This not only allows you to create more individually tailored offers, but also increases customer loyalty in the long run. After all, the more offers customers receive on one digital platform, the more loyal they are to it.

Ecosystem Con Tech (Digital Construction)

The concept of digital construction is concretized by projects such as the 5G AMC2 project to study the application of 5G in construction. The project is being implemented as part of the 5G Create program, which aims to explore and develop solutions that support 5G data. It will allow you to collect, analyze and use data to maximize the productivity of construction processes. The project will deploy exemplary solutions including cameras, drones, mixed reality, and IoT sensors for construction process monitoring and asset tracking.

Tracking will use 5G 3GPP release features that provide improved positioning with an accuracy of more than 3m indoors and 10m outdoors. The goal of the project is to become a conduit for digital solutions that increase the productivity of construction.

The goal of another project is computer vision and IoT to monitor the safety of a construction site in real time. The project involves the use of real-time imagery and machine learning technologies to detect, recognize and track construction site hazards and alert nearby operators via GPS-enabled IoT devices. The need for the development and widespread use of digital technologies in the field of occupational health and safety in construction is high. Existing vision-based approaches to construction site monitoring focus only on guarding, dispute prevention, and recording project progress, and applications to improve people's safety are lacking. Safety managers and workers depend on self-reports or warnings from colleagues who may come too late to prevent an incident.

Another project involves using the Holo Site AR headset to control construction by overlaying a hologram on an object under construction. If deviations from the plan during construction are discovered too late, this leads to project delays and increased costs, which is especially true during construction phases with complex mechanical and electrical work. The idea is to proactively identify and prevent inaccuracies at an early stage. The goal is to save time and labor during construction. Carry out its stages exactly according to the project and complete it on time and within budget.

An important role is played by the use of artificial intelligence to predict the strength development of concrete. Converge technology can predict the time to reach critical strength with an accuracy of +/- 5% for several days ahead, using machine learning methods. This allows you to more accurately plan actions for the period of concrete gaining the appropriate strength and proactively, without delay, distribute teams for removing formwork and installing slabs.

The use of a digital shield is practiced. Digital shield technology defines the boundaries of restricted areas in the working environment and then sends this data to the control systems of the excavator to prevent any part of the machine from entering these zones. Shields are calculated by creating a virtual twin of the physical environment using a laser scanner.

This survey method collects millions of data points, which are then used to create a 3D digital model. On its basis, a digital shield was created at a given distance from the position of real objects.

Construction companies tend to robotize many processes at the facilities. Thus solving the problem of labor shortage and aging staff. An operator-controlled robot sticks the grout tape, applies the mortar and sands the walls to the highest quality level. Marking is a critical stage in construction, with cascading consequences for the entire project.

This process is traditionally done with a tape measure and chalk lines based on paper plans. However, thanks to the robot and BIM/CAD models, it can be automated. The application accuracy is 1/16 inch (about 1.5 mm). The robot can also print additional information on the floor of a construction site, such as the location and height of outlets, room legends, including room name, room number, ceiling type and height, or even paint color and floor finish.

Prop tech Ecosystem (Real Estate Ecosystem)

Common goals and interests, and most importantly, the need to respond to the growing demands of consumers, make cooperation the basis of ecosystem business. An ecosystem arises around products and services in which the creator has the most expertise. The implementation of transactions involves expertise in lending and transactions. The digital business begins with the entry into the market of work with developers and developers, as well as with a showcase of ads, on the basis of which a complete digital client journey is formed in residential real estate transactions.

The open ecosystem in real estate combines a large number of services designed to solve housing issues: from searching for ads and registering transactions, to organizing repairs and moving to a new apartment. The ecosystem provides market participants with the opportunity to interact with clients on one platform, and clients to resolve all housing issues in one window mode. This is a

unique open ecosystem that any partner can join using the API: a bank, a developer, a real estate agency, an insurance company, a retailer.

Many ecosystems have centralized customer support. Consultation on any of the services will be provided to the client in the contact center. The development of this format is supported by a steady trend towards the intensification of the collection and analysis of big customer data, as well as the growing penetration of smartphones into everyday life. Customers have voted for ecosystems because they are more cost effective and convenient. The client wants to feel connected to the brand and be part of the community. Metaverses are beginning to play an important role in the real estate market. They allow you to quickly respond to user requests and provide services to them.

Ecosystem Ecommerce (electronic commerce)

The eCommerce ecosystem includes service providers and services for eCommerce players. It is divided into several blocks, each of which reflects one of the key business processes in e-commerce: customer acquisition, payments, logistics, store management and customer service. Industry organizations are also mentioned, which include the media, training companies and associations.

The purpose of the ecosystem is to show the big picture, the key sections of the market and the most important players. Create an understanding among participants of the market structure and variation of services, as well as show areas of promising development. The scheme clearly reflects how developed the services involved in online trading for manufacturers and sellers are. The map is getting more and more detailed. From one category of services, several are formed. New niches and technologies appear at the junction of existing services.

The needs of the buyer are growing, and the demands of online stores are becoming more complex. Services try to match this. Services become targeted, and offers are complex. The future is connected with marketplaces. Their history began in 1996. It all started with the era of bulletin boards.

They are also called classifiers, or listings. These are the "yellow pages" that have been transferred to the Internet. Their main task is to assist with the search for a suitable offer and the subsequent opening of supplier contacts. Further communication between the supplier and the consumer, the meeting agreement and the transfer of money took place offline. The marketplace catalog was disorganized and difficult to navigate. And the entire responsibility for safety and quality lay with the consumer himself.

Thematic marketplaces appeared after the classified ads. These are the same message boards, but in a narrower niche. By focusing more narrowly on one of the verticals, they were able to provide a better customer experience. At this stage, reviews, user profiles, certified / verified suppliers, as well as an online request for a product / service appear. It was no longer just a phone number that was opened, but there was a request through the platform. But for the most part, using the marketplace came down to just finding the right supplier. Further communication with the provider took place directly, past the platform.

Consumer service was a little better than bulletin boards, but they still had a lot of responsibilities. At this point, the network effect of reviews appears. The more reviews, the more jobs the supplier gets. And the more tasks the supplier gets, the more the number of reviews grows. The proliferation of phones has led consumers to develop a culture of ordering everything "on demand." With the “uberification” of many markets and services, the smartphone has become a remote control for ordering anything. For food delivery from supermarkets, there is Zakaz.ua, for washing things - Washio, for finding a tutor - Buki. User communication appears in real time. Everything is needed here and now.

No one wants to wait more than ten minutes for an answer. On-demand marketplaces have good liquidity due to the focus on one category. Only taxis, tutor, only cleaners. There are more responsibilities on the part of the platform: matching, pricing, financial security of the transaction, guarantees and security. There is a reuse of providers for related services, such as Uber Pool.

This is when a taxi turns into a mini-bus. At this stage, the focus shifts from the supplier to the marketplace. If earlier they said “Order Salateira through Eda.ua”, now the phrase “Order a meal at Eda.ua” is increasingly heard. Many uber-like marketplaces died as they never managed to provide sufficient liquidity on the platform.

Managed marketplaces take on even more additional operational responsibilities. They take full responsibility for the quality of content. There are marketplaces that do not allow you to sell a car on their platform, but they themselves buy a car, branded clothes, and even a house. This is even more convenient for users. This significantly increases the cost of the transaction for the marketplace itself. To compensate for operating costs, such marketplaces themselves set prices for purchased goods, and the commission for their services reaches 45%. This model is relevant for niches and services that have high requirements for trust.

