DigEco

Co-funded by the Erasmus+ Programme of the European Union

ZHYTOMYR POLYTECHNIC STATE UNIVERSITY
PRYAZOVSKYI STATE TECHNICAL UNIVERSITY
KAMIANETS-PODILSKYI IVAN OHIIENKO NATIONAL UNIVERSITY
DMYTRO MOTORNYI TAVRIA STATE
AGROTECHNOLOGICAL UNIVERSITY
ADMIRAL MAKAROV NATIONAL UNIVERSITY OF SHIPBUILDING
NGO VINNYTSIA CITY ORGANIZATION FOR SOCIAL DEVELOPMENT
OF SPECIFIC CATEGORIES OF VULNERABLE YOUTH «PAROSTOK»

DIGITALIZATION OF ECONOMICS: INTER-DISCIPLINARY AND INTER-BRANCH APPROACH

Manual

The manual is developed in the framework of ERASMUS+ CBHE project «Digitalization of economic as an element of sustainable development of Ukraine and Tajikistan» / DigEco 618270-EPP-1-2020-1-LT-EPPKA2-CBHE-JP

This project has been funded with support from the European Commission. This document reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained there in.

ВИДАВНИЧИЙ ДІМ
Буk–Друk
Житомир • 2023

DigEco

Co-funded by the Erasmus+ Programme of the European Union

UDC 338:658.5:004.031
D44

Recommended for publication by the Academic Council Zhytomyr Polytechnic State University (Protocol No. 15 dated 12/19/2022)

Reviewers:

Dalia ***Streimikiene*** – Professor of Vilnius University;

Edmundas ***Jasinskas*** – Professor of Lithuanian Sports University;

Arturas ***Simanavicius*** – Associate Professor of Lithuanian Sports University;

Sergiy ***Lehenchuk*** – Doctor of Economic Sciences of Zhytomyr Polytechnic State University.

D44 **Digitalization of economics: inter-disciplinary and inter-branch approach :** manual. – Zhytomyr : Publishing House "Book-Druk", 2023. – 540 p.

ISBN 978-617-8085-89-6

The manual disclose the essence economic development in digital era, the content of the involvement of countries in the global digital economy. The processes of transformation in a new digital reality and the indicators of the effective development of the digital economy of the countries, with special attention on inclusion, has been researched.

The textbook is recommended for individuals who already hold a graduate degree, current students who have bachelor degree and continue their education on Master level Programs in “Social and behavioral sciences”, “Management and Administration”, “Information Technologies”. It will be useful for stakeholders – employers, businessmen, businesswomen, governmental institutions, non-governmental organisations for digitalizing of the processes in business and economics.

The authors are responsible for the content and presentation.

UDC 338:658.5:004.031

ISBN 978-617-8085-89-6

CONTENT

PREFACE

The modern world is rapidly transforming. Knowledge economy, sharing economy, digital economy. Educational courses, related to world economic processes, requires constant analysis of current trends and features of the functioning of local and global markets.

In manual has been proposed top-cases of digital transformation and modern economic development. Materials regardind notions of digital economy, digital marketing, blockchain, IoT, e-products, big data and others with the special attention on inclusiveness has been presenting. Models and approaches of information technologies usage in business processes, especially in the development of new products has been described. The new approaches to the formation of digital competencies of master graduates has been highlighted.

The manual has been prepared according to the objectives of the project, namely:

1. To “fill the demand of labor market in specialists in digital economics by implementation of modern trends in the digital sphere in accordance with EU best practices, … according to the Bolonia requirements and EU strategy of Digital Single Market. The aim … is to train professionals who understanding how organizations can effectively use digital technologies to innovate their business processes, products, services, and business models.

2. To create inclusuve educational enviroment acording Education 4.0. in the field of DE-implementation of methodological and technological activities ... People with disabilities will be able to gain knowledge and skills without discrimination.

3. Launch innovative partnership model for stakeholders networking – creating of basic digital services for use by citizens in the field of education, for launching partnership models of representatives of the digital industry, business and universities” (http://dig2eco.eu/about-us-2/).

UDC 004.330.1

Viktor IEVDOKYMOV, Doctor of Economic Science,
Doctor of Public Administration, Professor
Oksana OLIINYK, Doctor of Economic Science, Professor
Yuliya BOGOYAVLENSKA, Dr., PhD in Economics, Associate Professor
Svitlana OBIKHOD, Dr., PhD in Economics, Associate Professor
Viacheslav TKACHUK, Dr., PhD in Economics
Zhytomyr Polytechnic State University,
103, Chudnivska str., Zhytomyr, 10005, Ukraine

Chapter 1
THE NOTIONS OF DIGITAL ECONOMY

Content

1.1. Digital economy: the essence and components

At the end of 20th century, it has become clear for the whole world that the old economic model with all its shortcomings is giving way to a more advanced one – the *digital economy* based on digital computer technologies. In general, the concept "digital economy" presented in an international bestseller of the great Don Tapscott "The Digital Economy: Promise and Peril in the Age of Networked Intelligence" in 1994 [1]. One of the world's most leading authorities in the field of business strategy and on the impact of technology on business and society Don

Tapscott defined the ***digital economy*** as an economy that is based on the dominant application of digital technologies, when digital data (binary, informational, etc.) plays a key role. His further book "The Growing Up Digital" (1997) alighted the digital future. That is, the digital economy is a type of economy characterized by the active implementation and practical use of digital technologies for collecting, storing, processing, transforming and transmitting information in all spheres of human activity. From the point of view of the founder of the Media Laboratory of the Massachusetts Institute of Technology Nicholas Negroponte, the concept of digital economy is a shift from (the processing of) atoms to (the processing of bits) in his bestseller "Being Digital" (1995).

Mainly, since the early 1990s, the definition of the digital economy has evolved based on the technology trends that characterized the times, as well as the level at which technology penetrated different tasks and markets. In the mid-1990s, "digital economy" was a bit an abstract concept associated with the development of the Internet and data proceeding. Some saw it as the new networking of humans enabled by technology, and others as the convergence of computing and communication technologies that enabled e-commerce; still others defined it based on its ICT infrastructure foundations. Today, as technology rapidly evolves and becomes ubiquitous, it is widely agreed that the digital economy encompasses all those definitions [2]. According to "Arthur D. Little" the digital economy at the present stage of development is an economic activity that uses digitized infrastructure and knowledge as key factors in production and value creation [3]. Component approach prevails in most definitions of the early digital age, when the economic essence of the digital economy formed.

The Organization for Economic Co-operation and Development (OECD) and scientists identifies three components of the digital economy, in particular [4, p. 14; 5–6]: *supporting infrastructure*, which includes hardware and software, telecommunications, networks, etc.; *e-business* – any processes that the organization conducts through computer networks; *e-commerce*, that is, the

distribution of goods via the Internet.

Rumana Bukht and Richard Heeks [7, p. 13] propose to present the modern digital economy by three components (Fig. 1.1):

1) **the core** – digital (IT/ICT) sector, as defined by the Organization for Economic Communication and Development (OECD), is composed of manufacturing and services industries that capture, transmit and display data and information electronically. This includes semiconductors, processors, devices (computers, phones) and enabling infrastructure (internet and telecoms networks);

2) **digital economy** (narrow scope) – the digital functions or applications that create economic value added, namely true economic profit of a company, as well as added value to business sectors and customers. This includes services and platforms (both B2C and B2B) using devices, data and connectivity infrastructure as inputs. Innovation in these sectors is widely driving spillover impacts to other sectors;

3) **the digitized economy** (broad scope) – sectors that were not traditionally digital are now being transformed by the adoption of digital technologies. These include, for instance, e-health, e-commerce, and use of digitally automated technologies in sectors such as manufacturing and agriculture, which include 4.0 and precision agriculture, among many others.

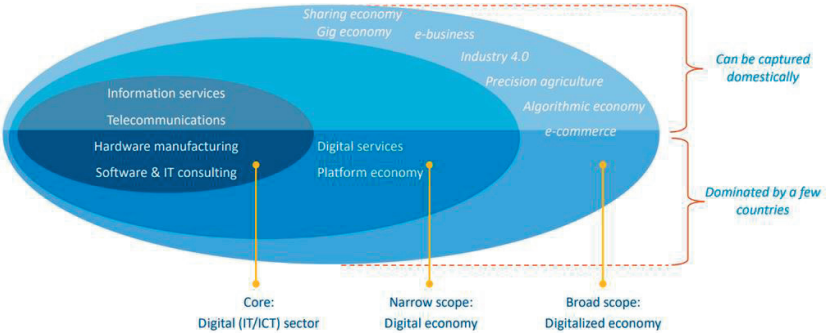


Fig. 1.1 – Scoping of digital economy [2, p. 12]

The digital economy covers everything from traditional sectors of the economy – industry, agriculture, trade, healthcare, education, transport, etc.,

which are transformed under the influence of the digital technologies, – through to new digital sectors. To be talking in a “narrow sense” the digital economy is digital technologies as a set of digital functions, solutions, products and services that create added value for businesses and their customers. In this way macro- and micro- digital economy developing [8].

The **digital economy** deals with activity carried out using information, communication and digital technologies, during which value added and public goods are created. In other words, it uses digitized information, data and knowledge as *key means of production*. Logically, it permeates all sectors of the economy, creating new segments, clusters and even industries. This stimulates the transformation of the traditional economy into one that creates, rather than consumes resources [9]. In practice, it is, first of all, a consumer-oriented economy (economics of demand, sharing and economy of impressions/experience economy [10]. In addition, these are online stores, Internet banking, instant messengers and other social networks for instant orders, a market for an unlimited selection of goods and services [11]. The digital economy is too intertwined with the traditional economy: the development and implementation of information and communication technologies and innovations in the field of information and communications more and more affects all sectors of the economy and society.

With the increase in population and consumption of resources in the modern world, the digital economy influences more than into the sphere of business and trade, – it also has no less impact on the educational and banking sectors, and creates new ones. The digital age continues to change approach on doing business, as well as the requirements for the information technologies usage [12]:

– marketing, sales and service management systems;

– telephony and instant messengers;

– document management and personnel management systems;

– accounting systems and many other enterprise applications into e-direction.

The main key elements of the digital economy in the process of further transformation of the traditional economy are digital infrastructure, human capital, financial resources, higher education, business environment, public policy (Fig. 1.2).

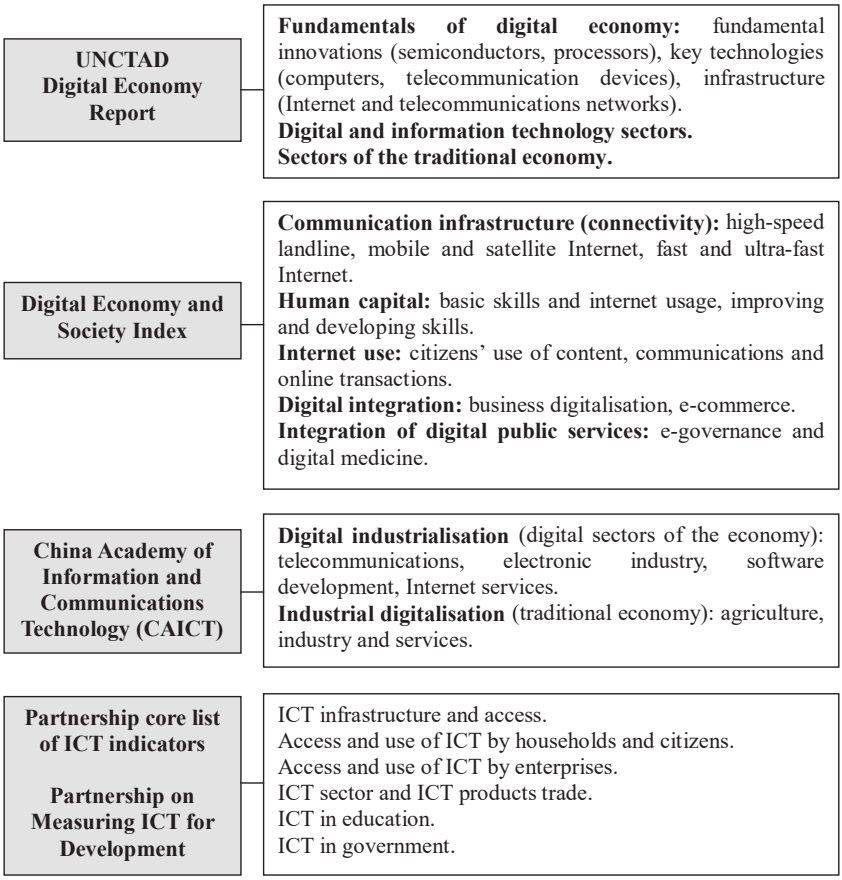


Fig. 1.2 – Systematization of approaches to the definition of digital economy components [13]

Features of the digital economy are:

– widespread use of information and communication technologies (IT/ICT) and the Internet in economic processes, widening their presence in society;

– maximum automation of business processes of entrepreneurs;

– the use of electronic document management;

– digital skills widening in creating modern technologies among participants in economic relations;

– the use of digital platforms and digital business models functioning;

– formation of an information space between the participants of economic relations: business, state and citizens;

– increase KPI from ICT functioning, information products and services in GDP;

– growth of gross domestic product due to digitalisation of the economy, increasing the part of the digital economy in GDP. Already, the digital economy based on the broad definition of measurement is estimated to be $ 11,5 trillion, or 15,5 % of world GDP. On average, it accounts for 18,4 % of GDP in developed countries, and 10 % in developing countries [14]. This includes the contribution of sectors that have not been traditionally digital, which are using digital technologies to react on the rising challenges of a competitive, growing and interconnected world [2; 7];

– access to world information resources and meeting the growing needs of consumers in information products and services;

– development of the global digital market;

– transparency information and economic integration of countries and peoples, globalization of the economy.

The digital economy is changing societies and the way people interact, introducing significant social, economic and environmental changes.

Questions for self-control:

1. The economic content of the concept of the digital economy.
2. Characteristic features of the digital economy.
3. Components of the digital economy.
4. Digital sectors of the economy.

5. Information technology for business.
6. The impact of the digital economy on the state and development of traditional sectors of the economy.

1.2. Application of digital technologies and products in economic relations

Many researchers and managers in the world and in Ukraine use different names for the concepts of the digital economy: Internet economy, new economy, web economy, GAFAnomics (from the first litters of the names of companies Google, Apple, Facebook and Amazon), “on-demand economy”, “data economy”, etc. In general, all these describe the type of economy in which main means of production are digitized (numerical and textual) data and information.

In the digital economy we use digital *data* (sets of data) as well as *digital information* (interpretation of data). Meanwhile, new digital objects have their own specific features that distinguish data from information as an object of civil rights in the usual sense for us and determine the specificity of their legal nature.

Digital data is a set of symbols, the value of which is determined by the demand for them. Data, by form, has specific properties. They are not characterized by those signs that are characteristic of information; not amenable to moral aging, cannot spread indefinitely, which is due to the specifics of technologies, can be destroyed, have an exhaustive character and, crucially, can be separated from the person who transmits them. That is, this kind of data can be disposed of in the same way as the disposal of material things occurs [15, p. 41].

Digital economy development goes with information interaction, e-environment for economic relations further formation, ITC (information and communication technologies) improvement. The *improvement of digital technologies* contributes to increasing the competitiveness of various

sectors/clusters of the world economy, creating new business opportunities by connecting to digital global value chains, emergence of new markets and segments, accelerating the launch of new digital products on the world market [16, p. 185].

Information and communication technologies are defined as a set of methods, tools and techniques used to develop information systems and build communication networks, allow users to create, access, store, transmit and change information using such systems and networks. Digital technologies, so, are the systems, networks, and devices mentioned. Information and communication technologies combine all technologies related to telecommunications, intelligent control systems (smart systems), audiovisual data processing and transmission systems and network control and monitoring functions.

The key components of ICT include [17]:

– *cloud computing:* data collection and processing centers – large cloud services;

– *software:* a set of tools, data, programs that are used to work with computers to perform specific tasks;

– *hardware:* physical infrastructure of software (computer equipment, devices, sensors, etc.);

– *digital transactions:* online transactions that take place between participants in the digital economy without the use of paper ("paperless");

– *digital data:* data forms using specific machine language systems, which allows you to interpret information using various technologies and devices;

– *Internet access:* the process of connecting users to the global Internet using hardware.