A new segment of marketplaces has appeared offer their suppliers some useful and most often free software, and then involve them in participating in the marketplace. This is the so-called “come for the software, stay for the customers” approach. An example is the OpenTable project, which provides restaurant reservation solutions. Connecting each new restaurant to the network helps the marketplace build liquidity. The advantage of this type of marketplace is that free software attracts and quickly activates new providers. Free software creates a well-protected new market with competitive advantages.

But this strategy will only work if this vendor really needs such software. It is also important that the scope of use of suppliers is disposable. In OpenTable, the marketplace is growing well due to the fact that people are always looking for some new interesting restaurants. This approach will not work in areas where trust and long-term relationships are important (like ordering a doctor). When reviewing the history of the development of marketplaces, the trend is

clearly visible. Marketplaces are becoming more and more complex mechanisms, acquiring additional operational obligations.

Commodity marketplaces will take over the entire customer service cycle. Storage of goods, delivery, payments - all these processes will be absorbed by marketplaces. Even after-sales service will be carried out by the platform. At the next stage, marketplaces will apply for regulated services. These are niches that were previously avoided due to the need for suppliers to have special permits and licenses. There are more and more marketplaces that cover certified and licensed services. These are medical, engineering, accounting, training, legal, cosmetology services.

Licensing sets a certain standard, but at the same time sets many restrictions. New types of marketplaces will expand the supplier market. If the niche requires a legal entity for the supplier, the marketplace will help to open a legal entity and provide a license. Some marketplaces are starting to delegate part of the processes to artificial intelligence.

Digital Economy and Law: Regulatory Sandboxes

Regulatory sandboxes create a special experimental legal regime for innovative projects. They allow you to abandon some of the regulatory requirements that hinder the development of innovation. New technologies and services are emerging that simplify production, communications and people's daily lives. At the same time, legislation lags behind the development of technology. Because of this, technical innovations sometimes exist outside the legal field for years.

Due to the special conditions of sandboxes, companies involved in the development of new products and services, as well as government officials, can test them without the risk of violating applicable law, and subsequently, if the testing is successful, enter the market with them. The mechanism of regulatory sandboxes is used in many countries. The first sandbox was created in the UK in

2016. They have been successfully implemented in the USA, Australia, Singapore, UAE, Malaysia, Thailand, Indonesia, Bahrain, Switzerland and Canada.

It was assumed that medical, transport, including unmanned vehicles, e-learning and distance learning technologies, the financial market, distance trading, industry, construction, state and municipal services would fall under the law. But the list of areas of application of regulatory sandboxes has been expanded. Regulatory sandboxes represent experimental legal regimes applied in the field of digital innovation. This is a mechanism for testing technologies in real legal relations that, for various reasons, cannot yet be used.

Under an experimental legal regime, the government can give a limited number of companies in a certain territory and for a certain time to comply with the current legislation with a number of features. These features will allow the use of appropriate technologies. This is a risk-free opportunity to test and develop technologies that still exist outside the legal field. This allows not only to develop and test, but also to implement digital innovations in such areas as medical and pharmaceutical activities, telemedicine; transport; Agriculture; financial market; online trading; building; industry.

Digital innovations represent new or significantly improved products (goods, works, services, protected results of intellectual activity) or processes. A new sales or organizational method in business, workplace, or external relations that has already been introduced, created, or used in medicine, agriculture, finance, and industry. Such innovations include technologies of robotics and sensors, distributed registry systems and wireless communication.

If, as part of the experiment, an innovation demonstrates positive results, the government can extend the legal regime to the entire country, that is legislate the possibility of using this innovation. Block chain represents one of the most promising regulatory sandbox technologies. This technology could change the landscape of today's stock market. Companies that want to raise large amounts of funding have to go through costly IPOs. Preparation for it can take years.

Block chain makes it possible to conduct a Security Token Offering instead of an IPO. It is cheaper and easier in organizational terms. The state can do the same: for example, the Central Bank of Thailand issued $ 1.6 billion of government bonds on the block chain this fall. The issuance of such bonds instead of two weeks took only two days.

Distributed registry technology can be used in most areas - insurance, law, medicine, public administration. The point of the block chain is to reduce the number of intermediaries between the two parties to the transaction and, accordingly, reduce its cost. At the same time, the transparency of the transaction only increases, because it is impossible to make changes to a transaction already recorded in the block chain.

Definitions play an important role in legal discourse. A “regulatory sandbox” is a specially agreed-upon mode for developing and piloting decisions, including regulatory ones, to determine an effective interaction model and build business processes in a new area. It is expedient to use the "regulatory sandbox" to develop mechanisms and rules for regulating economic processes within the framework of digital initiatives and projects.

"Digital platform" is a system of tools that supports the use of digital processes, resources and services by a significant number of subjects of the digital ecosystem and ensures their seamless interaction. "Digital transformation" is a manifestation of qualitative changes, which consist not only in individual digital transformations, but in a fundamental change in the structure of the economy, in the transfer of value-added centers to the sphere of building digital resources and end-to-end digital processes. As a result of digital transformation, a transition to a new technological and economic structure is taking place, as well as the creation of new sectors of the economy.

"Digital economy" is a part of the economy in which the processes of production, distribution, exchange and consumption have undergone digital transformations using information and communication technologies. "Digital Ecosys-

tem" is an open sustainable system that includes the subjects of the digital ecosystem (physical, legal, virtual, etc.), as well as the communications and relationships of these subjects in digital form based on digital platform services.

"Digital Transformation" is a set of activities aimed at transforming business processes in accordance with their digital model. "Digital space" is a space that integrates digital processes, means of digital interaction, information resources, as well as a set of digital infrastructures, based on regulatory norms, organization, management and use mechanisms. "Digital asset" is a set of information in digital form and means for its processing, collected on the basis of a competitive business model, the use of which leads to economic benefits.

Digital Logistics

Digitalization of business processes in logistics is a great opportunity to optimize costs for a company. It is possible to robotize not only logistics, but also internal business processes of the company, for example, work with contractors. Automation of logistics with the help of robots has reduced delivery times. Systemic changes reorganized distribution centers, automated the storage of goods in warehouses automated the issuance of goods in warehouses.

A key feature was the automated collection and analysis of customer characteristics. Huge arrays of data generated from each client made it possible to implement a personalized approach to each. Only knowing the business from the inside, you can correctly set the goal and develop a strategy for digitalizing the business. Also, on the way to digitalization, you need to be prepared for mistakes and try to treat them calmly. Mistakes are a standard part of any change, so these problems should not be an obstacle. Digitalization of business takes place in three stages.

To begin with, it is necessary to analyze all business processes and strategic assets of the company. Determine the effectiveness of all its divisions, production, internal and external communications. Think about how it can be im-

proved with the help of digital technologies. At this stage, it is necessary to set a clear goal to which the company should achieve with the help of digitalization. Formulate an approximate strategy for achieving this goal. To minimize the risks, you need to approach this very carefully and responsibly. New technologies should not completely change the business. Their main goal is to simplify business processes.

It will take time to introduce new technologies, test, correct technical errors, train staff or customers in working with services. You have to wait to see any results. After the implementation of each digital solution, it is necessary to analyze its effectiveness and make sure that it brings additional profit or any other benefit to the company, and does not hurt the budget.

Digitalization and institutional environment

Digitalization involves communication with the institutional environment in a feedback mode. But this connection may not be due to negative phenomena in the institutional environment. Among these phenomena are "inefficient institution", "institutional trap", "dysfunction of institutions", "institutional conflict", "institutional hole", "institutional loop". One of the priority areas in the study of negative phenomena in the institutional environment is the theory of institutional traps. An institutional trap is an inefficient stable norm.

The problem of disruption of the functioning of institutions is being developed within the framework of the concept of dysfunction of institutions, special phenomena that contribute to a high degree of disorganization of the system and a low level of controllability. At the same time, dysfunction is understood as a violation of the functions of an economic institution, to a greater extent of a qualitative nature. The dysfunction of the institution manifests itself in the form of partial or complete failure to fulfill the functions of the institution, the appearance of failures in the functioning of individual subsystems, and legal restrictions. The emergence of institutional traps is facilitated by changes in cer-

tain parameters of the system. Non-payments, barter, tax evasion are not examples of institutional traps, but manifestations of the blocking effect.

There are several reasons for the existence of the qwerty effect: 1) lack of coordination of interests of various groups of economic agents; 2) inconsistency of long-term and short-term interests. Based on these factors, it is possible to explain the existence of a significant number of rather inefficient, hardly compatible technological standards.

Most problems arise due to poor coordination of economic agents, their lack of awareness and involvement in decision-making processes. As part of digitalization, new network models of interaction are being formed new models of economic activity and ways of organizing social systems are being created. With the advent of new opportunities, there are also risks that did not exist before. Concerns related to cyber threats, confidentiality and abuse of personal data, monopolization of markets, structural changes in the labor market, manipulation of public opinion are becoming more and more obvious.

The global nature of the digital environment brings with it a rich cultural and normative diversity, with different actors having their own, often competing interests. The benefits of technology are exponential, and bridging the digital divide will become increasingly difficult. There is a significant risk of introducing structural inequalities into social and economic systems, dooming a significant number of people to alienation. Secondly, trust is the basis for any interaction. Without trust, economic agents cannot provide information, exchange goods or services. In a digital context, trust is built through effective privacy, security, accountability, transparency and participation policies. As an increasing number of companies and government organizations conduct their business on the Internet, the level of trust in the digital space and the level of trust in society are increasingly correlated.

The digital world needs to be socially, economically and environmentally sustainable. This entails not only business models that are economically viable,

but business practices that are socially sustainable. The increasing complexity of the global socio-economic system calls into question the processes of sustainable development. In the accelerating pace of technological development, the imperfection of institutions that regulate socio-economic interactions in an industrial society and are not adapted to a digital society is increasingly manifested. From here appear institutional traps, failures of the institutional environment.

Under these conditions, it is necessary to develop new mechanisms that form the rules of the game in the context of digitalization. Development based on the concept of big data can only be achieved through partnerships between government agencies, software developers and civil society organizations, creating a dynamic ecosystem of the digital space. Turning data into a resource for development requires creating a number of ecosystem elements, including privacy and security for users and incentives for government, civil society and the private sector to share and use data to develop socio-economic systems.

At the same time, it is necessary to take measures to reduce the risks posed by digital technologies. One of the forms of organization is the organization of activities based on platforms, which are an effective mechanism for coordinating various economic agents. Business transactions are increasingly taking place in virtual spaces. At the same time, platforms are something more than virtual marketplaces. They contain opportunities to create network effects while co-creating value while building sustainable ecosystems.

One of the innovative approaches to solving the problem of trust in the digital space is block chain technology. It contains the ability to create a distributed database that maintains a dynamic list of ordered records. Each block contains a timestamp and a link to the previous block. This architecture makes it impossible to change blocks later. The important thing is that the block chain database is managed autonomously and there is no need to control it.

The platform connects the demand and supply of certain services in market conditions, unites various user groups in the public sector. An ecosystem is

emerging around the platform. In general terms, an ecosystem is a set of applications built around a platform core that interact with it. Crucial to the platform economy are the companies that build these platforms. They bring together end users and application providers to make transactions easier. Such companies create infrastructure and develop software, interface for users, algorithm the principles of interaction between platform users, create norms and rules, and program institutions.

The architecture of the platforms is based on cloud computing. This means that application vendors or end users no longer need to make their own investments in infrastructure, storage or software. The development of the platform economy has become a factor in the formation of new models for organizing economic relations, such as crowdsourcing, crowd funding, the share economy, the provision of public services in electronic form, and other innovations.

One of the most effective economic models in the context of digitalization is the share economy model. The share economy represents socio-economic relations between two parties, one of which has certain resources and does not use them (partially uses them), and the other party is ready to rent them for a certain time to meet its own needs. This economic model is designed to increase the efficiency of the use of limited resources.

The emergence of share economy models has an economic explanation based on the following factors. Research by a number of scholars has shown how the quality of goods traded on the market can deteriorate if buyers and sellers do not have equal access to information. If the buyer cannot distinguish between high-quality and low-quality goods, he will only be prepared to pay a fixed price for the goods, often lower than the seller expects. However, sellers know the exact quality of the item they own. This may result in a situation where sellers refuse to sell goods at a lower price and leave the market.

Eventually, the average willingness to pay among buyers will decrease because the average quality of goods will deteriorate, which in turn will cause

even more sellers of quality goods to leave the market, triggering a market failure. Intermediaries that signal the quality of goods and services and remove barriers to information exchange can reduce the risk of market inefficiencies and ensure stable transactions.

In traditional market conditions, larger suppliers benefit from the economies of scale. The role of digital platforms that facilitate transactions is critical to aggregating the offerings of small suppliers and allowing them to compete with large companies that have significant resource economies of scale. Often small companies don't have the resources to sell the products and services they offer. They lack the funds and experience to conduct market research and other tools to effectively promote their own products.

Intelligent digital systems and algorithms operating within digital platforms are able to match the demand and supply of certain goods in real time, reducing the heterogeneity of supply and demand. Digital platforms reduce transaction costs and provide tools to promote goods and services that were previously only available to firms. The growing penetration of the Internet and the proliferation of digital devices have provided an opportunity to increase participation in economic activity for small firms and individuals. Consumers can quickly and in real time search for products and services that best suit their preferences, greatly reducing search costs.

Market leaders seek to use the benefits that the share economy creates in order to increase their customer base, to involve consumers in the process of creating added value. The formation of a shared economy is based on a number of trends that ensure its competitiveness in comparison with traditional economic models. This is the use of modern technologies for building Internet platforms. The algorithmic revolution implies that the tasks underlying business processes can be transformed into formal, codifiable algorithms with clearly defined rules for their implementation. In the algorithmic revolution, actions are formalized and codified, and so they become computable.

The algorithmic revolution opens the way to artificial intelligence, the development of algorithms for data analysis and decision making, the programming of norms and rules for the interaction of economic agents.

Platforms are marketplaces that facilitate exchange between different types of consumers who might not otherwise interact with each other. The attractiveness of using platforms is based on network effects. One group of agents benefits from the size of other groups that join the platform. The network effect is the dominant view in the analysis of platform economics.

The network effect works so cumulatively that eventually some platform or its ecosystem becomes a monopolist in the market. Providing a common basis for innovation, cooperation and the creation of ecosystems is a basic principle for the development of modern states and their institutional environment.