The European Patent Office (EPO) identifies ***three groups of Industry 4.0 technologies*** that influence the development of the digital economy [18]:

1) *core technologies* that make it possible to transform any object into a smart and connected device. These comprise three fields: connectivity,

IT hardware and software.

2) *enabling technologies* that are used in combination with connected objects. These comprise eight fields: data management, user interfaces, geo-positioning, data security, safety, 3D systems, power supply and core AI.

3) *application domains* where the potential of connected objects can be exploited. There are eight domains: consumer goods, services, vehicles, healthcare, industrial, home, infrastructure and agriculture.

Taking into account the EPO classification, mark the modern digital technologies (Table 1.1).

***Table 1.1* – Potential of technologies for economics [12]**

Group of technologies	Technologies	Potential for economics
1	*2*	*3*
Core technologies	– 5G; – Internet of things; – robototechnics	5G is a new infrastructure in the digital economy that provides support for the functioning of artificial intelligence (AI), cloud computing, processing of large amounts of data and the Internet of Things (IoT). The IoT allows to interconnect physical devices for the purpose of data exchange. The IoT and the robotization provide increased production productivity and effective involvement in value chains. The use of 5G technology, the IoT and robotics has potential in all sectors of the traditional economy: primary, secondary and tertiary sectors, as well as in the knowledge economy (education, science medicine).
Enabling technologies	– additive producing (3D-printing); – cloud computing; – Big Data and it's analysis; – artificial intelligence and machine learning; – augmented and virtual reality; – cybersecurity; – quantum computing; – software intelligent agents; – blockchain technologies (public, private, consortium, hybrid)	Auxiliary technologies with a developed 5G infrastructure and the introduction of the IoT allow economic entities to flexibly respond to changes in consumer needs and the latest trends. The introduction of assistive technologies in the sectors of the traditional economy allows to ensure a high level of competitiveness of the country through prompt response to changes and involvement in global value chains, as well as contribute to improving the quality of life and security.

Continuation of Table 1.1

1	*2*	*3*
Application domains	– remote control of devices (in production, unmanned vehicles, in medicine, etc.); – technological solutions using 5G; – unmanned vehicles; – Smart Cities; – digital health (status monitoring sensors, stand-alone injection devices); – digital payments	These technological solutions are aimed at the development and implementation of smart technologies. In combination with basic and assistive technologies, application domains become the basis for new digital platforms: – digital business (e-Business); – digital government (e-Government); – digital education (e-Education); – digital medicine (e-Health); – electronic commerce (e-Commerce); – agricultural technologies (Agritech); – fintech (Fintech); – smart cities (Smart city); – sharing economy (also known as collaborative consumption or peer-to-peer-based sharing).

Digital technologies are changing traditional business models, production chains and driving the cause of new products and services. Fast and structural transformations of sectors of the economy are taking place under the influence of digitalisation and intensification of research and development in the field of ICT. A significant ***social effect*** (as a result of the business activity in the spheres of the economy, which is reflected in the trends of the society development and cannot be accurately calculated) creating as well, namely for the development of smart cities, health care, education (Fig. 1.3).

It is important to note that OECD analysts determine that the modern digital economy is characterized by five trends:

– the Internet has become critical;

– there remains a gap between countries in the use of technology and the Internet;

– a growing need to manage digital threats and risks;

– data is a key resource (it is official – data is now the most valuable asset in the world, ahead of oil, according to The Economist);

– the development of digital technologies is concentrated in some countries of the Big Twenty.

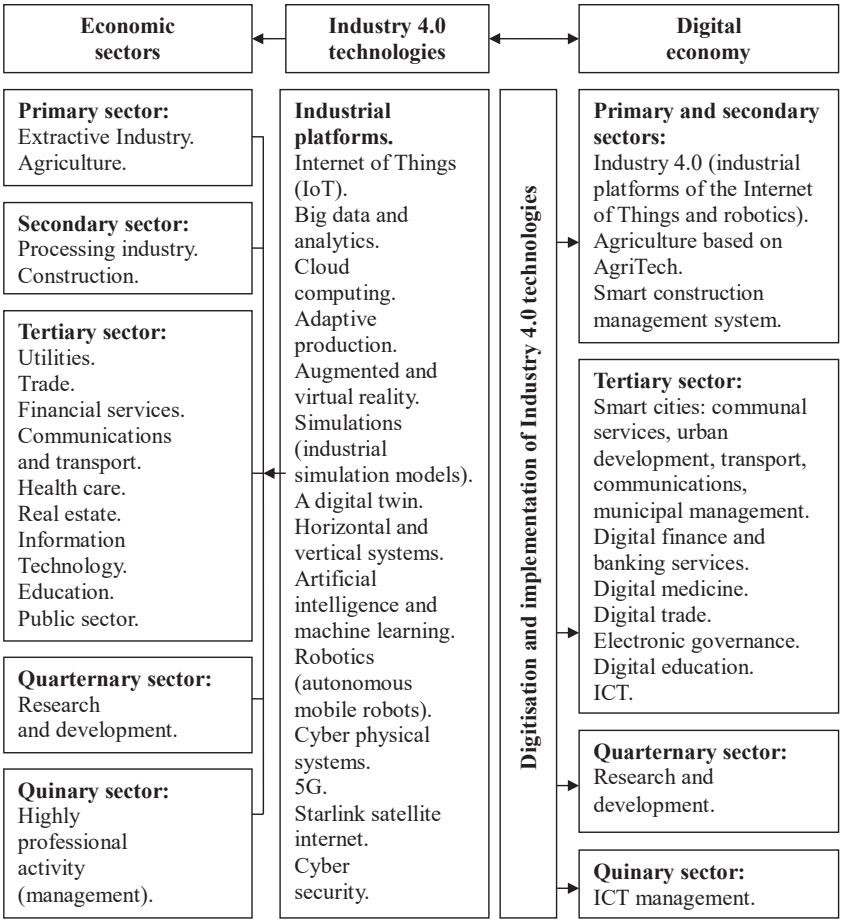


Fig. 1.3 – The impact of technologies on the development of the digital economy

Current trends in the global ICT market (Table 1.2) are characterized by:

– digital transformation (70 % of all organizations will accelerate the use of digital technologies for business sustainability, productivity and customer engagement);

– widening of artificial intelligence (77 % of consumers use artificial intelligence technologies);

– IoT development (an increase in the number of devices connected to the Internet per user from 4 in 2020 to 15 in 2030);

– the need to ensure cybersecurity (the growth of such threats as phishing, cryptojacking, cyber-physical attacks, attacks on devices via the IoT necessitate the development of cyber protection and cybersecurity programs);

– intensive use of cloud computing (the use of cloud technologies by small businesses in order to reduce costs);

– deployment of 5G infrastructure (the development of the fifth generation Internet network is the basis for accelerated digital transformation: by 2024, 5G networks will cover 40 % of the world's territory and 25 % of global traffic, by 2035 5G will contribute to the creation of 22 million jobs);

– expansion of the scope of virtual and augmented reality (medicine – treatment of post-traumatic stress disorder, paralysis, pain control; education, additional workplace opportunities);

– chatbot and blockchain technologies.

***Table 1.2* – Modern trends in development of digital technologies [19]**

TOP ICT Trends	
1. Accelerated Digital Transformation	6. 5G Network
2. Ubiquitous Artificial Intelligence	7. Virtual Reality
3. Internet of Things	8. Augmented Reality
4. Cybersecurity	9. Chatbot
5. Alternatives to Cloud Computing	10. Blockchain

Digital transformation of the economy will provide countries with productivity growth, stimulate economic development and contribute to increased competitiveness. Investments in ICT and widening of digital technologies in various sectors of the economy have a multiplier effect and contribute to the growth of added value.

Digital technologies manifest in the realm of entrepreneurship in the form of three distinct but related elements – digital artifacts, digital platforms, and digital infrastructure [20, c. 1031]. ***Digital artifact*** is a digital component, application, or media content that is part of a new product (or service) and offers a specific functionality or value to the end-user. The separation of information from its related physical form or device has led to the infusion of such digital artifacts or

components into a wide range of products and services, and opened prospective opportunities for entrepreneurs. Such digital artifacts or components are present not only on smartphones and other personal devices (e.g., apps that run on smart watch fitness watch, etc.) but also as part of things for home, toys, clothes, shoes, automobiles, etc. (e.g., Amazon Dash button, Oral-B's toothbrush, Ralph Lauren the Polo Tech shirt, etc.). Digital artifacts can be either stand-alone software/hardware components on a physical device or a part of an ecosystem of offerings that operate on a digital platform.

A ***digital platform*** is defined as a shared, common set of services and architecture that serves to host complementary offerings, including digital artifacts. For example, Apple's iOS platform and Google's Android platform enable apps to run on their smartphones. Similarly, Ford's SYNC 3 is a digital platform that hosts integrated communication, navigation, and entertainment apps in cars. Digital platforms provide opportunities for entrepreneurs – opportunities that involve developing complementary products and services. Such digital platforms (and associated ecosystems) are often marked by a single firm, the platform 'leader', in establishing the modular platform and in creating both value creation and value appropriation. The potential for new ventures to deepen their specialization while offsetting their production, marketing, and distribution capabilities explain the attractiveness of digital platforms as a place for entrepreneurship.

Digital infrastructure is defined as digital technology tools and systems (e.g., cloud computing, data analytics, online communities, social media, 3D printing, digital makerspaces, etc.) that offer communication, collaboration, and/or computing capabilities to support innovation and entrepreneurship. Such digital infrastructures have led to the democratization of entrepreneurship, i.e., the engagement of a greater quantity of different people in all stages of the entrepreneurial process – from opportunity exploration to concept testing to venture funding and launch. For example, crowdsourcing and crowdfunding

systems allow entrepreneurs to interact with potential customers and investors in buying varied resources (ideas, capital) in a global. Similarly, cloud computing, digital makerspaces, and data analytics have made it possible for new businesses to create effectively and test new concepts involving more potential customers. Indeed, new digital infrastructures have shown the capability to support end-to-end entrepreneurial activities.

Thus, digital technologies increasingly become an inherent part of the entrepreneurial opportunity in terms of both the outcome as well as the process. Specifically, doing Davidsson's "entrepreneurial opportunity framework", digital artifacts and digital platforms serve as part of the new venture idea (outcome) while digital infrastructure serves as an external enabler (supporting the process). The characteristics and other aspects of these digital technology elements critically shape the changing assumptions regarding the nature of innovation and entrepreneurship and the distribution of entrepreneurial agents.

So, digital technologies, services and systems are extremely important for economic and social development. They can provide growth and job creation in all types of economic activities, the opportunity for quickly adaptation business models to the realities, and a place in the global economy.

Questions for self-control:

1. Digital data and digital information.
2. Formation of the digital environment of economic relations in a turbulent economy.
3. Key components of information and computer technologies.
4. Industry 4.0 Technologies.
5. Systematization of digital technologies.
6. The impact of digital technologies on the development of the digital economy.

1.3. Advantages and challenges of the digital economy

Digital technologies have already transformed jobs, education, leisure, entertainment, formed new market opportunities, which has caused socioeconomic consequences in various sectors of the economy and society, because:

– reducing the cost of digital technologies in combination with existing cloud services reduces the investment required to start a business;

– the use of digital technologies reduces costs, digitalisation of documents leads to general optimization of the process, decentralization of production increases productivity and efficiency of real-time decision-making;

– digitalisation is changing business culture, and transforming the management;

– free content and services (to low marginal costs): users pay only a part of the cost that is created in the digital economy;

– digital technologies can be used to create unique products that are fully adapted to the preferences of the client;

– digital technologies in the service sector allow to operate from anywhere in the world, sell and buy goods and services via the Internet;

– digitalisation can contribute to solving social problems by facilitating access to health services (e-health), education (distance learning), financial services, transparency and efficiency of government activities (e-government: system of electronic regulations and registrations);

– increase the level of environmental friendliness of production, product quality.

One of the key advantages of the digital economy is the implementation of the possibility of “automatic control” of both the entire system and its individual components, as well as “its scaling” without loss of efficiency, which allows to increase “the efficiency of economic management” (economic activities and

resources of the country in various industries) at the micro- and macro- levels [21–23].

At the level of society, the following advantages of the digital economy are highlighted:

– economic and social effects of digital technologies for business and society;

– improving the quality of life, first of all, by improving the satisfaction of people's needs;

– increasing the productivity of labor;

– new models and forms of business allow to increase the profitability and competitiveness of activities;

– increasing the transparency of economic operations and ensuring the possibility of their monitoring;

– ensuring the availability and promotion of goods and services globally.

Advantages of the digital economy ***at the level of companies and industries*** are:

– the ability to work directly;

– cost optimization as a result of reducing the cost for searching, processing and analyzing information, transaction costs, the cost of promoting goods and services, the cost of negotiating, etc.;

– acceleration of all business processes, including by reducing the time for communications;

– reducing time on a market changes response, for developing products and services and bringing them to market;

– better understanding of consumers and improving the quality of products and services;

– creation of new products and services, increasing the flexibility of the products offered and their high adaptability to new expectations or needs of the consumer.

Technological advantages due to digitalisation:

– sharing of information and "lack of competition in the consumption" of knowledge and information, because the use of a database or knowledge base by one consumer does not interfere with their simultaneous use by other consumers;

– accumulation of large amounts of data, implementation of their automatic processing and analysis;

– synchronization of information flows, the possibility of point distribution of data throughout the business and, as a result, the ability to track a large number of chains between suppliers and consumers, as well as conducting intellectual and point analytics;

– awareness of the potential of digital innovation contributes to the creation of new innovative products;

– transition from paper documents to electronic ones.

For the person (consumer, employee) advantages of the digital economy are:

– reducing the cost of payments;

– new sources of income;

– the cost of Internet services is lower than in the traditional economy (mainly by reducing marketing costs), which makes services more affordable (including public services);

– goods and services become available anywhere in the world to any customer;

– goods and services take into account consumer preferences and customer needs as much as possible;

– the range of information, educational and entertainment services is significantly expanding, the level of provision and speed of which are also growing.

Generalization of the world experience of digital transformation of national economies allowed to mark the following positive consequences of these changes [21–24]:

1. Creating new opportunities for business development based on the use of digital technologies (mobile networks, social technologies, big data analysis, cloud computing) that increase the potential of enterprises, attract new customers, etc.

2. Improving the competitiveness of the national economy through the development of new business models and digital technologies (big data analytics, digital platforms, robotization, 3D printing, IoT, neural networks, artificial intelligence, blockchain, etc.).

3. Increasing the transparency of the process of interaction between business and the citizens with the state and improving the business climate in the country as a result (simplification of procedures for the provision of public services, development of a system of electronic services and online services for business and the people.

4. Saving time and erasing boundaries, including in communication.

5. Improving the quality and convenience of obtaining medical, educational, cultural, logistics services, services in the field of public safety.

6. Mitigation of the regulatory regime, development of unify standards in for digital technologies.

7. Stimulating interest for use of digital innovation and the development of digital culture.

The development of the digital economy is becoming a source of not only new opportunities, but also threats and problems. ***The negative consequences of the digital transformation of the economy could be following [24]:***

1. Digital divide, digital inequality and polarization; increased tensions between states for technological dominance.

2. Transformation of international markets and consumer behavior patterns; increased price competition.

3. Loss of jobs. First, the automation of processes will leave some part of the people without work. Secondly, there will be new needs and demands from the

market for new professions and the transformation of existing ones. In particular, over the past 30 years around the world, human participation in production has decreased from 64 % to 59 %. Therefore, according to experts, by 2040 the automation of industry will lead to a reduction in jobs by about 40 %, primarily due to low-paid positions in production.

Digitalisation can leave millions of people in the world without work. It is assumed that by 2030 more than 60 % of professions will be automated.

4. "Polarization" of human resources according to the level of development of digital skills, which increases the risks of non-compliance of quality educational and professional knowledge, personnel skills with the requirements and needs of the labor market.

5. Deepening the social polarization of society, the precarization of labor, the loss of labor potential due to the growth of labor migration.

6. The emergence of socio-psychological problems of individuals and society, which are associated with threats of segregation of the country's citizens according to the criteria of their competencies in digital technologies, deterioration of functional capabilities and labor skills of personnel and changes in motivation, digital autism and hyperinformation environment.

7. The problem of security of confidentiality, cyberattacks as a more important danger and the growth of cybercrimes (theft of personal data, money from accounts, collection of a lot of confidential and commercial information, blocking activities, etc.).