The greatest success in the context of the development of digital technologies and the share economy is achieved by companies that create digital products (digital platforms, social networks and data analytics). Trust in the digital environment is an important condition for the success of socio-economic relations. To create a trusting relationship, such tools as rating systems, reviews, and insurance are used. In the context of digitalization, additional tools are emerging to involve consumers in the activities of companies in order to receive feedback (via social networks, crowdsourcing platforms).

Since the development of the platform economy tends to increase the availability of globally produced services, this leads to higher expectations from traditional public services and thus an increased need for the development of public sector platforms. Digital ecosystems are helping to reshape the boundaries between the public and private sectors. There are many partnership models, including mutual regulation, the creation of industry consortiums.

The key issue, which is critical to the success of public-private collaboration, is when to decentralize enforcement of regulations into a private platform and when to retain government oversight and control. Numerous factors deter-

mine the right balance, including whether market failure is due to information asymmetries, external factors, or both, and how data availability affects regulatory effectiveness, as well as privacy and related issues.

New technological solutions in the field of digital technologies will start a new wave of innovations and integrated solutions. The value of these solutions will lie at the intersection of traditional sectors, such as integrated environmental monitoring, energy and transport systems for cities. This will require cooperation in various areas of the economy. The common problem is how to create effective partnerships. Such cooperation will be critical to effectively address the most serious trust and security issues in the near future. Despite the significant efficiency of the share economy, it requires appropriate institutional changes that minimize some of the risks of its development.

The difference in the regulation of economic activity in the Internet space and the traditional economy in some cases can lead to an imbalance in the economic system. First, a broad regulatory framework cannot be effective due to the diversity of business models in the sharing economy. It is necessary to create specific rules based on the key characteristics of each business model. The business models of agents of the sharing economy can differ from each other to a large extent, even if they work in the same area. Therefore, rules that are relevant to one business model may not be effective for another, even if they work in the same market.

Secondly, the institutional design of the share economy should be aimed at promoting the widespread introduction of information technologies in economic activity and the social sphere, which will also help increase the competitiveness of business models of the share economy. The efficiency of the share economy is determined by the presence of extensive communications, including mobile communications and the Internet. Without the use of digital technologies, the use of a shared economy loses its meaning, as the efficiency of communication with consumers is lost.

Thirdly, the share economy requires the development of a national regulatory system. As the experience of most countries shows, the development of digital platforms mainly affects national economies. Drivers for the development of the digital economy are nested sets, each of which includes both other technologies and certain models of socio-economic behavior. So the processing of big data is the basis for the formation of digital platforms, and the share economy is based on digital platforms. At the same time, big data itself is the result of user relationships within certain platforms (for example, social networks) and is impossible without social contacts.

New technologies and virtual actors of the digital economy

In the 20th century, Gorillaz animated musicians first appeared before the public. Not only artists, but also the virtual universe in which they live became part of the project. One of the musicians went to prison, and then escaped from it. Fan stadiums were assembled by Japanese virtual singer Hatsune Miku. This is a synthesis of the voice of a live singer and the technologies of the Vocaloid program. Since 2016, the career of a blogger, influencer and model Lil Miquela began. She is on the list of the most influential people on the Internet according to Time magazine.

Digital avatars become available to everyone. Any ordinary user can make a personal Memoji on an iPhone or replace the face of a star in a photo with their own face. Such avatars blur the boundaries between the real and virtual worlds. They are turning into a fast growing market.

Digital celebrities have entered the practice. The video and photo synthesis technique is used using a neural network, which is trained on images of a real person. The main difficulty lies in the preparation of data based on hundreds and thousands of images. Many box office actors have digital twins. But there was a problem of deep fakes. In China, publishing deep fakes without a special mark is considered a criminal offense. Political deep fakes are banned in a number of US

states. According to members of Congress, they threaten the national security of the country. 96% of celebrity deep fakes are used in porn. Because of this, technology is often perceived negatively.

In the case of posthumous digital copies of artists, the issue of copyright remains open. Who actually owns the person - the developers, the customer business, the person or his family? These are not easy and not the only questions for lawyers. Living stars in the US are protected by the right to image. This concept in judicial practice helps celebrities cope with the illegal use of their image for commercial purposes. They find these values in the virtual personalities of Lil Miquela and the Russian "digital person" Aliona Pole. Users find digital influencers to be more sincere. If real opinion leaders are forced to carefully control their online behavior in order not to lose their image, then the cybernetic model does not pretend to be genuine emotions. In 2018, brands and IT companies took notice of their potential. Researcher Ruby G, Japanese influencer Imma, cyber celebrity from Indonesia Thalasya, German Noonoouri and first Russian digital model Kira have become products of the trend.

In 2019–2020 more than fifty new virtual people appeared in social networks. They live the classic influencer life. They are invited to fashion shows and events. They are being interviewed. They are paid for advertising. CGI models earn no less than their real competitors, for example, Lil Miquela's commercial post costs $8.5 thousand.

When working with a virtual blogger, the risks of advertisers are minimal. A digital influencer has no whims, days off and sick days. The pandemic has restricted the movement of real bloggers, and digital bloggers can travel anywhere at any moment. Behind each of them is a team of content specialists. They develop a brand of a fake person. They can more accurately capture the needs of the target audience through the right texts, thoughts and images.

In the future, developers will learn how to create more believable avatars of real people using a digital footprint, artificial intelligence algorithms, and

natural language processing. Cyber-me technologies will be applications that can remember the history of communication. Google introduced the Meena bot, which can take into account the context of the conversation. There is great potential in this industry for large corporations that can collect and process terabytes of user data. Soon, Google may offer the user to archive not only letters in the mail, but also himself.

Digital twins of production

Historically, the virtual essence of cyber-physical systems has been given many definitions: a computational mega-model, a shadow of a physical device, a mirror system, an avatar, a synchronized virtual prototype. Eventually, the term digital twin became established. An innovative breakthrough can ensure the optimal and efficient use of digital twin technologies, usually formed in the process of working with various industrial companies. The concept of a digital twin was born within the framework of the engineering paradigm, in relation to industrial products, where there was a clear connection between a digital twin and a real object at all stages of the product life cycle. However, after the creation of the product, the virtual model was no longer used.

In the concept of a digital twin, a virtual model is no longer discarded after the creation of a material object, but is used in conjunction with it throughout its entire life cycle: at the stage of testing, refinement, operation and disposal. The concept of the digital twin was voiced by Michael Greaves in 2002. It follows from it that each object can be represented as a physical and virtual system. The virtual system mirrors the physical system and vice versa. A digital representation of the object is used that is sufficient to satisfy the requirements of the set of use cases.

It is a digital model of a specific physical element or process with data connections. It provides convergence between physical and virtual states with the appropriate synchronization speed. This is a digital (virtual) model of any

objects, systems, processes or people. It faithfully reproduces the form and action of the original and is synchronized with it. A digital twin is needed to simulate what will happen to the original in certain conditions. This is a system of interconnected highly adequate digital models of a product, technological, production and operational procedures. The digital twin should be a dynamic and constantly updated representation of a real physical product, device or process. The static model of real space is not a digital twin.

The digital twin links the virtual and physical environments. The physical environment (real object, built-in and external sensors) constantly transmits operation and maintenance data to update the virtual model in the digital twin. The digital twin becomes an accurate real-time representation of the physical system as it changes. It uses real-time measurement data. This information is supplemented by metadata, properties, and documents such as reports or work procedures generated at all stages of the object's life cycle. At different stages in digital twins, different information and different technologies can be used. It is a digital model capable of predicting the behavior of the physical twin.