Digitalisation of the economy and society carries with it certain ***risks*** [22–24]:

1. Risks associated with the use of the IoT: vulnerability (unauthorized influence, cyberterrorism) and illegal use of technologies (video monitoring systems etc.). As IoT facilitates much higher collection and consumption of data, the use of these technologies poses increasing privacy and security concerns. These considerations accumulate further in the case of cross-border data flows, as

sensitive data can be transferred to a country where the jurisdiction may not apply the same standards of data protection as in the country where the data are collected. In exploring the governance landscape for IoT, the World Economic Forum (WEF) concludes that "the many risks inherent in IoT have not yet been effectively mitigated, and the state of IoT governance remains immature. At the same time, however, the effort to manage these risks can lead, in some cases, to inappropriate regulation, which in turn can threaten the value and effectiveness of many IoT applications. The issue of cross-border data exchange is a case in point… As important as it is to govern the use of many IoT applications, privacy and cybersecurity regulations remain fragmented across the globe".

2. Risks from using artificial intelligence, robotization, automation: increasing social tension due to job losses, rising unemployment; total control on lives of citizens, possible leakage of information that is a trade secret.

3. Risks from using blockchain technology associated with a vulnerability in the security of the blockchain system itself, the service infrastructure built on it, the inability to change information on the network (inability to correct the error, change incorrectly entered information), the use of tokens as a means for "money laundering", terrorist financing.

4. Risks associated with the use of import, namely microelectronics. For example, most of the hardware, computer equipment used in Ukraine are imported (it is possible that they may contain special chips for spying).

5. Risks associated with the use of cloud – dependence on the reliability of the telecommunications system; erosion of responsibility for information security and reduction of the level of control due to their distribution between user companies, organization and owner of the cloud platform, Internet provider.

6. Risks associated with the stability of the Internet – during the pandemic and (and in general with a great interest in using remote workers), everything shifted online; from work to education, everything was done virtually. Today's businesses are increasingly reliant on cloud-based software solutions and Web-

based communications to function. Productivity is contingent on the ability to stay connected to the web and its resources. And an increasingly connected workplace often demands high-speed internet to ensure efficient operational processes within the enterprise. It becomes imperative that the Internet connections of business remain both fast and stable to maintain effective internal operations. However, many connections cannot take a lot of loads and are forced into a loop of disconnecting and reconnecting. In this regard, a strong, fast, reliable internet connection is vital for the day-to-day operations of any business. First, it allows employees to stay connected and be productive from anywhere. Second, it enables businesses to take advantage of cloud-based applications and services. Third, it helps businesses keep their customer data safe and secure. Lastly, a stable internet connection can help businesses save money on their telecommunications costs.

7. Risks of influence on public consciousness. The development of big data technologies, the growth of the network space, and achievements in the cognitive and behavioral sciences led to the emergence of developments, which focuses on implicit data collection and hidden management of group behavior of big teams.

8. Risks associated with increasing the level of complexity of business models and the lack of qualified personnel.

The digital economy has a number of challenges that neither society nor business may be ready for. To overcome these challenges and strengthen positions at the international and national levels, it is *need to pay attention to the following* [21–24]:

1. Promoting digital compatibility between countries around the world. Creating global rules taking into account the economic, political and cultural differences of countries. The key set of rules provides the development of a global document to determine the principles and priorities proven by international practice for the dissemination of digital technologies, in order to ensure their interoperability, prevent fragmentation of global space and the formation of digital "islands".

2. Leveling the digital "gap" by enhancing digital development for all. World leaders must help bridge the digital divide between developing countries and developed countries, as well as between different social groups in any country.

3. Creating reliable technologies for everyone. Digital technologies should reach more people, reduce costs and inefficiencies, especially for small and medium-sized businesses. Digital technologies must be reliably implemented for all participants, including enhanced data privacy protection, better online dispute systems, and algorithms that do not discriminate against any of the "players". This requires the development of e-public-private partnerships with a people-centered approach.

4. Creation of an international platform for helping to solve the negative impacts of digital technologies (in particular, overcoming digital inequalities in society among countries) and overcoming security and privacy challenges.

5. Increasing the level of functioning of systems for adequate and continuous tracking of the processes of introduction of digital technologies and their socio-economic consequences in dynamics, with an improvement in monitoring of statistical data at the micro level (enterprises, households, individual entrepreneurs).

6. Creation of a support fund, the money of which should be directed to the development of digital infrastructure and the dissemination of technical education in less developed countries of the world, taking into account the lack of domestic investment resources and in order to reduce the digital "gap".

Questions for self-control:

1. Socioeconomic consequences of the impact of digital technologies in various sectors of the economy and society.
2. The advantages of the digital economy at the level of society, at the level of industries and companies, as well as at the level of person.
3. Technological advantages due to digitalisation.

4. Negative consequences of digital transformation of the economy.
5. Risks of digitalisation of the economy.
6. Solutions for the challenges of the digital economy.

1.4. Digital platforms as the core of the digital economy

The digitalisation of the economy is the necessary process for creating a "normal future".

One of the key tools for digital transformation is a digital platform that provides information exchange and transactions between a large number of users. ***Digital platforms*** are central for today's global economy, and offer great potential for economies and societies. On the other hand, it is an online platform (website) where two or more groups of users create utility (value) to each other. For example, the digital platform Uber combines the interests of carriers (taxi drivers) and passengers.

There are platforms, where there are transitions from using its own resources to using the resources of users of the platform, or coordinating them (for example, Airbnb, unlike the Hilton network, uses not its own housing stock, but the property of platform users to meet the need for short-term rental real estate). Although not every site is a digital online platform, but every global digital online platform has a web interface. For example, the site zakupki.prom.ua is a digital platform – it combines the interests of manufacturers and customers of goods and service.

So, ***digital platforms have certain characteristics:***

– are technologically mediated;

– clear how a set of digital resources (services, content, etc.) provides interaction between groups of users;

– allow groups of users to perform specific tasks;

– the specific nature of the platform depends on the type of task that its participants are trying to perform;

– evolve in an ecosystem in which heterogeneous components constantly adapt to relentless changes.

It is good to understand the essence of the digital platform through technological and social aspects. Digital platforms are a type of information technology (IT) with distinct properties, which lend particular affordances for development [25, p. 871]. Technical, technological and digital characteristics, multi-level architecture and modularity of platforms differ depending on their type and purpose. Instead, digital platforms are a socio-technical phenomenon, since they are created for the purpose of interconnection and communication, the performance of certain functions. The socio-technical dimension of digital platforms is the impact on organizational structures or international standards.

Digital platform is a set of:

– digital data;

– models (logic);

– and tools (methods, means),

informationally and technologically combined into a single automated system with controls for the target subject area and the organization of interaction between subjects.

It is a set of technological solutions (technologies) that create the basis for the functioning of a specialized system of digital interaction, reducing the cost of transactions. Thus, the hypothesis is that digital data becomes a factor in production.

Modern companies use various digital platforms, and build business models with special attention to them, and this is not only the field of e-commerce and e-business, but also the whole range of communications in the triangle “business-consumers-state”. Their use leads to an increase in the completeness of market information, increased trust between counterparties through the transparency of

transactions, creates opportunities for free competition on a fundamentally new technological basis and ensures the development of a successful business. At the same time, digital platforms are becoming the centers of global digital information ecosystems, combining virtual (VR), augmented (AR) and real worlds.

Digital platforms hold a central position in the business models of the largest companies in the world, transforming traditional roles in areas like employment, productivity and innovation activities. Four of the largest firms in the world in terms of market value in late 2018 were Microsoft, Apple, Amazon and Alphabet – all platform companies. If adding the three other platform leaders, Facebook, Tencent and Alibaba, these seven companies represented close to $ 5 trillion in market value and were reported to account for two-thirds of the total market value of the world's 70 largest digital platforms in 2018 [25, p. 870].

The three most capitalized companies in the world at the beginning of September 2018 belong to the technology sector (Apple, Amazon, Google). Their shares are collectively valued at more than 2,8 trillion USD. The world market was dominated by financial conglomerates (HSBC Holdings, Bank of America, JPMorgan Chase) and well-known industrial corporations (General Electric, ExxonMobil, Royal Dutch Shell, BP, Toyota Motor, etc.).

There are several approaches to the classification of digital platforms (Table 1.3); the complexity of the classification of such structures lies in the fact that each popular platform unites characteristics of several types.

Table 1.3 **– Approaches to the classification of digital platforms [26]**

Classification principle	Type of platforms	Example
1	*2*	*3*
According to the classification of *The Centre for Global Enterprise*		
According to the functions of the platforms	Operating platforms	Uber, Gett
	Innovative platforms	Android, IOS, Microsoft Service
	Integrated platforms	App Store, iCloud
	Investment platforms	Kickstarter
According to the classification of *European Commission*		

Continuation of Table 1.3

1	*2*	*3*
Online platforms according to their functional purpose	Search systems	Google, Bing, Search.com.ua, Yahoo.com
	Social platforms	Facebook, LinkedIn
	E-commerce platforms	X-Cart
	App buying stores	
	Price comparison sites	Price.UA, Hotline.ua
According to the classification of *Deloitte University*		
According to the functions of the platforms	Aggregated platforms	Alibaba
	Social platforms	Facebook, Instagram
	Learning platforms	Coursera
	Mobilization platforms	CRM
According to the general vision		
According to the functions of the platforms	Social networks	Facebook, LinkedIn, Snapchat
	Online auction and retail	Amazon, eBay, Angie's List, Flipkart, Snapdeal, Etsy
	Financial and HR functions	Workday, Elance, Freelancer, WorkFusion
	Transport	Uber, Lyft, Sidecar, BlaBlaCar, Ola, JustPark
	Mobile payments	Mahala, Square
	Clean energy	SolarCity, EnterNOC
	Crowdfunding	Kickstarter, Gofundme, Yomken, Ulule
	Public services	G-Cloud
According to the classification of scales of activity		
According to scale of activity	Global platforms	PayPal, Facebook
	National platform	Diia, eHealth
	Regional platforms	Megogo

Depending on the main goal, there are two types of digital platforms: transaction platforms and innovation platforms. The ***main characteristics and differences*** are given in Table 1.4.

Table 1.4 **– Key characteristics of innovation and transaction platforms [25]**

Category of digital platform	Transaction	Innovation
1	*2*	*3*
Purpose	Matches users or user groups, the value for a user increases with the number of users in a user group.	Enables the creation of applications and services by third party developers based on combining and recombining functionality sourced from a platform core.
Focus with literacy platforms	Driven by economics perspectives of direct and indirect network effects.	Driven by innovation management and software engineering perspective.

Continuation of Table 1.4

1	*2*	*3*
Underlying digital characteristics	Massive processing on platforms enables the search and exchange of information reducing costs, which are traditionally associated with these operations.	Driven by the re-combinability of digital information and functionality; ready access to cheap easy to use digital tools to facilitate software development at scale.
Basis of value creation	Facilitating the exchange of information and services between third parties; matchmaking – value from increasing the size of the pool and then increasing the likelihood of a better match (quality); making interactions and transactions as easy as possible.	Facilitating the innovation of new services by third parties (generally and without supplier contracts); opening up functional capabilities for third parties to innovate; resourcing developers with the capabilities they need to innovate.
Source of value capture	Charging for access to the platform or charging commission on sales of services that platform enables; additional sources of revenue include advertising.	Charging for access to the platform through licensing arrangements or charging commission on sales of complementary services that platform enables; advertising.
Examples	Alibaba.com, Mercado Libre, Whatsapp, Taobao, MPesa, Jumia, Esoko, GoJek, Uber.	Android, SAP, DHIS2, iOS, AliOS.

Digital transaction platforms are also called multilateral markets or exchange platforms. Their main goal is to facilitate transactions between different organizations, legal entities and individuals, for example, to connect buyers with sellers, recruiters with job seekers, drivers with passengers. Transaction platforms can be classified according to their main purpose. For example, social media platforms (e.g., Facebook – on a global basis), e-commerce (Mercado Libre – originating from Argentina), the 'gig' economy (Gojek – originating platforms from Indonesia), platforms built around the notion of the sharing economy (Afristay – originating from South Africa), online portals and app stores (Freebasics – originating from internet.org) and platforms enabling digital identity (Aadhaar – originating from India) [25, p. 873].

Innovative digital platforms are the platforms on which other companies can create additional products, services or technologies. The technical architecture of

the innovation platform contains modules or building blocks that provide innovative opportunities. These modules can then be accessed and combined by apps developers (complementors) to build apps and services (known as platform complements). Innovation platforms are exemplified by mobile operating systems such as Android and iOS, whose functionality is drawn upon through APIs by a platform ecosystem of third-party developers to build and innovate apps as services. Other forms of innovation platform extend to cloud services such as Amazon Web Services, Google and Microsoft Azure, enterprise platforms such as Salesforce.com and SAP, as well as enterprise IoT platforms such as Siemens Mindsphere. There are, in addition, innovation platforms that are designed for development.

Digital platforms operate in a certain socio-technical environment. They exist within a network of stakeholders, which are unite and interact. Their existence, use and evolution are influenced by a set of economic, organisational, institutional and spatial factors. Therefore, digital platforms create a specific ecosystem that brings together stakeholders. Relationships in ecosystems go beyond "typical" relationships with suppliers and customers, and business models are complicated in terms of financial transactions. The concept of "platform economy" has appeared in the scientific literature, which is the use for organizations of external platforms and related ecosystems that are not owned by the organization and are not controlled by it.

"A *digital ecosystem* is a group of interconnected information technology resources that can function as a unit. *Digital ecosystems* are made up of suppliers, customers, trading partners, applications, third-party data service providers and all respective technologies. Interoperability is the key to the ecosystem's success. There are *three main types of digital ecosystems*: the digitizer ecosystem, the platform ecosystem and the super platform ecosystem:

1) *digitizer ecosystems* focus on digitizing an existing product with the help of business partners, while also maintaining low managerial complexity. Digitizer

ecosystems can add new functionality to systems and create digital service revenue; usually incorporates 20 to 100 existing partners across five industries, and best suited for businesses with strong product capabilities, limited digital abilities and a primarily internal focus;

2) *platform ecosystems* are more advanced, and focus on flawlessly connecting users and smart devices on a platform, while simultaneously guaranteeing high service levels and limited obstacles. They create revenue streams from platform usage. The data generated by the ecosystem can be used for similar businesses and service models. Platform ecosystems typically have 50 to 10 million partners across a maximum of five industries; works best with companies that have solid digital capabilities and a strong focus on external expertise. Established tech startups and companies are more likely to adapt this platform as their core business model than nanotech companies (Xiaomi);

3) *super platform ecosystems* are the most complex type of digital ecosystem. They focus on integrating several platforms into one integrated service, while also capturing user data from the integrated platform. This type of ecosystem provides a wide range of user data and also turns the data into money using adjacent business models. The super platform ecosystem typically has at least 10 million partners across at least 10 different industries" [27].

"A monetized platform is an online space that hosts creators' content and allows them to earn money off of it" [28].

There are some approaches regarding solutions for increasing the network effect to monetize the platform [29]:

1. ***Shift to transaction-based model*** – digital platforms function as a marketplace facilitator by bringing supply and demand together, creating opportunities to drive incremental revenue on a per-transaction basis. PayPal and eBay have become massive successes by just taking a few dollars or a couple percentage points from each sale – not enough to create a hurdle to individual adoption, but enough to create incredibly large and durable revenue streams.

Platforms that adopt this model must be focused on removing friction from all aspects of the matchmaking process to grow the userbase and make it as easy as possible for buyers to find sellers and vice versa.

2. ***Leverage emerging trends from network to increase usages*** – as the number of participants increases on the platform, unexplored trends will emerge, which can be discovered through extensive data analysis using predictive machine learning and AI capabilities. Best of all, these insights can only be known and acted on by the platform itself, delivering a sustainable competitive advantage. *For example,* Netflix continually studies what its customers watch, then use those viewing patterns to invest in new content that delivers a steady pipeline what its customers are looking for. To capitalize on this monetization strategy, platforms must be agile enough to quickly create additional content, products, and services that align with user's requirements, keeping users engaged and the competitors in the rearview mirror.

3. ***Cross-selling and up-selling*** – the use of data models to understand purchase history patterns can create a powerful recommendation system. Amazon is the gold standard in this regard, using powerful recommendation algorithms to cross-sell or up-sell customers and deliver uniquely personalized engagement experiences that delight customers and create significant loyalty.