The technology of digital twins has evolved under the influence of convergence processes (involving new technologies) and divergence processes (application of technology to different user groups and different industries). By combining data from various information sources, the digital twin can predict the technical condition of a physical object, and can also be used to predict the system's response to critical security events.

Solutions are possible when the digital twin generates control actions that can mitigate damage or degradation of systems by activating self-healing mechanisms or recommending changes in the mission profile (for example, choosing a mode with less load on the problem area, thereby increasing both life expectancy and success rate missions). The set of digital twins can be divided into four categories.

The Digital Twin Prototype, DTP is a virtual analogue of a real physical object. The DTP twin characterizes the physical object of which it is the prototype and contains the information necessary to describe and create the physical version of the object. It contains all data for this product, including information from the design and production stages, such as product requirements, a three-dimensional model of the object, a description of technological processes, disposal conditions. Digital Twin Instance, DTI represents data that describes a physical object. For example, an annotated 3D model, information about the materials and components of the product, information about workflows, test results, repair records, operational data from sensors, and monitoring parameters.

Digital Twin Aggregate, DTA is a system that integrates all digital twins and their real-life counterparts, allowing data to be collected and exchanged in real time. Digital Twin Environment, DTE represents a multi-domain application space for working with digital twins. These operations include performance prediction and information query. In the case of creating a digital twin of a complex object, the process of building a twin becomes an integral part of the digital transformation of this object.

Real and virtual spaces are connected, starting from the production and operation of a product, device or process and ending with its elimination. Information from sensors, reports from users and other data obtained during production and operation must be continuously transmitted to the digital twin. Various predictions and estimates, control parameters and other variables that can be used to develop and operate a real device must be continuously transferred back from the virtual space to the real space.

An important role is played by the possibility of forming feedbacks at the stage of operation - to optimize the process, taking into account various operating modes; at the production stage - to optimize production processes; at the design stage - to redesign critical components or create a new generation of high-tech products, taking into account the experience of operation, maintenance and

repairs. Allocate a digital twin (virtual model) with an emphasis on technology and reduce technical risks; performance, maintenance; batch updates; adaptive user interface; adaptive learning user interface (smart digital twin).

The pre-digital twin is a traditional virtual prototype created during the preliminary design phase. It helps to make decisions in the development of the concept and preliminary design. A virtual prototype is a virtual model of the system being created, yet only supposed. Usually such a model is created before the physical prototype. Its main goal is to reduce technical risks and identify problems at the preliminary design stage.

The digital twin is a virtual model of the system that is able to combine the performance, health, and maintenance data of the physical twin. The collection of data from physical sensors and computing elements of the physical twin includes both health data and technical characteristics. The data is passed to the digital twin, which updates its model, including the maintenance schedule for the physical system.

The Adaptive Digital Twin features an adaptive user interface for physical and digital twins. The adaptive user interface is receptive to user/operator preferences and priorities. A key capability at this level is the ability to learn operator preferences and precedence in different contexts. The preferred features are captured using a machine learning algorithm based on neural network technology. The models used in such a digital twin are constantly updated based on data received from the physical twin in real time.

The smart digital twin is endowed with the ability of machine unsupervised learning, due to which it recognizes objects and patterns found in the working environment. It supports learning and recognition of system and environmental states with reinforcement by signals from the interaction environment in an uncertain, partially observable environment. The digital twin has a high degree of autonomy.

Customers save on the fact that they almost completely eliminate errors during the restructuring of production. Everything is already calibrated through digital engineering. Many changes can now be made without stopping actual production. A virtual model can be built for the entire factory floor or its individual parts. With it, engineers can test various equipment settings, changing them until the result is the best. The introduction of digital twins in production gives industrial enterprises the ability to predict the results of too expensive or complex changes using virtual sensors, test scenarios for changes in production processes. Optimize production during the design phase and compare optimal performance with actual performance.

Digital engineering gives the greatest advantage to enterprises that actively use robots and automated equipment or seek to implement them. This is due to the fact that modern software provides an opportunity to fully test and debug the operation of these components in a virtual environment in a short time.

The Industrial Robotics Laboratory, located in Brest, cooperates with such global brands as Techman Robot (manufacturer of collaborative robots), OnRobot (advanced gripper and sensor systems for industrial automation), Robotize (mobile robotics), Visual Components (leading developer of software and solutions for 3D modeling of production), Festo (pneumo automatics and automation). With a digital model, you can verify that a product meets marketing claims or regulatory requirements.

The twin makes it possible to quickly transform production technology to transfer production between plants and adapt them to new equipment. Digital twin visualization of belts and conveyors allows customers to develop customized solutions so they can see at a glance how the technology will improve product flow in their plant, as well as run several possible scenarios at once to select the optimal solution.

Thanks to digital twins, manufacturers can see in real time what happens to their products during each stage of production. For example, using sensors it

is possible to determine whether foods have been exposed to temperatures or other environmental conditions that may make them unsafe to consume. Such information allows enterprises to prevent defects in production and choose reliable suppliers.

An important role is played by the orchestration of the entire process of dispatching and maintenance of equipment, namely, linking with existing production and service systems at the enterprise. Industry 4.0 no longer refers to patchwork technologies, but to integrated solutions built into the existing control loop. An optimization module is built into the system model, which makes it possible to build technological regimes based on complex technical and economic target functions.

The presence of a dynamic model helps to combine the developments created in the design organization and the developments that exist at the equipment manufacturer, and transfer this data directly to operation. Digital twins use machine learning technologies. They are self-learning systems that use information from sources, including data from sensors that monitor various indicators of the operating state of a physical object, information from expert experts and from other similar machines or fleets of machines, as well as larger systems of which the observed may be a part physical object.

Digital twins in industrial plants can increase their efficiency, reduce costs and increase the operational reliability of equipment, since they are based on numerical and system modeling technologies widely used in the industry.

The digital economy leads to the accelerated implementation of fundamentally new business models. There is an opportunity to create a competitive economy based on technical means based on the smart industry. Enterprises are integrating into global industrial networks to connect the network of production resources and global applications.

The concept of platform integration

Platforms have the character of marketplaces where two or more parties interact directly for their mutual benefit. It is the defining basis for interaction regarding prices, hours of operation, complaint rules, payment for goods and services. This is not about markets as a common means of coordination, but about markets that define the framework that establishes the rules and structure of the market interaction itself. They are not a new phenomenon. Mediation between two parties can take place in a variety of ways. One firm may sell goods directly to the consumer. A dealer can act as an intermediary, buying an item from one party and selling it to another party. Both parties are affiliated and interact directly on a regulated platform.

The main difference between these types lies in the concept of transaction costs, which include the costs of finding, executing a transaction (payment, logistics) and the costs of creating and maintaining a market. The advantage of the classical market was that after entering the market, transaction costs were significantly reduced, and the disadvantage was the problems of organization, ensuring a sufficient number of buyers and sellers, and delivery of goods. Therefore, a large number of transactions took place not in the market itself, but in the resale mode or in vertically integrated firms.

With digitalization, the attractiveness of the market model has greatly increased due to the fact that the cost of transactions has decreased significantly for many reasons. The goods themselves are becoming digital. From an organizational point of view, the search mechanism and the digitization of supply and demand become decisive. The cost of creating and maintaining a marketplace has become very low, as technological solutions are used to monitor and control the market. The potential of platforms comes not from the fact that more and more marketplaces are starting to compete with traditional firms operating in vertically integrated or reseller mode, but from the fact that the role of the in-

termediary itself is becoming obsolete and the existing business model is not adapting or transforming, but disappears.