4. ***Ad revenue model and audience targeting capabilities*** – platforms can take years to implement an ad revenue model and turn a profit once the platform has reached enough critical mass to interest advertisers. But that adoption curve gets steeper all the time as the digitisation of society increases. *For example,* Facebook may have taken three years to reach 50 million users – a massive number to be sure – but WeChat reached that milestone in just one year.

To be successful, a platform must offer unique audience targeting capabilities to differentiate from other advertising options, ensuring that every advertising investment is maximized. ML/AI capabilities can dig into the rich history of first-person data the platform captures, parsing the data in such a way that advertisers

can't help but invest more in these digital channels.

5. ***Dynamic and innovative pricing methods*** – product pricing is usually fixed, no matter how much of the product is consumed over a period of time. The only opportunity to pay less per license is with volume pricing. Platforms, however, can take advantage of dynamic and innovative pricing models based on the ways users derive value from the platform. Some options include:

– "freemium" pricing that allow users to engage with some or all of the platform for a period of time before any payment must be made. The "30-day trial" is a common example. Membership fees with unlimited use (think Amazon Prime) or subscription offerings that deliver consistent value for less cost (annual pricing at 20 % less than the monthly rate, for example) encourage frequency of usage or to reward customer loyalty;

– pay-for-what-you-use pricing models function like your utility bills: the less you use, the less you pay. Marketing automation companies offer tiers of pricing based on the number of target records in your database, or the number of emails you send out each month. Cloud storage vendors often charge based on the number of gigabytes used.

These adaptive pricing methods, which are in context with business needs and phases of its lifecycle, helps in increasing the adoption and scale of the platform. And, there're several models of monetization of digital platforms (Table 1.5).

Table 1.5 **– Monetization strategies for digital platforms [26; 30]**

Model (relating to the consumer)	Implementation mechanism
Free	The platform provides free services. Monetization takes place by delivering advertising content to users (Facebook)
Shareware (conditionally free)	The platform provides free services in the basic version, the user pays for the extended format (Spotify)
Commissions	Withholding a fee for each transaction (eBay, Uber)
Payment for access (subscription model)	Fee for access to information on the platform (Science Direct, paid electronic media)
Differentiated access fees ("partly" access is fees)	Part of users who are more interested in the platform's services pay for the access to the platform's services (dating sites)

For example, in Ukraine very popular platforms as marketplaces (Prom, Rozetka, etc.). For the buyer they are free, but for users-sellers a set of services can be implemented either according to the conditionally free model (a limited number of free ads, without additional services), or according to the payment for access or subscription model (payment once in a certain period of a certain set of services, such as, for example, design, promotion, automatic filling of ads, etc.). Ukraine is also developing digital platforms, but to reach the level of a global one with a relevant and good functioning business ecosystem will take time. The clear advantages are represented mainly in agro-industrial and mining and metallurgical complexes, platforms with good communications presented in the Table 1.6 [31, pp. 64–65].

***Table 1.6* – Examples of digital platforms in Ukraine in accordance with basic communication models**

Subject (producer of goods and services)	Object (consumers of goods and services)		
	Business	**Customers**	**Government**
Business	Model "Business-to-Business". Electronic commercial procurements (prom.ua).	Model "Business-to-Consumers". Online stores (rozetka.com.ua).	Model "Business-to-Government". Electronic public procurement (prozorro.gov.ua).
Customers	Model "Consumers-to-Business". Digital employment services (work.ua, rabota.ua).	Model "Consumer-to-Consumer". Online services for ordering services (kabanchik.ua).	Model "Consumer-to-Government". Digital platforms for petitions, participatory budgeting (petition.president.gov.ua).
Government	Model "Government-to-Business. The possibilities for business development; ability to submit reports in electronic form (business.diia.gov.ua).	Model "Government-to-Customers" (or, "Government-to-Citizens"). Public digital services for citizens (igov.org.ua), grants.vzaemo.diia.gov.ua).	Model "Government-to-Government". E-government.

The analysis of the top-50 sites by traffic in Ukraine showed that less than half of the sites are of national origin [32]. Among the top-10 – nine represent

foreign companies. These are mainly social networks (youtube.com, facebook.com, instagram.com) and search systems (google.com, yahoo.com, bing.com). The only national site in this ranking is the ukr.net that represents the field of "News and Media". In the second ten are privatbank.ua, prom.ua and rozetka.com.ua, which are full-fledged digital platforms. The rest of the sites mainly represent the field of news (censor.net.ua, obozrevatel.com, korrespondent.net, segodnya.ua) and trade (rozetka.com.ua, kidstaff.com.ua).

Top-10 websites ranking for all categories in Ukraine as of October 2022 given in the Table 1.7 [33].

***Table 1.7* – Top-10 Websites Ranking for all categories in Ukraine**

Rank	Website	Category
1	google.com	Computers Electronics and Technology > Search Engines
2	youtube.com	Arts & Entertainment > Streaming & Online TV
3	facebook.com	Computers Electronics and Technology > Social Media Networks
4	ukr.net	News & Media Publishers
5	sinoptik.ua	Science and Education > Weather
6	obozrevatel.com	News & Media Publishers
7	censor.net	
8	pravda.com.ua	
9	olx.ua	eCommerce & Shopping > Classifieds
10	alerts.in.ua	News & Media Publishers

An important limitation for the growth of Ukrainian digital platforms is their focus on the local market, while foreign ones form most of the traffic outside their country of origin. For example, in facebook.com, more than 80 % of traffic is generated outside the United States; domestic digital platforms provide themselves with more than 90 % of traffic at the expense of users in Ukraine – for example, ukr.net receives 93 % of traffic from Ukraine.

The prospects for the creating the global digital platforms in Ukraine are partly optimistic. On the one hand, there is still not enough sources for domestic investment and a full level political lobby for the entire digital sector. On the other hand, the growing IT sector should look for opportunities for global expansion.

Digital platforms are a breakthrough innovation that radically change the structure of the national markets. On the one hand, digital platforms make it

possible to avoid the chain of intermediaries, offer the end user the maximum list of opportunities. On the other hand, in case of a "digital monopoly", owners of successful platforms receive control over the market and can impose their own pricing policy. That is, the "traditional" business benefits greatly from the digital boards, but strategically it is at risk of losing distribution channels and becoming completely dependent on platform owners. An important feature of digital platforms as a basis for the functioning of an online community is minimization of transaction costs. Thanks to its architecture, platforms grow synchronously with the needs of their users. The platforms' architecture and interfaces enable to work with individual user behavior.

Anything that is not based on complex technology is more profitable to organize on the basis of platforms. An interesting situation is when there are two or more digital platforms in one market – in this case, there is still one that absorbs (destroys) all the others, primarily due to a more successful strategy and a better environment that it is able to provide to its consumers.

Digital platforms are a logical step for the evolution of business, which was created as a result of the computer technologies, information and communication technologies development, spread of devices for Internet access among people.

Questions for self-control:

1. The essence of the concept of a digital platform.
2. Features of using digital platforms in companies (and their business-models).
3. Modern key characteristics of innovative and transactional digital platforms.
4. Elements of the digital platform ecosystem.
5. Restrictions in the growth of Ukrainian digital platforms.
6. Prospects for the global digital platforms' creation by Ukrainian developers.

1.5. Digital competencies and the quality of human capital formation

The development of the digital economy and the use of digital technologies opens up new opportunities for the growth of the national economy and improving the quality of life of society. The application of these opportunities in the economy, business, and society requires appropriate *digital competencies* for education, employment, work, leisure and civic activities. The Institute for the Future (IFTF) report on "Future Work Skills 2020" identifies six key factors that will change the work landscape and determine the basic skills for the different jobs and working conditions that employers will need in the next 10 years. ***The main factors influencing the sphere of labor and social and labor relations*** [34]:

1) *extreme longevity* – increasing global lifespans change the nature of careers and learning;

2) *rise of smart machines and systems* – workplace automation nudges human workers out of rote, repetitive tasks;

3) *computational world* – massive increases in sensors and processing power make the world a programmable system;

4) *new media ecology* – new communication tools require new media literacies beyond text;

5) *superstructed organizations* – social technologies drive new forms of production and value creation;

6) *globally connected world* – increased global interconnectivity puts diversity and adaptability at the center of organizational operations.

The driving force of the digital economy is **human capital** – knowledge, talents, skills, abilities, experience, intelligence. The rapid adoption of digital technologies makes the digital competencies of citizens key among other skills. According to experts, by 2020 more than 1/3 of the knowledge and skills important for today's work activity should have changed. In the new digital reality in the field of labor and human resource management, financial, legal, economic,

social, cultural, psychological issues arise, among which it is worth highlighting:

– guarantees of human security, society, state; finding a balance between privacy and ensuring personal safety in the online environment;

– issues of paid or free access to online resources, including educational ones;

– emergence and protection of digital rights, intellectual property rights;

– social and labor rights and freedoms in the digital economy;

– finding a balance between economic efficiency and social justice;

– preservation of cultural values and national identity, psychological health of the population;

– ensuring national security in the context of the dissemination and application of digital technologies.

Accordingly, there is a transformation of the labor market and labor relations. ***The following features of the transformation of social and labor relations in the conditions of the formation of the digital economy*** can be distinguished [35–36]:

1) the boundaries of the traditional division of labor are changing, the boundaries of professions are erased, the pace of "extinction" of traditional professions is accelerating, new, previously unpredictable ones arise;

2) forms of employment are changing (freelancing, remote work, flexible forms of work, informal employment on online platforms, part-time or week, employment in seasonal episodic work, project form of employment);

3) mobility of employees increases (migration processes, interprofessional, intersectoral, intra-company mobility are activated);

4) the structure of enterprise management and the personnel management system are changing (abandonment of cumbersome management systems, transition from manager-subordinate relationship to customer-performer relations, digitalisation of the personnel management system);

5) competition in the labor market for unique human resources – creative, creative, inventive abilities – increases;

6) lifelong learning is the principle and concept of changing social and labor relations. As noted in the Report on Human Development, mastering the skills necessary for the 21st century should become part of the process of education throughout life, aimed at critical thinking, collaboration, creativity and communication [37];

7) the level of precarization of the active population is growing, which is determined by the characteristics of employment, working conditions, but in most cases, they do not meet the criteria of decent work and productive employment. Employed in the informal sector; officially unemployed, working without registration of labor and collective agreements; part of migrant workers; People of free professions, employed on freelance conditions and those who are involved in the shadow or illegitimate labor market – these are the categories of labor for which the problem of prescriptiveness is relevant. **Precarity** is an unstable way of life and work without long-term guarantees and reliable earnings, especially in relation to the spread of non-standard employment;

8) the formation of a new segment of the population is typical – NEET: not in education neither in employment nor training among young people aged 15–29 years. This category of the population is excluded from both the unemployed and the employed population.

Such challenges and transformations were met by the first IT industry; Other industries today adopt this experience, introduce atypical forms of employment (outsourcing, outstaffing, borrowed labor, etc.) and create remote jobs. The development of digital competencies is becoming one of the most important conditions of any country today.

For a note, in Davos published the results of Deloitte Global's "Fourth Industrial Revolution on the Threshold – Are You Ready for It?" (2018), the main conclusion of which is that CEOs and government leaders from around the world do not feel full confidence in the willingness of their organizations to influence and seize the opportunities that the fourth industrial revolution brings with it

("Industry 4.0"). Was a vision that in 2020–2030 the generation of "millennials" (born in the 1980s–1990s) and the next generation born after 2000 will enter the markets as the main consumer, with their value system and the benefits of "smart" consumption, and then assisted (supported by computer analytics) consumption, with labor strategies focused not so much on a narrow professional career as on building flexible and adaptive personal and group competencies with unique career trajectories [38].

Digital competencies are a set of knowledge, abilities, character traits and behaviors that are necessary for a person to use ICT and digital technologies to achieve goals in his personal or professional life [39, p. 6]. Competence in the field of digital technologies should be perceived not only as knowledge relevant to technical skills, but also as knowledge more focused on the cognitive, social and emotional aspects of work and life in the digital environment. Digital competence is a multifaceted evolving process that is constantly changing with the emergence of new technologies.

The Digital Competence Framework is a tool created to improve the level of digital competence of Ukrainians, help in creating public policy and planning educational initiatives aimed at increasing digital literacy and practical use of IT technology tools and services by specific target groups of the population. The framework was adapted by Ukrainian experts. It is based on the relevant Framework for EU citizens (DigComp 2.1: The Digital Competence Framework for Citizens), as well as other recommendations in the field of digital competences from European and international institutions, which are adapted to the national, cultural, educational and economic characteristics of Ukraine [40].

The digital competence framework contains a description of the main areas in the field of digital competence that a modern citizen should possess. These are such areas as: information and digital literacy, communication and cooperation, creation of digital content, safety of problem solving [41]. ***Digital competencies can be summarized into five large groups:***

1. *Information and ability to work with data:* view, search and filter data, information and digital content (formulate information needs, search for data, information and content in digital environments, access and move between data, information and content); create and update personal search strategies (evaluate data, information and digital content; analyze, compare and critically evaluate the reliability and reliability of data sources, information and digital content); data management, information and digital content (organize, store and select data, information and content in digital environments; organize and process them in a structured environment).

2. *Communication and collaboration:* interaction through digital technologies (interact through a wide range of digital technologies and understand what means of digital communication are appropriate for this context; share data, information and digital content with others through appropriate digital technologies; act as a mediator, know practical methods of reference and attribution); implementation of civic position through digital technologies (to participate in the life of society through the use of public and private digital services; to look for opportunities for self-improvement and implementation of active citizenship using appropriate digital technologies); cooperation through digital technologies (to use digital means and technologies for cooperation processes, as well as for joint development and joint creation of resources and knowledge); network etiquette (know the rules of conduct and know-how regarding the use of digital technologies and interaction in digital environments; adapt communication strategies to a specific audience and take into account cultural diversity and generational contradictions in digital environments); digital identity management (create and manage one or more digital identities, be able to protect your own reputation, work with data created using several digital tools, environments and services).

3. *Creation of digital content:* development of digital content (create and edit digital content in various formats, express themselves by digital means);

integration and processing of digital content (to change, refine, improve and integrate information and content into an existing body of knowledge to create new, original and relevant knowledge and content); copyright and licenses (understand how copyright and licenses apply to data, information, and digital content); programming (plan and develop a sequence of clear instructions for the computing system to solve this problem or to perform a specific task).

4. *Security:* protect devices (protect devices and digital content, understand risks and threats in digital environments; be aware of security and security measures, and properly consider trust and privacy issues); protection of personal data and privacy (protect personal data and privacy in digital environments; understand how to use and share personally identifiable information while maintaining the ability to protect yourself and others from harm; understand that digital services use the "Privacy Policy" to inform about how personal data is used; be able to avoid health risks and threats to physical and psychological comfort when using digital technologies; be able to protect yourself and others from possible dangers in digital environments; know about digital technologies to ensure social well-being and social integration; be aware of the impact of digital technologies and their use on the environment).

5. *Solving the problem of the digital environment and lifelong learning:* solving technical problems (identifying technical problems in the operation of devices and using digital environments and solving them: from troubleshooting to solving more complex problems); identification of needs and their technological solutions (assess needs, identify, evaluate, select and use digital means and possible technological response measures to meet these needs; establish and adapt digital environments according to personal needs, for example, to ensure accessibility); self-assessment of the level of own digital competence, identification and elimination of gaps (understand in what aspects their own digital competence needs to be increased or updated, identify gaps, build their own profile for the development of their own digital competence; be

able to support others in the development of their digital competence, keep up with the process of evolution of digital technologies); solving life problems with the help of digital technologies (be able to use digital technologies to solve their own life problems in the field of everyday life, social communications, health care, education, etc.); lifelong learning and professional development in the digital environment (be able to use open digital educational resources – trainers, courses, educational programs – for your professional and personal development anywhere and anytime throughout your life; improve professional practices, look for opportunities for self-development and further training, create and fill your own e-portfolio as an addition to your own resume).

Through the EU4 Digital initiative, the European Union supports ***the implementation of digital skills strategies in Ukraine***, in particular by [42]:

– development of methodology for measuring and forecasting gaps in national digital skills;

– defining a common competence framework for SMEs and microbusinesses;

– supporting the establishment of national coalitions for skills and jobs in the Eastern Partnership countries;

– conducting training seminars and trainings;

– conducting advertising campaigns in partner countries.