Research on platform structures is quite young. Among the first large-scale studies is the work of MIT economists M. Cusumano and A. Gaver, published in 2008. Various aspects, concepts and strategies of platforms are discussed, but a clear and agreed definition of a platform is still lacking. Different definitions have different entry points and theoretical backgrounds (economics, industry structure studies, product strategy or competitive strategy). There is also a distinction between two-sided platforms, where only two parties interact, such as Uber (professional drivers and passengers) or Airbnb (homeowners and renters), and multi-sided platforms, such as the Google Android operating system (users, equipment manufacturers, software developers).

In earlier definitions, the presence of network effects is used as an identification criterion. The new definitions recognize that network effects come with platforms but are not a defining condition. At the same time, there are different ways to monetize network effects on platforms: transaction fees, access fees, fees for expanding access (for example, increasing positions in search engine results), and payment for additional information services. Another characteristic is a certain openness (or limited control) of platforms, on the one hand, and the existence of functioning standards.

These are common platforms where two or more types of counterparties can cooperate and interact directly for mutual benefit under the partial control of the platform. The parties directly control the key terms of interaction without the direct control of the intermediary. This leads to the effect of locking the sides to a specific platform and prevents them from switching easily. Customer value increases not only with the number of customers (direct network effects) but also with the number of participants (indirect or cross-network effects). The main consequence of the network effect is the likelihood of new participants joining. It depends on the number of participants on the other side and vice versa.

There is a clear line between openness, control, competition and cooperation. Cooperation is vital. On the other hand, as members want to expand their roles in pursuit of growth, they can easily compete with each other or even become competing platforms.

More parties lead to potentially larger cross-network effects, greater scale, and potentially diversified revenue streams. It may not be economically viable for all parties to exist independently, but involving many parties runs the risk of creating an overly complex structure and conflicts of interest.

The platforms cater to different types of customers who have different incomes and sources of profit. Often they provide their services free of charge or at subsidized prices and receive their profits from other parties. Governance rules should be where market mechanisms do not work properly.

The business model of the platform can be viewed from several aspects. The value proposition describes the value created by the offered products or services for customers and suppliers. The value architecture shows how resources and competencies are configured and allocated to provide a service. Financial indicators reflect the revenue side with pricing models for counterparties and the cost of using and switching the platform. The value network describes the different roles of actors in the platform concept. Value management defines the mechanics of access, interaction and economic incentives

The roles in the concept of the platform are quite diverse. Clients (customers) are directly interacting parties on the platform, depending on the type, it can be two or more levels. Complements add value to the platform indirectly by providing related services or products. The remaining roles are responsible for the technical functioning of the platform, and they can be performed by one or several companies. The sponsor is the owner of intellectual property rights and the architect of the overall business model of the platform, the provider provides the main point of contact of the platform with customers and complements, and

the operator performs the service function of creating and maintaining the technological infrastructure or owns it.

The development of a platform concept depends on contextual factors such as corporate competencies, market situation and competitive dynamics, and existing product ecosystems. Along with the IT infrastructure and software, the company's staff must also have the necessary management and maintenance skills. The lack of skills in the IT sector means that instead of transforming the internal structure, companies are forced to explore the possibilities of delivering technology outside the enterprise. This puts more emphasis on cloud infrastructure and solutions, managed services and automation. The importance of artificial intelligence technologies continues to grow, but for many companies it is still only a conceptual technology.

With the right use of solutions based on appropriate high-level technologies, it is possible to increase the effectiveness of internal strategies, marketing campaigns, and accelerate the overall growth of the business. However, the need for intelligence can be overburdened as it grows in volume in the hope that it can provide insight into performance, setting goals and identifying drivers for achieving results. Data initiatives require a clear understanding of the purposes for which they are created and the resources available to implement them.

Communication allows a product to communicate with its operating environment, users, manufacturers, other products or systems, and provides additional functionality in a virtual non-physical space. "Smart Factory" represents an enterprise where CPS communicate via the Internet of Things and help people and machines perform their tasks.

System integrators

The role of the system integrator is changing towards a comprehensive solution of the tasks facing the business. At the beginning of the 21st century, box-moving was a popular model. Dealer of information technology manufacturers

provides the implementation of complex projects, supply, implementation and maintenance. In this context, he is an intermediary between business and vendors. The integrator's task is to use technologically different solutions from vendors, choose what the client needs, and combine it into a whole that meets business objectives. To do this, you need to have a good understanding of business processes, delve into the needs of the customer and understand modern technologies. Be a service provider of information technology.

The main factor for the growth of demand for services of integrators is the availability or absence of funds for the development of information technologies in companies. If in 2019 most companies preferred on-premise infrastructure, now cloud technologies and a service consumption model have come to the fore.

These are the need for an accelerated transformation of information technology and the lack of opportunities for capital investments (ie investments in on-premise). The cloud approach became the first choice, and on-premise became the second. In-house IT professionals could easily understand the services offered by providers. There are already several large hyper scalers on the market now. To use the cloud approach, competently integrate it with your own infrastructure and not spend money, you need to have professional expertise.

If the company lacks its own experts, it attracts external ones. Therefore, system integrators have a new role, Managed Service Provider (MSP). And some system integrators need to seriously restructure their business, because the service approach has become a global trend.

The task of the system integrator is to keep the expertise up to date and always be aware of IT trends. If you overlook innovations and offer customers old approaches, you become uncompetitive. Competencies can be conditionally divided into classical and modern competencies. Among the first are the ability to understand current trends and the global market and the proposals of world technology leaders in various subject areas. It is also important to be close to the customer, to understand what challenges his business faces, what exactly he

needs. Among modern competencies is a service approach, which dictates other methods of work.

The system integration market is highly competitive. New players are constantly appearing on it. The winner is the one who is better versed in technology, understands the needs of the customer and is competent in the service approach. First, technological competencies: how integrator understands the proposed solution. Secondly, the ability to understand a business task and adapt a technological proposal to it plays a role.

It is enough to pay attention to several parameters. The term for preparing an extended and high-quality technical and commercial proposal speaks both of technological competencies and how important the project is for the system integrator. Secondly, the list of already implemented projects is important. It is worth asking for the contacts of IT managers of companies for which the integrator has already done similar projects. The third parameter assumes the existence of several approaches to the implementation of the task. A good integrator is not the one who will calculate the specification for three or five vendors, but the one that will offer several options for implementing a business task: off-premise, on-premise and hybrid options.

Service economics

Services around the world form the basis of an economy that is less susceptible to fluctuations in demand and is the first to respond to modern technologies. The most dynamic markets are transport services and ready-made food delivery, online ticket offices, professional and personal services. The segment has overtaken other e-commerce industries.

The volume was provided by the markets of taxi aggregators and car sharing services, as well as food delivery services. The second place in terms of volume is occupied by the market of professional services (educational, medical, legal), as well as personal services. A complex of factors is pushing the service

sector to develop: urbanization, consumer demands for personalization of services, changing demographics.

The business of knowledge service providers is growing. China is the world leader in the sharing economy. The service economy is changing the labor market. The development of mobile applications and aggregators increases the availability of personal services for customers and expands the potential customer base for those who provide these services.

Self-employment is experiencing a renaissance in the service industry. Remote work exchanges not only help customers and contractors find each other. They act as market regulators. Form ratings of customers and freelancers. They allow you to conduct transactions through yourself. In this way, the parties can protect themselves against the risk of non-payment or non-performance of work. The most common professions among the self-employed were taxi drivers, tutors, consultants and apartment landlords. The service consumption model will increasingly go into end-to-end services. The aggregator will gradually turn into a platform that provides the service itself.

Service activities in one form or another are present in all sectors of the economy. Any economic activity is associated with the consumption of services (electricity and heat supply services, premises rental services, banking services, and much more). Any product of labor created in the primary or secondary sectors inevitably creates a need for services, such as warehousing, transportation, advertising services. Enterprises that produce material products can provide various services to consumers of their products (warranty and maintenance, installation services).

Digital transformation of design organizations and digital management

Peter Drucker and Itzhak Adizes believe that the paradigm shift in management will be to refocus on the agility of organizations through value orientation, teamwork and rapid response to changing market demands.

Change cannot be controlled, but it can be anticipated. The new paradigm includes changes in the types of organizational structures and the principles of their functioning, in human resource management, production technology and productivity, the type of information, its processing and application. The project planning stage, previously carried out exclusively with the help of MS Excel, Gantt charts, is now the most powerful artillery of software products, both independent and already built into a package of specialized applications. A new level of communication "project team – consumers of project results" has appeared. To collect process and analyze the data obtained, digital technologies of the information and communication spectrum have been developed.

Based on the data on the project of the organization, business analytics is built and management decisions, scenarios for the implementation of the project, development of the department or organization are formed. In order to digitize business processes and integrate them into the structure of the organization, it becomes necessary to create a new business infrastructure. The highest level of development of the digital transformation of an enterprise can be considered the creation of a digital twin, the so-called digital twin of an organization. It provides unlimited opportunities for modeling and monitoring of all company activities (production and organizational).

The digital twin technology is to create a virtual version of a real-life object or process. This technology allows real-time tracking of various indicators of the object in question, modeling all kinds of situations by influencing the parameters of the digital twin, and minimizing risks. The use of technology provides the opportunity to conduct experiments and tests on a digital version of the object, which makes it much faster and safer to identify the best solutions not based on real trial and error, but on the results of virtual simulations.

The labor market is adapting to a new round of digital development of companies. There is a demand on the market from employers for specialists in new progressive professions - Digital Manager and Digital Adoption Manager

(digital manager and digital adaptation manager). Digital Adoption Manager is responsible for the digital transformation of the business. Digital Adoption is an adaptation to digital services. The user must understand how to perform a particular task faster and better, what software (SW) to use and what algorithms to use so that digital solutions make work easier. Digital Adoption Manager is a specialist who helps to implement digital technologies in the company. The return on investment in IT depends on it.

Digital Adoption Manager (DAM) acts as a link between managers who want to implement something new and employees who will use this software. The main task of DAM is to set up processes within the company in such a way that all employees can effectively use IT platforms. DAM must understand the challenges employees face in the new digital environment and, based on this, adjust the learning process or return the product for revision.

Digital Adoption Manager builds onboarding strategies and trains new employees to work with enterprise software. Identifies bottlenecks in digital transformation processes and corrects them. Works with stakeholders and collaborates with IT, HR and other departments to develop business processes.

Competencies are necessary for professional activity. This is the ability to draw up an educational methodology and the ability to clearly convey information. This skill is necessary for DAM to speak the same language with the IT department and understand the technical capabilities of the platforms used. Be pleasant and easy to communicate with, as DAM will be in contact with a large number of employees. He must also be an attentive listener so as not to miss important details. By collecting and analyzing data, DAM, for example, can understand how long it takes on average to complete a particular operation, and from this infer the training needs of employees.

Various models are used to assess the organizational maturity of project management. To assess the level of digitalization of a company, digital maturity assessment models have been developed. Digital maturity is one of the key

markers of a company's digital transformation. It takes into account the number of specialists who intensively use information and communication technologies.

We are talking about both specialists (software developers and analysts, multimedia designers, etc.) and representatives of other professions (financial activities, administration, marketing, etc.). The second indicator consists of the expenses of organizations for the implementation and use of modern digital solutions. Design organizations are actively implementing changes in the digital infrastructure. An example is digital visualization tools, which are necessary at all stages of the project life cycle.

They concern not only the visual component of the final product (which is used especially actively in agile approaches), but also allows you to visualize the links between the structural divisions of the design organization, contractors, and outsourcers. Digital infrastructure is also represented by complex cloud solutions this tool concerns the storage, transmission of large amounts of data and their security.

In project management, there is also a redistribution of competencies. To a greater extent, this applies to the project manager and work package leaders. Knowledge of the subject area of the project, the so-called hard skills, digital technologies (artificial intelligence, robotization of business processes) are taken over. Competencies in the field of control and monitoring are also replacing new digital infrastructure tools - specialized frameworks, built-in tasks in software.

They allow you to save time on tracking the calendar schedule, transferring information to responsible persons, predicting risks, and much more. Thus, such basic roles of the project manager as coordinator, moderator and leader come to the fore.

The emergence of virtual spaces, where the main interaction between members of the project team takes place, works not only to increase the speed of communications, but also the specifics of working methods with remote teams. Thanks to new digital platforms for project management, project teams are being

decentralized. The level of their independence allows to weak the organizational control, the bureaucratic burden on the project manager the flow of reporting and approval is reduced. In some design organizations, completely remote teams are formed, the activities of which are supported exclusively with the use of new information and communication technologies.

The organization of work requires taking into account the peculiarities of independent work and new methods of interaction between the project manager and the project team. This task seems to be a priority for digital management in project management.

Development of the company's digital strategy, effective digital platforms and technologies, adaptation of the project team and manager (acquisition of new knowledge, skills and experience), theoretical understanding and formation of the digital management methodology are the components of the new project management ideology.

Digital management in projects concerns not only organizational changes, but also the transformation of the project itself. A new generation of consumers is becoming selective and demanding to meet their personal expectations. With the use of digital management tools, the final product becomes more personalized. For example, big data analysis can be directed to create innovative offers with unique properties, so the consumer can get those product characteristics that are important to him. It is important to emphasize here that the introduction of digital management also works to reduce the cost of project development.

Human resources are released the time for making changes to the project is reduced. The use of digital management contributes not only to the preservation of existing competitive advantages, but also to the acquisition of new, high-tech ones. The main vector for the development of "numbers" at the design stage is the implementation of process activities. For people, the main priority will be the formation of work principles - interaction within the project team, communication with stakeholders and relationships with consumers.

The process of forming the principles of activity is characterized by the concept of "emergent intelligence". The term is interpreted as a certain state of the project participants, in which they represent an integral system aimed at the successful implementation of the project, and possessing properties that its components did not previously possess. In practice, these properties will relate to the area of solving intellectual problems in project management. This term is applicable to project teams, but there are still a number of barriers to extending it to all project stakeholders.

There must be a restructuring of collective behavior so that customers, contractors, sponsors are ready for changes in the project they are ready to sacrifice their personal interests in order to obtain high results and successfully complete the project. In other words, all participants must be ready to compose this system. The post-project stage also appears to be more prolonged.

It includes not only tracking the further life of the project (its operation, payback, and other indicators), but also the processing of information on the project and subsequent conclusions. Digital resources are responsible for creating a database, creating a project archive and experience analytics. Previously, this functionality was performed by the project manager or Competence Center. We leave the creation of a database and the formalization of knowledge for the digital infrastructure of the organization to people.