Many organizations have focused on identifying and developing the digital skills and knowledge needed for the future. Implementing a system of training in professional digital competencies such as coding, data analysis and e-business skills can help young people take advantage of new opportunities in the digital economy and meet the requirements of employers in the labor market.

Questions for self-control:

1. The main factors influencing the sphere of labor and socio-labor relations in digital era.

2. Features of the transformation of socio-labor relations in the context of the digital economy development.
3. Digital competence framework.
4. Groups of digital competences.
5. Digital skills development strategies in Ukraine.
6. Implementation of a system of trainings for digital competencies development in professional spheres.

References:

1. Tapscott, D. (1994), *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*, McGraw Hill, 342 p.

2. Little, A.D. and Huawei (2020), *Think differently. Think archetype. Your digital economy model. A novel approach to digital transformation and policy reform*. Arthur D. Little, Luxembourg, 12 p.

3. «Arthur D Little», [Online], available at : https://www.adlittle.com/en.

4. Karcheva, H.T., Ohorodnia, D.V. and Openko, V.A. (2017), «Tsyfrova ekonomika ta yii vplyv na rozvytok natsionalnoi ta mizhnarodnoi ekonomiky», *Finansovyi prostir*, No. 3, pp. 13–23.

5. «Digital economy: OECD», [Online], available at : https://www.oecd.org/digital/ieconomy.

6. «Digital economy: Meijburg & Co», [Online], available at : https://meijburg.com/trending/digital-economy.

7. Bukht, R. and Heeks, R. (2017), *Defining, Conceptualising and Measuring the Digital Economy*, University of Manchester, Global Development Institute, Manchester, pp. 1–24.

8. «Epoch Perspectives», [Online], available at : https://www.eipny.com/white-papers/bits-meet-atoms/?

9. Tulchynska, S.O. and Korzun, L.S. (2021), «Tsyfrovizatsiia yak zasib transformatsii ekonomiky Ukrainy», *Aktualni problemy derzhavnoho*

upravlinnia: zb. nauk. prats, No. 83, Vol. 2. pp. 52–59.

10. Pine II, B.J. and Gilmore, J.H., *Welcome to the Experience Economy*, [Online], available at : https://hbr.org/1998/07/welcome-to-the-experience-economy.

11. Zhekalo, H.I. (2019), «Tsyfrova ekonomika: problemy ta perspektyvy rozvytku», *Naukovyi visnyk Uzhhorodskoho natsionalnoho universytetu*, No. 26. pp. 56–60.

12. Antoniuk, L.L., Ilnytskyi, D.O., Lihonenko, L.O. and Denisova, O.O. et al. (2021), *Tsyfrova ekonomika: Vplyv informatsiino-komunikatsiinykh tekhnolohii na liudskyi kapital ta formuvannia kompetentnostei maibutnoho*, monografija, KNEU, Kyiv, 337 p.

13. Kraus, N.M., Holoborodko, O.P. and Kraus, K.M. (2018), «Tsyfrova ekonomika: trendy ta perspektyvy avanhardnoho kharakteru rozvytku», *Efektyvna ekonomika*, No. 1, [Online], available at : http://www.economy.nayka.com.ua/?op= 1&z=6817.

14. Nicholson, J.R., *New Digital Economy Estimates*, [Online], available at : https://www.bea.gov/system/files/2020-08/New-Digital-Economy-Estimates-August-2020.pdf.

15. Nekit, K.H. (2021), «Tsyfrovi dani ta informatsiia yak obiekty prava vlasnosti», *Chasopys tsyvilistyky*, Vol. 42, pp. 38–43.

16. Novytska, M.V. (2022), «Porivnialnyi analiz vyznachen terminu «tsyfrova ekonomika», *Ekonomika i orhanizatsiia upravlinnia*, No. 2 (46), pp. 183–189.

17. Pratt, M.K., *ICT (information and communications technology, or technologies)*, [Online], available at : https://www.techtarget.com/searchcio/definition/ICT-information-and-communications-technology-or-technologies.

18. «Fourth Industrial Revolution: EPO study global trends in 4IR technologies», [Online], available at : https://www.epo.org/news-events/in-

focus/ict/fourth-industrial-revolution.html.

19. «TOP 10 digital transformation trends to watch out in 2022», [Online], available at : https://magenest.com/en/digital-transformation-trends.

20. Nambisan, S. (2017), «Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship», *Entrepreneurship theory and practice*, Vol. 41 (6), pp. 1029–1055.

21. Nochvina, I.O. (2021), «Tsyfrovizatsiia ekonomiky: mozhlyvosti ta osnovni zahrozy», Zb. nauk. prats KhNPU im. H.S. Skovorody *«Ekonomika»*, Vol. 19, pp. 90–97.

22. Tsyfrova ekonomika: trendy, ryzyky ta sotsialni determinanty (2020), Tsentr Razumkova, Vydavnytstvo «Zapovit», Kyiv, 182 p.

23. Shevchuk, I.B., Deputat, B.Ia. and Tarasenko, O.Ie. (2019), «Tsyfrovizatsiia ta yii vplyv na ekonomiku Ukrainy: perevahy, vyklyky, zahrozy y ryzyky», *Prychornomorski ekonomichni studii*, Vol. 47 (2), pp. 173–177.

24. Hrazhevska, N.I. and Chyhyrynskyi, A.M. (2021), «Tsyfrova transformatsiia ekonomiky v umovakh posylennia hlobalnykh ryzykiv i zahroz», *Ekonomika ta derzhava*, No. 8, pp. 53–57.

25. Bonina, C, Koskinen, K, Eaton, B. and Gawer, A. (2021), «Digital platforms for development: Foundations and research agenda», *Information Systems Journal*, Vol. 31 (6), pp. 869–902.

26. Sichkarenko, K.O. (2018), «Tsyfrovi platformy: pidkhody do klasyfikatsii ta vyznachennia roli v ekonomichnomu rozvytku», *Prychornomorski ekonomichni studii*, Vol. 35. pp. 28–32.

27. Brush, K., *Digital Ecosystem*, [Online], available at : https://www.techtarget.com/searchcio/definition/digital-ecosystem.

28. «Monetized Platform», [Online], available at : https://www.mightynetworks.com/encyclopedia/monetized-platform.

29. Badgujar, S., *5 Ways to Successfully Monetize Your Software Platform*, [Online], available at : https://www.persistent.com/blogs/5-ways-to-successfully-

monetize-your-software-platform.

30. Kushmaro, Ph., *6 strategies smart digital publishers use to monetize content*, [Online], available at : https://www.cio.com/article/230459/6-strategies-smart-digital-publishers-use-to-monetize-content.html.

31. Vyshnevskyi, O.S. (2018), «Tsyfrovi platformy yak yadro tsyfrovizatsii ekonomiky», *Tsyfrova ekonomika*, zb. mater. natsion. nauk.-metod. konfer., 4–5 zhovtnia, KNEU, Kyiv, pp. 63–66.

32. Liashenko, V.I., Vyshnevskyi, O.S. (2018), *Tsyfrova modernizatsiia ekonomiky Ukrainy yak mozhlyvist proryvnoho rozvytku*, monografija, NAN Ukrainy, In-t ekonomiky prom-sti, Kyiv, 252 p.

33. «Top Websites Ranking», [Online], available at : https://www.similarweb.com/top-websites/ukraine.

34. «Future Work Skills 2020», [Online], available at : https://uqpn.uq.edu.au/files/203/LIBBY%20MARSHALL%20future_work_skills_2020_full_research_report_final_1.pdf.

35. Tiutiunnykova, S.V., Bronytska, V.V. and Nestulia, O.O. et al. (2020), «Sotsialno-trudovi vidnosyny v umovakh tsyfrovoi ekonomiky», *Sotsialno-trudovi vidnosyny: problemy nauky ta praktyky,* monohrafiia, Poltava, 695 p.

36. Khandii, O.O. and Shamileva, L.L. (2019), «Vplyv tsyfrovykh transformatsii na ekonomiku ta sferu pratsi: sotsialno-ekonomichni ryzyky ta naslidky», *Ekonomichnyi visnyk Donbasu*, No. 3 (57), pp. 181–188.

37. «Doklad o chelovecheskom razvitii 2016», [Online], available at : http://www.ua.undp.org/content/ukraine/uk/home/library/annual-reports/human-developmentreport-2016.html.

38. «The Fourth Industrial Revolution is here – are you ready?», *Deloitte Review*, Issue 22: [Online], available at : https://www2.deloitte.com/insights/us/en/deloittereview/issue-22/industry-4-0-technology-manufacturing.

39. «Opys ramky tsyfrovoi kompetentnosti dlia hromadian Ukrainy», [Online], available at : https://thedigital.gov.ua/storage/uploads/files/news_

post/2021/3/mintsifra-oprilyudnyue-ramku-tsifrovoi-kompetentnosti-dlya-gromadyan/%D0%9E%D0%A0%20%D0%A6%D0%9A.pdf.

40. «DigComp Framework», [Online], available at : https://joint-research-centre.ec.europa.eu/digcomp/digcomp-framework_en.

41. Kuibida, V.S., Petroie, O.M., Fedulova, L.I. and Androshchuk, H.O. (2019), *Tsyfrovi kompetentsii yak umova formuvannia yakosti liudskoho kapitalu*, analit. zap., NADU, Kyiv, 28 p.

42. «EU4Digital: Ukraine», [Online], available at : https://eufordigital.eu/countries/ukraine.

UDC 004.330.1

Tetiana OSTAPCHUK, Doctor of Economics, Professor
Halyna TARASIUK, Doctor of Economic Science, Professor
Dmytro ZAKHAROV, PhD in Economics
Kateryna ORLOVA, PhD in Economics, Associate Professor
Zhytomyr Polytechnic State University,
103, Chudnivska str., Zhytomyr, 10005, Ukraine

Chapter 2
THE SYSTEM OF DIGITALIZATION ECONOMICS IN THE PARTNER-COUNTRIES

Content

2.1. General tendencies of digitalization in the partner-countries

Today the development of economics and society undergoes constant changes due to the rapid spread of digital technologies. The development of digital economics is a priority value for all countries. Certainly, the vector of development and trends are set by economic leaders: the USA, Great Britain, Germany, Japan, et al. These countries have already demonstrated that transition to a new system of functioning of economics and society can be implemented through the development of basic information and communication infrastructure,

the formation of policy in the digital economics sphere, coordinated between all its participants, the development of support programs for digital technologies implementation at all levels of state, and business, especially for educating digital skills and abilities.

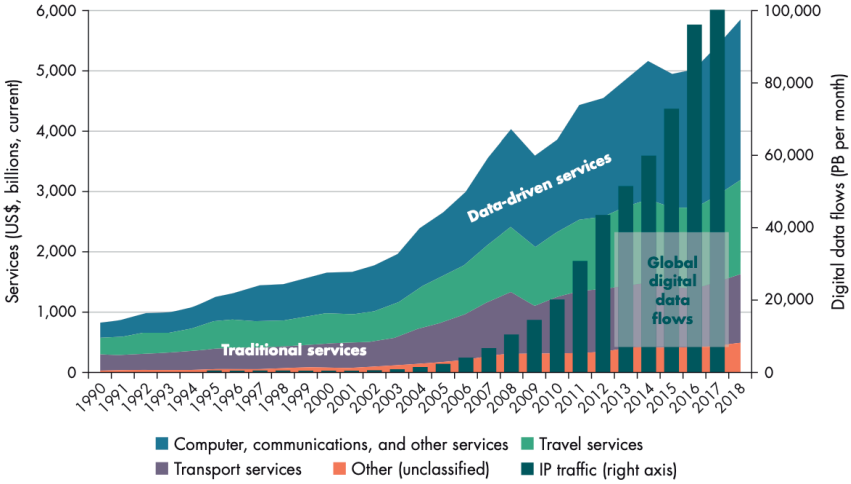
During last years another wave of transformation of activity models in business and social sphere can be observed. Artificial Intelligence, robotics, IoT (Internet of Things), Big Data, Wireless network are the technologies of new generation. These technologies change existing systems and structures of social and economic relations. According to the World Bank estimations, new technologies implementation is able to increase labor productivity in companies by 40 % [10]. In the nearest future it is the efficient use of new digital technologies that will define international competitiveness of individual companies, as well as of countries. Only those who are able to form infrastructure and legal environment for digitalization will develop sustainably.

New stage of digital technologies development is characterized, first, by exponential increase of quantity, quality, and diversity of relations between business, individuals, and social and economic systems. Diversity in the use of data and dynamic growth of data volumes results in complex and synchronized "all to all" integration, the consequences of which are not fully understood yet. Since 1990 the world trade of data-driven services has grown exponentially and now accounts for half of services trade (Fig. 2.1).

Such transformations require new skills and competencies from people, their readiness to use new technologies in everyday life. The special importance is acquired by formation of educational programs, which will be in compliance with global trends and personalized learning trajectories, capable to support "digital literacy".

At the same time, new challenges emerge. The society needs to understand the possible and current negative consequences of digitalization. The negative consequences include shrinking or even disappearance of traditional markets;

professions disappearance due to systems automatization; increase of the cybercrime scales; vulnerability of human's rights in digital space. To solve the mentioned problems and to minimize the related risks it is necessary to form regulatory procedures for these problems solving at the institutional level.



Source: WDR 2021 team calculations, based on World Bank, WITS (World Integrated Trade Solution) database, http://wits.worldbank.org/WITS/. Data at http://bit.do/WDR2021-Fig-O_5.

Note: IP = Internet Protocol; PB = petabytes.

Fig. 2.1 – Dynamics of global trade in data-driven services [6]

The sector of information and communication technologies (ICT) is an important factor of digital economics and society development. According to the World Bank data, the share of ICT in the GDP of OECD countries is about 6 % and is much less in the developing countries. In the USA where 8 out of 14 the world's largest hi-tech companies in terms of revenue are operating, the contribution of the ICT sector to GDP is about 7 %.

It should be mentioned that the developed countries pay considerable attention to the digital economy development. The European Commission identifies five dimensions of the digital entrepreneurship program:

a) digital knowledge and ICT market;

b) digital business environment;

c) access to finances for business;

d) digital skills of employees and e-leadership;

e) formation of the supportive entrepreneurial culture.

The DESI Index (The Digital Economy and Society Index) is used in the countries of European Union for estimation of the level of technological development and the innovative technologies adoption degree in society and, particularly, in economy [42]. The index is calculated from 0 to 1. The amount of human capital, the integration of digital technologies, digital public services, the quality of communication means, and the use of the Internet are evaluated.

The structure of digital economy system can be presented as follows (Fig. 2.2).

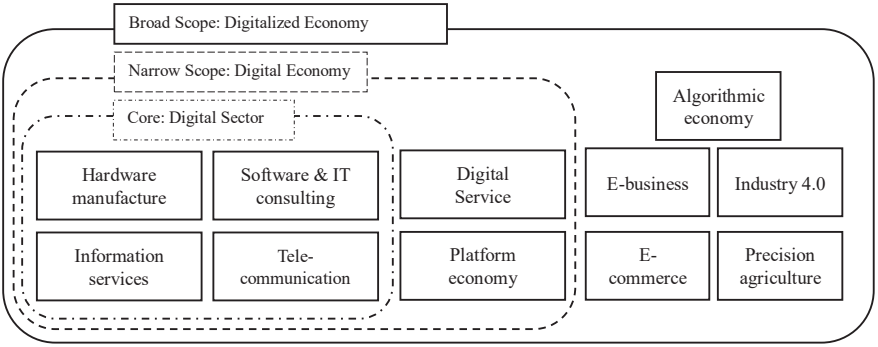


Fig. 2.2 – Scoping the digital economy [3]

To analyze the system of digitalization of the country's economy, it is important to study the following indicators: connectivity, Internet use, level of integration of digital technologies, Digital Government, digital trade.

The connectivity is the level of access to the Internet network in the country. This indicator is characterized by the availability of both fixed and mobile broadband network access to the network. The Network Readiness Index [4] data reflects that the highest level of mobile connection among the analyzed countries is in Germany – 78,95, followed by Slovenia – 67,30, Lithuania – 65,32, Ukraine – 55,7, and Tajikistan – 34,55. At the same time, the data of the report

show that Ukraine is the leader among countries with income below the average, and Tajikistan is in second place among countries with a low-income level.

According to the International Telecommunication Union (via World Bank) data the share of population that uses Internet in Lithuania, Slovenia, and Germany is above 80 %, and Ukraine is approaching this mark. At the same time Tajikistan still lags significantly behind this indicator (Fig. 2.3).

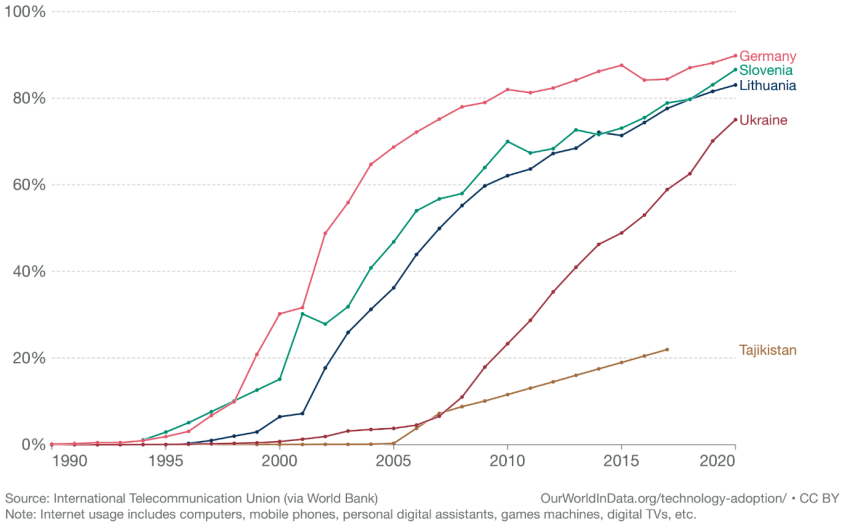


Fig. 2.3 – Internet penetration by country [8]

Today, Internet is a media system which is a tool for work, education and communication, information dissemination and conducting business. The layer of reliable information that is presented on the network is so powerful that it actually affects the ways of obtaining it. The appearance of cloud libraries has significantly reduced the number of real ones. In addition, the amount of information on the Internet is constantly growing, the dynamics of development is increasing daily.

One of the most important network laws is the law of Robert Metcalfe. This scientist is a representative of Massachusetts Institute of Technology and the inventor of Ethernet – one of the most wide-spread technologies of local networks organization. According to the Metcalfe theory, the value of the whole system

increases faster than the number of network elements. Thus, networks are able to generate new value.

According to Metcalfe's law, the more components are in a computing network – for example, in the Internet – the higher is its value to users. This means that more new users will be willing to connect to it. The network growth influences its value simultaneously, and the overall value as the network grows further can affect the entire economy.

It is with the expansion of the Internet use that its influence on the development of the digital economy increases new opportunities and problems at the same time arise that require a modern approach to their solution. Marketing and services industry have changed under the Internet influence: the geographical boundaries expanded, the opportunities of target approach to the Internet audience and formation of organizational connections with partners have emerged.

Enterprises productivity increase is one of the main factors of the Internet influence. It is possible due to simplification of communication, acceleration, and automation of business processes, as well as reduction of transaction costs.

The greatest achievement in the sphere of Internet development is the capability to provide banking services from anywhere in the world. In connection with the consolidation of the banking sphere, a significant growth of the online banking market is expected, which will continue to expand its geography.

In the world Internet-economy, according to the Boston Consulting Group forecasts, great advantages will be possessed by those companies, which will learn to use Internet-tools:

1) mobile Internet – a new user model, which provides access to the Internet through mobile devices;

2) behavioral model change – according to the IDC forecast, smartphones will provide full access to the network that can change the behavioral model between business and consumers fundamentally;

3) formation of the connection ecosystem – initially it concerned the

infrastructure of the Apple company, now other large companies are forming their own ecosystems, among them Amazon, Facebook, Google, Baidu, Tencent, etc.;

4) expanding of the world Internet-economy – growth of investments in network development, creation of new jobs and increased competition with the traditional economy are expected.

The development of information technologies and the Internet in industry brings it to a qualitatively new level: factories and networks of suppliers form a single organism – a global industrial ecosystem (Smart Manufacturing). Modern IT-technologies (PLM-systems) provide an opportunity to gather all the information related to development, production, sales, and exploitation of products. This contributes to flexibility in business promotion, production customization and localization, consumer involvement in the process of product development on early stages.

Several research at the same time have established the positive impact of Internet speed growth on the economy. The higher the speed is, the greater are GDP, business productivity and jobs number.

The study of International Telecommunication Union [43] has identified that a 10 % increase in Internet coverage increases GDP per capita from 0,27 % to 1,38 %. It happens because high-speed Internet helps to increase the efficiency of business processes. In its report, the World Bank [48] recognized high-speed Internet as one of the tools for the growth of economies in developing regions. It called it a key driver of economic growth, job creation and improved interaction between people.

Questions for self-control:

1. What technologies change the existing systems and structures of socio-economic relations?
2. What is measured by the DESI Index?
3. How important is access to the Internet for the economy?

2.2. Digital government

Under conditions of global digitalization, the governments also have to change the approaches and forms of interaction with society. Only such changes will allow to remain effective and to be ready to respond to today's challenges. OECD together with OPSI prepare and publish annually a report on key tendencies and directions of application of innovations by the governments of the countries of the world. In 2020 such report concerned the acceleration of digital development and digital transformation of public sector [18].

In recent years, state governments have been actively working on the transition from providing public services in a traditional way to fully digital solutions. The digital directions of government policy are concentrated in three spheres:

1) transition to the services of virtual government;

2) use of digital technologies for timely and effective communication with the public;

3) transformation of public administration based on partnership, openness, and inclusivity.

The UN research on the e-government 2022 – is an assessment of the UN digital governance system in all 193 member states. The e-government survey is based on the results of long-term research that lasted for more than two decades with countries rating on the basis of E-Government Development Index of the UN, using a combination of primary data (collected and owned by the UN Department of Economic and Social Affairs) and secondary data from other UN agencies (Fig. 2.4).

According to this study, Slovenia, Germany, and Lithuania have a high level of digital governance, and their indicators exceed 0,87 points. Slightly less is the indicator in Ukraine – 0,80. At the same time, the indicators of these countries significantly exceed the world average level, which is, respectively, 0,6102.

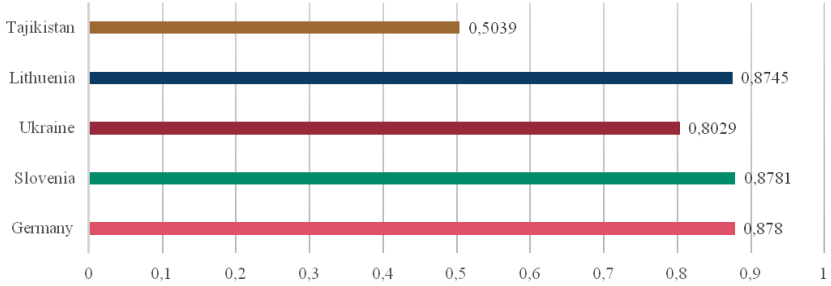


Fig. 2.4 – E-Government Development Index [46]

The indicator in Tajikistan is 0,5039, which is lower than the world average level. Mainly Tajikistan lagging is explained by the underdevelopment of telecommunication systems in the country, and by the low level of online services that a citizen can receive.

The transformation of public administration is declared as a priority direction in the EU. Modernization of e-governance and public services with the use of digital means has a crucial role in reducing the administrative burden on citizens and business as a whole [19].

According to "2030 Digital Compass: The European way for the Digital Decade" [20] public administration transformation is aimed on achieving:

a) openness and transparency of public administration. In particular, it is envisaged to achieve accountability of public administration bodies to citizens through the use of digital technologies, to provide their openness for democratic participation, as well as for the control by the society;

b) human centeredness of public administration: public sector must be focused on the needs of society in general, and of each person in particular, namely, be inclusive, accessible, providing personalized services. It is the digital public services implementation that helps to achieve high level of accessibility and inclusiveness of digital government;

c) economic efficiency of public administration. The financing of public administration takes place mainly at the expense of taxpayers. Digitalization helps

to shorten excessive bureaucracy, and to control the financial issues of budget funds spending. Another aspect of digitalization is the opportunity to consider economic criteria in the pricing of electronic public services.

Digital Government concept refers to the use of digital technologies as a component of public administration modernization strategies to create public value. This concept envisages the formation of state management ecosystem, which will include representatives of government, non-governmental organizations, business, citizens associations, and individuals which supports formation and access to the data, services, and content with the help of interaction with government [35]. It is about the deepening of digital transformation in the sphere of public authority, as a result of which technologies significantly affect the content of public administration activities, and not just change the forms and tools of public administration.

Full-fledged digital government, mentioned in the Recommendation of the Council on Digital Government Strategies [35], should embody such principles: it should be digital by design; managed by data and using data; operating as a platform, be open by default and focused on human needs.

An equally important aspect in the development of digital government is the actualization of public administration based on data. Digital world produces an incredible amount of data, which can provide government with important information on the events in real time, tendencies, and human behavior, emergencies, etc. These data is really valuable and can be used during forming and implementing public policy. Digital governments acknowledge that data is a key strategic asset and can be used effectively in planning and monitoring of the public policy. However, the use of data also carries some risks. So, public government should take care of the formation of effective policy, ethical principles, reliable, safe use of data. The legal regulation of data should provide an effective protection of personal data and wide availability and publication of open data.

Separately, it is worth to mention biometric data, which is increasingly used in everyday life. By using of the simplest smartphones applications, e-banking a person provides access to his / her biometric data. Governments often use biometric technologies to develop simplified and adapted services for their citizens. Some public services are available after authorization using biometric data. So, the public administration task is to form a clear legal policy on ethics and privacy related to the use of this technology. The society needs to understand how their data are collected, stored and used. Accordingly, the openness and transparency in the legal policy on data is a basis of trust in public administration. If the legal policy is concentrated on data security, then society has a more positive attitude towards new technologies and is ready to accept them in different situations.

The rating of the analyzed countries according to the Global Cybersecurity Index 2020 [31] data formed by International Telecommunication Union is presented on the Fig. 2.5.

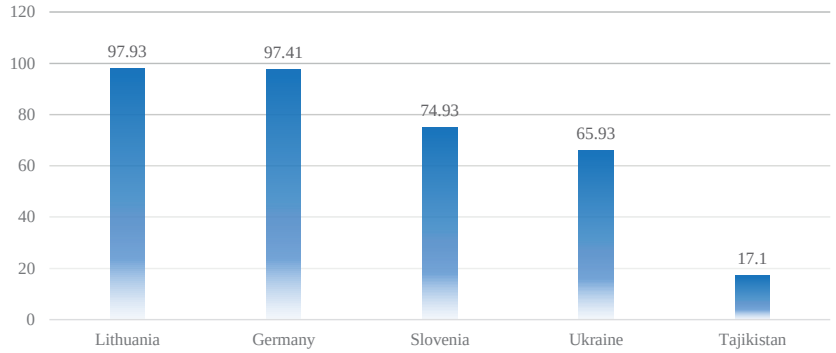


Fig. 2.5 – The Global Cybersecurity Index 2020 [31]

Lithuania and Germany have high-level indicators of cybersecurity. These countries work constantly on the cybersecurity systems improvement. Slovenia and Ukraine need to strengthen work in terms of technical capabilities of cybersecurity. It is also recommended to improve the organizational policy on cybersecurity measures in these countries.

Cybersecurity Index estimates cybersecurity level according to five main principles [31]:

– legal measures – estimating laws and regulations on cybercrime and cybersecurity;

– technical measures – assessing implementation of technical capacities of cybersecurity through national and industry agencies;

– organizational measures – estimating national strategies and organizations regarding cybersecurity measures;

– potential development measures – assessment of informational campaigns, learning, education, and incentives for cybersecurity potential development;

– cooperation measures – evaluating partnership between agencies, firms, and countries.

Digital governance completely erases the concept of "management for the sake of management" and moves to the plane of "management to meet the needs of citizens". It is safe to say that digital governance is not just another stage of electronic governance but is its qualitative transformation. In particular, digital governance is now a certain guide for the most developed countries in terms of digital technologies and a future reference for others. Digital governance brings e-governance up to a new, higher quality level and is gaining more and more popularity in the world, envisaging the creation of a new, qualitatively different dialogue between the state and society.

Questions for self-control:

1. What does «Digital Government» mean?
2. What factors affect the level of cyber security?
3. What are the advantages and specifics of the digital government?
4. In what areas are the digital directions of state policy concentrated?

2.3. Research & development for digital transformation

Development and implementation of innovations are important tools of stimulating of digital economy development. This is particularly important for the developing countries (Ukraine, Tajikistan), as it is exactly with the help of innovative developments and new knowledge is possible for country to increase its economy productivity and competitiveness on world markets. This is what stimulates economic growth, which at the same time ensures an increase in the employment of the population. In its turn, development and implementation of innovations are actually provided by scientific research and technical development. So, to increase the economic growth level a state needs to stimulate R&D.

It is necessary to form and improve national innovative system to provide the most effective use of economic potential. The state's innovative system should be based upon the priorities of development of knowledge and technologies of its use. The developed countries experience points to the positive consequences of stimulating innovative activities on the part of the state.

Innovations need to be implemented in production. A new or improved product is implemented when it is put on the market. New processes, marketing, or organizational methods are implemented when they are put into real use in the company's activities.

The economy transformation has become a part of national as well as a part of supranational economic policies since the late 90-es of XX century. In particular, the EU, while forming the economic growth strategy on the base of increase of competitiveness on international markets, has defined the activization of scientific R&D as a main factor by increasing funding (both through budget funds and within the framework of business projects). Today, the formation of the knowledge economy in the EU involves the integration of individual life processes of society into a single system: formation of education system oriented

on the knowledge development, development of business-science-education networks for new knowledge producing, encouraging business and society to effectively use knowledge and products made on its basis, formation of the support infrastructure (innovative ecosystem).

According to the Congressional Research Service [24] report on science and technologies, R&D expenses are the main indicator which reflects the level of the innovative efforts made by the country. In addition, in order to be able to compare such efforts between countries, an indicator of the specific weight of R&D expenditures in the country's GDP is used to assess the level of innovativeness (Fig. 2.6).

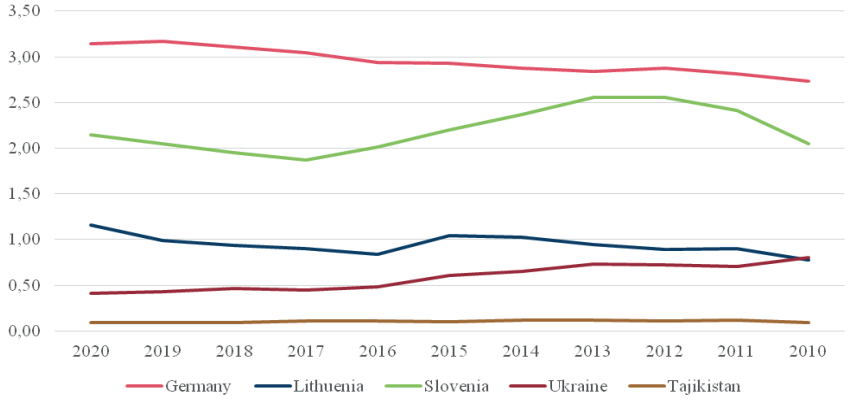


Fig. 2.6 – Dynamics of R&D expenditures by country [39]

If to analyze the dynamics of R&D specific weight in GDP in 2010–2020, the tendency of increasing the R&D expenditures in Germany, Slovenia and Lithuania becomes obvious, while there is a tendency to decrease those expenditures in Ukraine and Tajikistan. Average gross expenditure on R&D in OECD countries in 2020 was 2,36 % of GDP, and in the EU countries – 1,91 % of GDP. In addition, there are extremely few countries in the OECD and the EU that invest less than 1 % of GDP in R&D.

Promoting the development of digital economy on the regional and national levels in Germany, Slovenia and Lithuania is carried out by encouraging the

clustering policy. It is the clusters that are assigned the role of an accelerator of network interaction between economic entities of the region that have complementary competences or technological capacities, of mediator of productive dialogue about formation and commercialization of innovations between academic circles and business representatives. To increase the export capabilities at the level of the EU regions the concept of smart specialization is used, which is related to the cluster concept. It provides an opportunity to define strategic directions of regional development on the basis of formation of value-added chains with a focus on exporting globally competitive products.

The emergence of clusters that are based on knowledge is expedient to consider as a reaction on the relative lack of dynamism in the relationship between researchers and industry. And the main directions of cooperation concentration are defined as follows: renewal of regional R&D systems, formation of R&D institutions networks, joint funding on the first stages of commercialization.