As a result, after the completion of the project, the design organization receives a knowledge base, which today is the main value on the market. The principle of redistribution of competencies, a shifted focus on the ability to coordinate and integrate the project team by the manager is supported by updated international project management standards.

In August 2021, the new seventh version of The Guide to the PMBOK (Project Management Body of Knowledge) was released, the structure of which has undergone quite serious changes. Project management principles replace project management processes. The principles inherent in flexible, adaptive ap-

proaches to project management, agile methods, have always been opposed to the strict, even dogmatic processes previously applied. In the updated edition, the basic principles are rather soft there is no focus on hard skills. The focus is on team and adaptation. Project management processes in the classical, formalized sense are no longer put at the forefront. The redistribution of competencies lies in the plane of new principles formulated as: team, value, leadership, holistic thinking and adaptation.

The proposal to expand the boundaries of the project, increased attention to the pre-project and post-project stage are supported by the new standard ISO 21502:2020 Project, program and portfolio management - Guidance on project management, which replaced the fundamental standard ISO 21500:2012. In the new version of the standard, project management processes have been replaced by project management practices. This version is applicable to almost all models - waterfall, iterative-incremental, hybrid.

This is achieved by self-determining the life cycle of a particular project, its milestones and milestones. Part of the practices presented in the standard correspond to nine out of ten subject areas of process approach management: content management (scope); stakeholder management; time management (schedule); cost management (cost); resource management (resource); risk management (risk); quality management (quality); supply management (procurement); communication management.

New practices have emerged, such as the Benefit Management practice. The modern ideology of project management goes beyond the framework of "terms - budget - quality". The focus of the customer's attention is shifting to obtaining the final utility from the project. Benefit economic efficiency of the project in the future become a prerequisite. The success of the operation stage becomes the main criterion for the effectiveness of the project.

In order to achieve a given level of benefits, they must be envisaged at the project initiation stage or fixed in the project charter. They can represent a given level of profit in a certain time interval, a given payback period and profitability.

Neural marketing

It is not usefulness, rational arguments, but his own subconscious motivations that make the consumer make a choice or make a decision to purchase a product or service. This irrational aspect in human behavior (however, like any other aspect of it) can be understood and used by marketers only as a result of attracting scientific knowledge.

With the help of neural marketing, specialists are able to identify the cognitive and emotional response to a commercial message or information. For example, with its help, they are able to evaluate which of several packaging options, which advertising option evokes the most positive emotions.

Experts reveal the degree of perception of information. For example, they evaluate how much the musical accompaniment helps or prevents them from concentrating on the perception of the advertised product. All this is achieved with the help of neural marketing tools. With the help of high-tech procedures that allow recording the reaction of the human brain, it is possible to track with great accuracy the processes taking place in it without the participation of consciousness in response to a particular commercial product or advertising video.

First of all, these are the processes responsible for decision-making and emotional reactions, concentration of attention and style of behavior, aesthetic pleasure, short-term and long-term memory. People are not given to control cognitive processes all the time. Processes bypass human consciousness.

The fragments of information transformed and significantly edited by the psyche enter the consciousness, which are grouped into coherent patterns based on the structure of the personality, its environment and past experience. The in-

dividual makes a decision in accordance with subconscious reactions, impulses and motivations.

Human consumer behavior is irrational. A person himself cannot know the true motives of his decision. That is why it is possible to choose an adequate smell or musical accompaniment only with the use of neural marketing technology, when the true reactions of the brain of the respondents are evaluated. With the help of eye-tracking, specialists understand what the consumer pays attention to and where he looks the longest. This method is now widely used in studies of the effectiveness of advertising, text perception, the use of programs and sites. This is a tool for analyzing advertising images, directing attention when watching video clips, various design elements, including packaging. With the help of an eye tracker, you can create a "heat map" that uses color to show where and for how long a person looked. Some companies use eye trackers and track involuntary facial expressions.

Another effective method of marketing research is the combination of eye tracking with the demonstration of a virtual 3D environment that simulates store shelves. Typically, a purchase decision is triggered by a specific change in biological parameters, and stronger changes were observed in those buyers who spent longer on the shelf with the product. Eye tracking also confirmed that the human face is always the focus of attention. The individual subconsciously perceives even a schematic image of a face. Emotional activation of consumers precedes the inclusion of human attention and solving the problem of choosing between existing alternatives. For marketers, the immediate emotional reaction of consumers is important, as it indicates the presence of incentives in the product that draw the attention of the audience.

The correlation between consumers' neurological responses and their judgments is when the arguments voiced by research participants do not match their natural responses. Such analysis helps to choose the best packaging and / or advertising that provides a more accurate and effective emotional experience.

Measuring the brain activity and physiological reactions of consumers in the process of choosing from several options offers an answer to the degree of preference for a product or brand when it is ranked against competing offers on the store shelf. The influence of external influences on the human senses helps to determine the parameters of the environment of points of sale, which contribute to more predictable consumer behavior, choice and purchase.

The use of neural imaging technologies helps to determine the factors that affect memory and recognition during brand contact. Neurological indicators of brand extension help determine whether a given marketing move will be positively or negatively perceived by consumers at the stage of preparation for the launch of new categories in the line of proposals, whether it will increase the company's revenue. The neural marketing arsenal consists of eight types of biometrics that are used to scan and measure the above parameters of consumer emotional activity. It includes: electrical activity of the skin. The sweat glands of the hands are sensitive to changes in the emotional state, so any excitation is recorded by sensors, even when sweating is so slight that it is imperceptible to the person himself.

If people begin to breathe faster when they see or use a brand, this indicates their emotional excitement. As well as the two previous parameters, the heart rate gives an idea of the emotional state of a person. The faster the heart beats, the stronger the experience of the research participant.

Eye-tracking gives an understanding of what a person is considering, and how long he fixes his gaze on individual elements of the visual picture. Mimic. Special cameras capture the facial expression of a person while using a product or watching a video. A computer algorithm deciphers the emotions experienced to find out what the subject felt: joy, boredom, confusion, or interest. Any contraction of human muscles is accompanied by an electrical impulse that can be measured. The movement can be very small, and what can elude a person or a computer algorithm will be registered by instruments.

Mental activity can be measured if electrodes are connected to the surface of the head. This type of measurement can show whether a person is involved in the interaction with the product or not, i.e. brain activity increases or decreases in response to stimuli.

A more sophisticated way of measuring brain activity, which can be used to find out which parts of the brain are involved and respond to the received signals about the product being studied. Each of the types of biometrics is not self-sufficient and does not give a complete picture of a person's reaction, therefore, during research their measurements are combined in order to obtain a better quality of results.

Integrated logistics

Modern logistics systems are integrated. Integration in logistics is manifested in two aspects: the integration of logistics systems and the integration of information logistics processes.

Integration of information systems implies the integration into a single information field of various information systems of an enterprise or several enterprises using IT integration solutions. An example of such integration is the merging of the WMS (Warehouse Management System) and the 1C ERP system into a single information space, when paid customer orders automatically go to picking and shipment at the warehouse.

Another example - in case of warehouse outsourcing, the client's accounting system is integrated with the logistics operator's WMS system. In general, we are talking about the integration of accounting ERP systems, warehouse WMS systems and CRM systems that automate interaction with customers. Integration should provide full automation of data transfer in connection with the huge data flow that accompanies the material flow.

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