Germany is one of the leading countries in the world in terms of R&D. It is due to the powerful research support system. This system is aimed at the development of effective network for cooperation between industry and science for innovative start-ups.

According to the Germany government plan by 2025 the country will spend 3,5 % of GDP on R&D annually. This is one of the highest indicators in the world. The state development programs should be mentioned:

– High-Tech Strategy 2025 [27] – the main task of the program is to create real products on the basis of research results. Business, universities, and R&D centers should also form international networks to achieve that;

– Research and academic relations policy [40] – scientific diplomacy of Germany helps to form scientific cooperation within the country, as well as on the international level.

Lithuania also actively supports R&D on the state level. The government of Republic of Lithuania has invested 1 bn euro in the network with 5 integrated

R&D and business valleys. Such scientific centers are built in the three biggest cities of the country – Vilnius, the capital, Kaunas, the second largest city and the industrial center, and Klaipeda, seaport city. In addition to that, such state policy promotes the increase of not only state investments in R&D, but also private sector investments. R&D centers have facilitated the acceleration of transformation processes of interaction between the state and business, as well as development of digital economy.

R&D expenditures increase in real sector is a determining factor of economic growth, as it promotes raise of the country competitiveness. The increase of the importance of high-tech and knowledge-intensive industries for the economic development of countries causes the limitation of traditional resources and the need for more effective use of the resource base for the introduction of new, including "green", technologies, the expansion and creation of new sales markets, the increase of labor productivity, the creation of a multiplier effect from the results of R&D in high-tech and knowledge-intensive products and accelerating the development of other sectors of the economy.

Questions for self-control:

1. How does innovation affect economic development?
2. What is the level of R&D in partner countries?
3. What legislative initiatives have been adopted in partner countries for R&D?

2.4. Open data

Open data is information that anyone has access to and that anyone can use and share. Open data is used by individuals, companies, journalists, and civil society to learn more about the government activity and to create new tools and

ideas.

Modern open data concept provides for the open access to use and sharing of socially significant information by any person for any purpose. In most cases open data is related to the access to state information for providing transparent functioning of government. However, now open data is more and more often used by business representatives to increase its efficiency.

Opening data in different spheres promotes for creation of services which help entrepreneurs to avoid corruption risks and to solve problems, which can be faced by business in Ukraine.

In particular, data from the Unified State Register of Legal Entities, Individual Entrepreneurs, and Public Organizations, registers of court decisions, notaries, taxpayers, tax debtors can be useful.

Several areas of using open data to increase economic growth can be singled out. Their existence open opportunities for creation of new business models, optimization of operating companies' activity, creation of new jobs and increasing employment, as well as improving the climate for attracting foreign investment. In some studies the attempts to estimate the value of open data for the world economy are made. According to the global institute MCKinsey [*33*] estimations, open data (from governmental and non-governmental sources) in seven sectors of the world economy (education, transport, consumer goods manufacturing, electricity, petroleum sector, healthcare, and consumer services) can contribute to the creation of an economic effect in the amount of 3 to 5 billion dollars annually.

In the whole world in the most economy sectors the emergence of new companies, which rely on open data for their activities support, can be observed [37]. In general, new companies, which operate with data, implement in their activity one of the two models. The first one involves providing data as a resource for other companies; for this, the quality of data is improved, new platforms and data presentation formats are created. The second model provides informational and analytical services and products, ready to be used by companies

or consumers. Besides that, a lot of companies are working to make state open data more comfortable for use, to simplify access to it and its analysis.

Open data can be used for more effective job search by applicants and for finding staff by employers, thereby contributing to the growth of the overall level of employment in the country. A 2013 World Bank report [28] shows how job search services that use open data can benefit both employers and potential employees. Open data is also a tool which helps youth to develop skills of work with technologies, which increases their chances for successful employment. Today governments of different countries hold contests and "hackathons" in which open data of national, regional, and local level is used, and teachers can form teams of applicants studying computer science to participate in such events. The success of such initiatives will depend on the demand and supply of employees with technical skills. At the same time, in some regions, thanks to such training, it is possible to form a more qualified workforce and at the same time open wider employment prospects for it.

Another benefit of open data use is their positive impact on the investments attracting perspectives. Investors can be interested in data from census statistics, workforce skills, tariffs, land relations or national information infrastructure. Such open data provides an opportunity to form the understanding on resources and infrastructure which can be involved for support of investments in new projects. For foreign investors, who are concerned about the risks, the open data on the state governing mechanisms will be particularly valuable.

More and more often in the process of decision-making investors use state open data provided by the countries themselves (and not only data provided by third parties). The scale of the country's own open data program is now seen as an indicator of the country's openness, and this is an important factor for investors. Monitoring of the open data programs implementation in the world is conducted within the framework of two initiatives: Open Data Barometer – the global estimation of how governments publish and use open data for accountability,

innovations, and social impact [36], and Open Data Index calculated by Open Knowledge Foundation. Open Data Index forms the rating on the basis of 15 different categories: Government Budget, National Statistics, Procurement, National Laws, Administrative Boundaries, Draft Legislation, Air Quality, National Maps, Weather Forecast, Company Register, Election Results, Locations, Water Quality, Government Spending, Land Ownership. The last rating results are available for Germany, Slovenia, and Ukraine (Fig. 2.7, 2.8, 2.9).

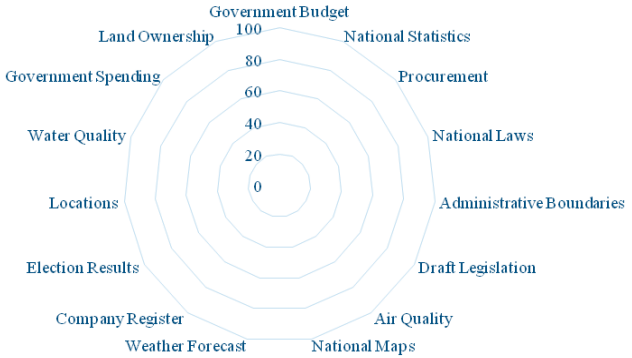


Fig 2.7 – Slovenia Open Data Index

Thanks to open data governments and companies in different countries find new opportunities to provide economic growth and to implement innovations in the private sector.

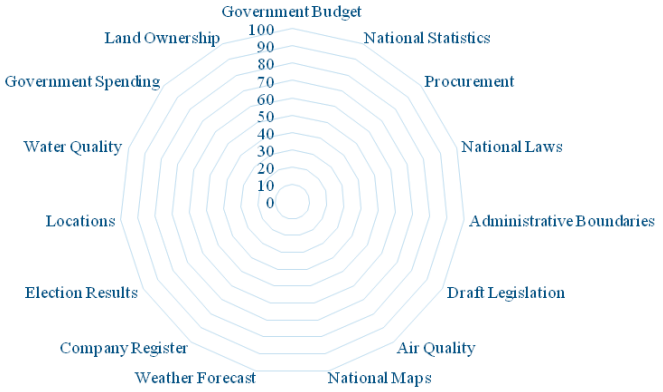


Fig 2.8 – Germany Open Data Index

Using the results of open data analysis and processing it is possible to start a new business, to make operating company more efficient and profitable, to increase employment and to attract foreign investments.

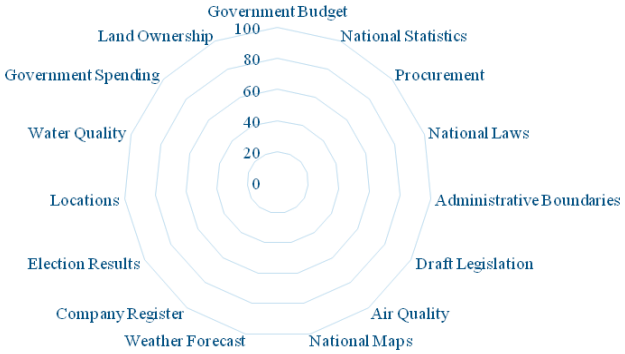


Fig 2.9 – Ukraine Open Data Index

Open data is a diversified and agile resource, which can be useful for companies, individuals, and economies.

Questions for self-control:

1. How open data affects economic development?
2. How can open data be used for business development?
3. What exactly does the Open Data Index measure?

2.5. E-commerce

On the modern stage of social development, the spere of e-commerce have become an integral part of human life, as evidenced by the dynamics of its development indicators in individual countries as well as in the whole world. E-commerce has a lot of advantages, which result in decrease of prices for goods and services. In its turn, it promotes the increase of volume of online sales. Thanks

to the use of modern data transmission systems, making commercial transactions has become more convenient. For example, the process of document exchange has been significantly simplified: instead of printed invoices, stock quotes, purchase orders and other documents, electronic versions are sent to the counterparty. A similar situation has developed in the sphere of electronic payments (transfers). An effective mechanism of interaction between financial institutions has been created and is functioning in terms of crediting and debiting customer accounts.

E-commerce provides an opportunity for small and medium businesses to compete effectively with large corporations. Statistical data shows that small organizations which actively use opportunities of Internet, expand much faster than those which do not use them in activity.

In addition, e-commerce helps commercial structures to overcome the consequences of financial and economic crises with the least losses. Thus, the global crisis of 2008 has become one of the causes of small entrepreneurship development in the Internet. Despite the general tendency of decrease of the business activity the growth in this sector hasn't stopped. This is due to the fact that under the conditions of a general decline in business activity and staff reduction, some young professionals decided to start their own business. In addition, starting a business on the Internet does not require significant investments. This advantage makes online trading attractive for all economic entities – both small and large businesses.

The activation of the use of information and communication technologies and the Internet by the population and business became the basis for the rapid development of e-commerce on a global scale. The number of digital buyers is growing annually that is presented in Fig. 2.10. The share of users who make online purchases in much lower in countries with low income. That shows the importance of increasing readiness for e-commerce not only from the standpoint of connection to the global network, but also in other spheres.

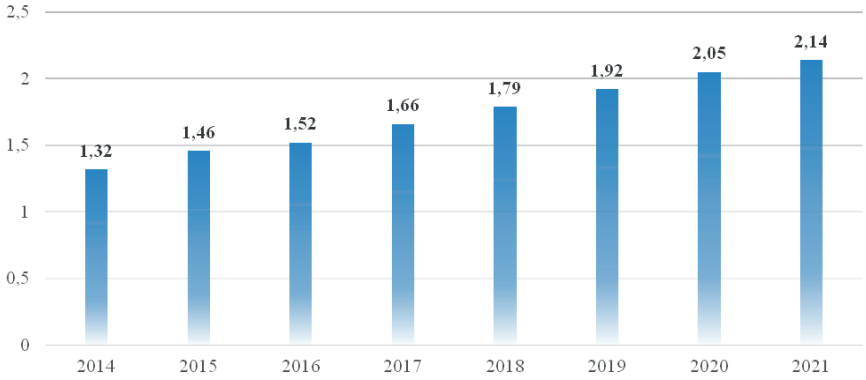


Fig. 2.10 – Number of Digital Buyers Worldwide from 2014 to 2021 [36]

In developed countries such as Denmark, Germany, Netherlands, Norway, Sweden and Great Britain more than 80 % of Internet users make purchases online. At the same time, there are more than two dozen countries in the world with a low or lower than average income level, where less than 10 % of Internet users make online purchases.

The UNCTAD B2C E-commerce Index is aimed at the estimation of the readiness of an economy to support online shopping. The ranks of the analyzed countries in the rating is presented in Fig. 2.11. The higher the Index is, the higher is the level of e-commerce development in the country.

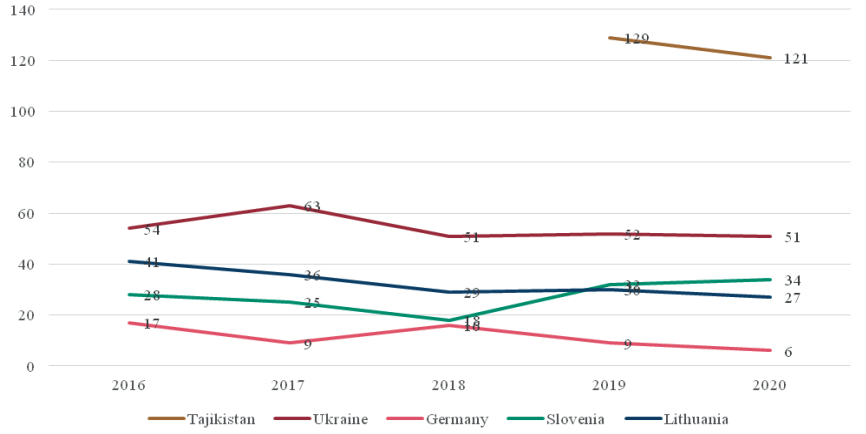


Fig. 2.11 – UNCTAD B2C E-commerce index, 2020 [44]

According to the estimations, the value of e-commerce market of Lithuania is worth US$ 1526 million [44]. The forecasts show that the expected growth rate of revenue is estimated as 18,59 %, which will result in a forecasted market volume of US$ 2,545,00 m by 2025 [15]. Currently, there are 1,41 million of online buyers in Lithuania, and this number is expected to grow up to 1,85 million in 2022. According to the estimations, about 18 % of Lithuanian small businesses sell their products and services online and almost 10 % use e-commerce platforms to sell abroad. On the other hand, e-commerce also increases competition. In particular, the share of foreign online stores in the Lithuania market is assessed as 36 % [34].

If to consider payment methods, Lithuanians mostly use online bank transfers for online shopping (48 % of online purchases). Other options used by Lithuanians include using a payment card (23 %), cash payments (14 %), e-wallet (7 %), and other payment methods (7 %) [21].

Revenue of e-commerce reached US$ 504 million in 2021 in Slovenia and according to the expectations will grow up to US$ 1,738,00 million by 2025, as the forecasted annual growth is 14,53 % [16]. Currently, there are 1,1 million users of e-commerce in Slovenia, so the estimated user penetration will be 50,8 % by the end of this year, and it is expected to reach 56,9 % by 2025.

The largest segment of e-commerce market in Slovenia is fashion. It accounts for almost 30 % of the total revenue from e-commerce in Slovenia. Toys, Hobby & DIY sector has a second place and generates about 26 % of the revenue. It is followed by Electronics & Media, which accounts for a 23 % share in the revenue. The last two sectors are Furniture & Appliances (11 %) and Food & Personal Care (10 % of the revenue).

Most of the transactions for online purchases are provided with the use of prepaid cards – about 63 %. The second place belongs to mobiles – 17 %, as the share of this payment method is much lower. Credit cards occupy third place with the share of 10 %, and e-wallets account up to 9 % [23].

The e-commerce market in Ukraine is one of the most dynamic, the market volume in 2020 increased by 41 % and reached US$ 4 billion, which accounts for 8,8 % of the total retail trade volume. The e-commerce market has grown almost 3 times over the past 5 years and is predicted to grow 2 times over the next 5 years.

The volume of e-exports in 2020 amounted to about US$ 450 million. At the same time, the USA is the largest importer of Ukrainian goods – 33 % of the total Ukrainian e-exports falls on the USA. Electronics and clothing are the largest and most developed e-commerce sectors in Ukraine. The volume of e-commerce in clothing in Ukraine has grown by an average of 26 % since 2016 and reached US$ 291 million in 2020. The share of e-commerce in the retail trade of clothing in 2020 was 6,8 %. And the average check was US$ 24–31 [41].

The estimated e-commerce market volume in Germany is US$ 121,8 billion and has grown by 15,8 % in 2022 compared to 2021 [26]. 20 % of retail purchases in Germany is made online and 41 % of purchases is completed on mobile devices [29].

If to consider payment methods in Germany, the most popular is bank transfer, which is used for 34 % of online payments. Germans use e-wallets in 29 % of online payments, a range of local and minor payment methods in a further 19 % and cash in just 4 % [26].

Germans use debit cards and credit cards, the standard payment method in markets such as the US, in just 14 % of online transactions. In the card market, Visa has a 13 % share, MasterCard 11 %, and American Express 1 % but other, local schemes hold a massive 75 % share [26].

The issue of e-commerce development in the EU and especially involvement of small and medium business in this sphere remains one of the key priorities of European policy at the modern stage. Its development has started from the time of “Electronic Europe” project launch in December 1999. The purpose of this program was the e-commerce development, which primarily consisted in providing buyers and sellers with appropriate guarantees for participating in it,

increasing user confidence, and providing appropriate technical solutions [22].

The e-commerce development is also a central element of the EU Digital Single Market strategy, which is aimed at strengthening this sector in the world economic space. The Digital Single Market strategy consists of a range of initiatives, focused on e-commerce and digital economy promotion by harmonization of national laws and development of single technical standards for facilitating of interaction. The joint efforts of European countries in the sphere of supporting the development and regulation of the market partly explains the rapid growth of e-commerce.

Despite the progress reached due to the effective cooperation between the EU countries in the sphere of single digital market harmonization, European enterprises continue to face obstacles to growth, especially beyond their national borders. One of the biggest challenges for online sellers remains the lack of a level playing field both within the EU and globally, as players based outside of Europe have the ability to exert serious pressure on the European single market. As a result, e-commerce businesses need the support to grow in a more competitive global market. It is also necessary to harmonize the main laws and standards so that European companies can rely on a single set of rules when conducting cross-border operations. Another important thing is that the rules created at the European level were enforceable in relation to companies from non-EU countries that operate on the EU market.

Questions for self-control:

1. What are the main advantages of e-commerce?
2. What are the characteristic features of e-commerce development in the partner-countries?
3. What are the main problems of e-commerce?

2.6. Digitalization policy by countries

Germany. At the beginning of the XXI century Germany has started an active process of information society creation: the country quickly realized the potential of communication technologies and systematically supported their development. The state program "Internet fuer alle" can be an example. This program is aimed at people with disabilities, children and adolescents or people with special social difficulties. The state program is aimed at helping people with special needs in order to give them the opportunity to fully use the Internet independently.

Germany belongs to the countries in which digitization has been actively popularized in everyday life. The formation of the digitalization policy have started in 2010 after the IKT-Strategie der Bundesregierung "Deutschland Digital 2015" publication [29]. The main purpose of digitalization of economy and society is digital transformation.

"Deutschland Digital 2015", developed by the Federal Ministry of economy and energetics, have proposed the new purpose – transfer to "gigabyte society" emphasizing creation of a network infrastructure.

In January 2022 in Germany there were 78,02 million Internet users. The level of Internet penetration in Germany accounted up to 93 % of the general population number at the beginning of 2022 [8].

In 2019 the government presented GAIA-X program [25]. This program is focused on representatives of business, science, and policy. The purpose of the program is to create data infrastructure of a new generation: open, transparent, and safe digital ecosystem, where data and services can be accessible, comparable, and shareable in the environment of trust.

In addition to the GAIA-X integrated data infrastructure, the following programs were adopted by the German government:

– Umweltpolitische Digital agenda – ecological agenda on

digitalization [12];

– Bundesregierung verabschiedet Blockchain-Strategie – the strategy on development and implementation of blockchain technology [3];

– Digitale Wirtschaft und Gesellschaft – digital strategy of Ministry of Education and Science [13].

All programs are aimed at improving the quality of digitization processes and the availability of the benefits of the digital economy for all citizens. It is important to mention the separate education program. The government sets a goal to ensure digital transformation in five key elements of the education sector: to strengthen digital education and professional training, to generate knowledge and innovation, to ensure technological sovereignty and scientific leadership, to increase security and trust, and to create conditions to live and work better and more sustainably.

In addition to the mentioned government projects, there is a range of other initiatives in Germany regarding economy digitalization. In particular, such initiatives are aimed at the development of the artificial intelligence systems, 5G connection implementation, cybersecurity strategy development.

Business, academic society, trade unions and politicians have joined their forces on the "Plattform Industrie 4.0" [38] platform to promote digital transformation of production in Germany. The platform participants are working to strengthen Germany's competitiveness. For them, digitalization is a process of society as a whole, which can only be successful in dialogue.

The "Industrie 4.0" platform promotes the development of Industry 4.0 in Germany by:

– development of pre-competitive concepts and solutions and their implementation in practice;

– supporting companies with recommendations on actions, information and cases for practical application (e.g., on the Industrie 4.0 map with more than 350 use cases and participation in the SME Transfer Network);

– introduction of own ideas into the international discourse of Industrie 4.0 and participation in international standardization processes (through more than ten international collaborations) [38].

Slovenia. Republic of Slovenia develops its system of economy digitalization according to the Strategy for the digital transformation of the economy for 2021–2030 within the framework of the Recovery and Resilience Plan. The existing strategy is formed according to the processes of digitalization, informatization, and single digital market of the EU. Stimulation of the development of technologies such as artificial intelligence, the Internet of Things, and big data processing is expected. Implementation of this strategy will not only contribute to sustainable economic growth and competitiveness but will also enable the country to enter the top five countries in the Digital Economy and Society Index (DESI).

The Strategy for the digital transformation of the economy is one of the three key strategies of the state. A synergistic effect is expected from the interaction of the Strategy for the digital transformation of the economy, RISS – Research and Innovation Strategy of Slovenia and SIP – Slovenian Industrial Policy. The main expected result is a formation of an innovative society, based on knowledge. These strategies are united within the S4 framework – the Strategy of smart specialization, which is a platform for targeted investments in priority spheres.

The Strategy for the digital transformation of the economy implementation should provide solving of the following tasks:

a) implementation of advanced digital technologies, which are direct drivers of digital transformation;

b) building an effective ecosystem of a competitive economy;

c) development of an open and sustainable society as a basis for the growth of the digital economy.

In order to support business Digital Innovation Hub (DIH) [47] is operating in Slovenia. The Hub functioning is aimed at providing support for companies in

their digital transformation, especially for micro, small and medium enterprises, and governmental sector. The European Commission data shows that there are ten digital innovative centers in Slovenia. DIH in Slovenia was created as a response for diverse needs and opportunities and that is because is aimed at those sectors where the requirements of the external environment were the highest.

To operate effectively DIH has created a network of strategic partners, which include those from the specialization platform S4 Smart Factory Cluster, ICT Horizontal Network (SRIP PMiS), industry representatives (members of the smart factories, TECOS), academic institutions (University of Ljubljana, University of Maribor) as universities are the largest Slovenia's research organizations, support environment for SMEs (Association for Informatics and Telecommunications, Chamber of Commerce and Industry of Slovenia), Technology Park Ljubljana (connecting SMEs and several research institutes for innovation), Smart Factory Cluster, Wood Cluster, IIBA Slovenia and others.

In addition to that since 2021 Slovenian Digital Center has operated to implement and develop advanced technologies. Slovenian Digital Center is a central economic event of Slovenia's presidency of the Council of the EU. Slovenian Digital Center allows business to present innovative and technically advanced solutions, products and / or services. Some of the spheres presented in the Slovenian Digital Center include the following: digitalization, AI, Society 5.0, robotics, cybersecurity, innovative technologies, advanced mobile services, energetics solutions, smart cities and communities, sustainable development, etc.

Lithuania. The development of the digital economy system in Lithuania is implemented according to "Lithuanian Industry Digitisation Roadmap 2019–2030" [30]. In the Roadmap the initiatives that will allow to implement the most modern technologies have been developed. The digital economy transformation is designed to make local production more effective and competitive. It is assumed that the Industry Digitization Roadmap will work in sync with the adopted Smart Specialization Strategy, as well as the Science, Technology, and Innovation

Strategy.

Lithuania has created The State Information Resources Interoperability Platform [17]. This platform allows individuals and enterprises to get access to all available state and administrative e-services: “Birth of a child”, “Losing and finding a job”, “Starting a business”, “Taxes”, etc. The e-signature system is used for identification. Everyone benefits from the check of the signed with e-signature document (ADOC), as well as from the creation and signing of e-documents.

In general, the digital economy development policy of Lithuania is highly integrated in the system of the EU digital economy. Lithuania is an active participant of all EU programs in economy digitalization, in particular in the sphere of digital skills popularization among the population. The analysis of the state services market in 2019 shows that the Smart-ID application which is used for identification and signing state documents has become the most popular tool for signing documents. In 2019, Smart-ID occupied 56 % of the market among electronic signature qualification certificates. At the same time, the 2019–2030 Strategy provides for an increase in the share of users of state digital services.

Business is an active participant of economy digitalization. Several projects are launched in Lithuania for state and business interaction within state digital services providing. Digital industry also has opportunities to receive various grants and subsidies from both the state and the EU. “Digital-Lithuania. A Hub for Innovation” [11] is one of the examples. “Digital-Lithuania” exists as a cluster of Lithuanian IT-companies. Different IT-companies are the participants of the cluster, which work jointly on the popularization of the ICT sector of Lithuania. At the same time one of the cluster tasks is to provide support and assistance in formation of digital government and digital business for Lithuanian and international companies.

Universities and R&D centers are actively involved to the implementation of state and business initiatives in the sphere of digital economy development.

The existing system of economy digitalization has allowed Lithuania to

reach progress in the transformation of the country and transition to the post-industrial level. At the same time, some spheres (access to connection, Internet services use) still are below the EU average level. The development strategy has an ambitious goal – Lithuania's achievement of 7th place according to the DESI index in 2030 already.

Ukraine. In 2016 Ukraine adopted "Digital Agenda of Ukraine" [5] until 2020. It outlined the conceptual foundations of digital development, proposed development initiatives, and defined key goals to be implemented by 2020. Thus, it was expected to improve Ukraine's positions in three ratings based on global development indices, in the Networked Readiness Index rating, the Global Innovation Index rating, and the Global Competitiveness Index rating. However, despite the beginning of the transformation of economic sectors, the digitization of public services, and an increase in the level of access to the Internet, the changes were not enough for real qualitative growth of the country's digitalization. In 2020, the Ukrainian Institute for the Future developed a strategy for the development of the digital economy "Ukraine – 2030E". The strategy foresees several development scenarios and defines an algorithm of actions to achieve the set goals. Key KPI until 2030 are:

– 65,0 % – the share of the digital economy in Ukraine's GDP in 2030;

– 99,9 % of Ukrainian households have broadband Internet access;

– 100,0 % – 4G–5G coverage of the territory of Ukraine;

– 99,0 % of all highways and railways and 95 % of rural areas are covered by mobile Internet technologies;

– 99,9 % of citizens have digital identification (citizen-card, Mobile ID) and technical capabilities to use trust services, etc. [45].

It should be mentioned that Ukraine in 2020 on the national level has launched the project "Diya City" to create favorable conditions for innovative and technological business development. The project involves such spheres as AgroTech, Fintech та Blockchain, AI and cloud computing technologies, medical

neural networks and biotechnologies, IoT, Publishing and marketplaces, aviation and space technologies, drones, advertising, marketing and promotion, animation, graphics and audio, cybersports and business process outsourcing [14].

"Diya" [7] project is another step in technical evolution, which allows a person to receive any document with a single click using a smartphone or laptop, where a person has a personal electronic signature. "Digital State" (another name of the project) is part of the development of the country e-governance. All services provided by various government bodies should become available to citizens online. Information about a person, his / her health, level of income, place of residence, skills, etc. are combined into big data, part of which remains open, and the rest is securely stored and limited by access rights. The well-protected platform is located in a proven data center and meets global standards for protection against cyber threats, so a person can be sure of the safety of personal data. In this way, Ukrainians join the global information community.

Government plans to implement four levels of e-services:

1) information about the state;

2) communication with the state;

3) transactions with the state;

4) involvement in state administration.

Among the already implemented e-services in Ukraine, a number of quite useful services can be noted that have made life easier for citizens and businesses. Already now, Ukrainians have the opportunity to register a business online, get certificates and extracts from registers, apply for childbirth assistance, etc. Currently, there are a number of solutions that facilitate the process of conducting business.

One of the most wide-spread and popular applications is mobile application "Diya" [49], which is a part of the "State in smartphone" project of the Ministry of Digital Transformation of Ukraine. "Diya" is needed to provide Ukrainians an opportunity to receive state services in the online mode instead of waiting for

hours in the queues to the cabinets. We are talking about obtaining certificates, extracts and data from various state agencies and registers, submitting packages of documents for the initiation of various processes: starting or closing a business, applying for unemployment payments, etc. The task of "Diya" is to make the process of providing these services fast, transparent and save people from unnecessary bureaucracy.

Digitization of data reduces the workload of call centers and local administrations, which allows to reduce the costs of their maintenance. But the challenge on the way to the successful implementation of the project is insufficient Internet coverage and computer literacy. Only 5 % of people use online services. And among the age group of 60+ people, only 30 % use the Internet. However, this is not an obstacle for developers, they have already created educational courses. Elderly people in the villages, understanding the advantages of smartphones and the Internet, quickly learned to use them [7]. Life is impossible without progress, whether we like it or not.

According to the developers' opinion, "Digital State" must become a service which will allow to get services quickly and to do job honestly. Therefore, the Ukrainian government launched the "Digital State" project, which will eventually unite all departments into a single convenient and effective online system.

By 2024 the Ukrainian government aims to transfer 100 % of all public services to online mode, reducing by three times the number of interactions between citizens and businesses with the government and achieving a zero level of corruption in this sphere.

So, in today's world, the information sphere plays a big role. As a result, the adaptation of state processes to modern society becomes extremely important for the implementation of effective state policy. "State in smartphone" is not a fairy tale from the distant future and not another empty promise, the project is already on the way to its implementation.

Tajikistan. Tajikistan as a full subject of the world's economy is involved in

formation of information economy segments, particularly digital economy.

Tajikistan government has been working on transition to e-governance (information state) for more than 15 years. During this time conceptual and program documents on economy digitalization in the country have been adopted. Such documents first of all include Concept of formation of electronic government in the Republic of Tajikistan (2012–2020) and Decree of the President of the Republic of Tajikistan "On the state strategy of information and communication technology for the development of the Republic of Tajikistan".

In the UN E-Government Development Index Tajikistan is positioned on the 129th place [46]. The E-Government Development Index of the UN is one of the key indicators of the information society development level.

Tajikistan gradually works on the formation of electronic databases. Such databases should become basis for implementing electronic customs, digital documents for business and population. As an example of electronic digital systems formation Tajikistan uses experience of high-developed countries which have reached results in the sphere of e-governance: South Korea, Japan, Germany, Lithuania.

Implementation of plans on country's digital economy transformation requires adaptation of legislation to new needs. It is also important to ensure the development of communications, to create universal access to fiber optic infrastructure. That's why the issue of IT-sphere development must be under special control of government.

Telecommunications sector in Tajikistan is continuously improving, but the access to high-speed internet is still limited and expensive if to compare with other countries. In Tajikistan 40,1 % [9] of people use Internet on any devices. Kepios [32] analysis reflects that the quantity of internet users in Tajikistan has increased by 605 ths (18,1 %) between 2021 and 2022. Permanent access to internet in Tajikistan remains to be limited by large city regions, where residents pay one of the highest in the world price for internet services. The cost of the basic

subscription package is equivalent to 16 % of the average monthly income.

Due to the poorly developed access to the Internet and high prices only 60 % of the companies in Tajikistan use email for communication with their clients and less than 50 % of the companies have their own websites. Tajikistan needs more investments and government support to use fully the potential of digital technologies and the Internet for increasing business productivity and economy competitiveness as a whole.

Opportunities for e-commerce development in Tajikistan grow from year to year. Its development will allow national producers to discover new markets and to find new clients. Digital Tajikistan can become an important source of innovations, growth and employment in the region if the country will invest more in people's skills, entrepreneurial environment and will continue to enhance digital infrastructure.

Thus, the digitization of the economy is one of the important and complex civilizational challenges. The prospects for functioning and development, the country's competitiveness depend significantly on the effectiveness of its solution. Each of the studied partner countries has its own characteristics, its achievements, and obstacles, which provides an opportunity to determine the optimal ways of achieving results in the field of digitalization using the experience of other countries.

Questions for self-control:

1. What are the main tendencies of digitalization in the partner-countries?
2. What methods can be useful in the development of the digital economy?
3. What country is the most "digitalized" in your opinion? Why do you think so?

References:

1. Bashir, Raeesa & Gaur, Bhawna & Sharma, Bhoopesh. (2019), *An*

Analytical View of the Moderating Effect of Gender on Online Purchase Behavior. International Journal on Emerging Technologies, 11, pp. 324–328.

2. Bukht, R., Heeks, R. (2017), Defining, *Conceptualising and Measuring the Digital Economy*. Development Informatics Working Paper, No. 68, [Online], available at : https://ssrn.com/abstract=3431732 or http://dx.doi.org/10.2139/ssrn.3431732.

3. «Bundesregierung verabschiedet Blockchain-Strategie. Bundesministerium für Wirtschaft und Klimaschutz». [Online], available at : https://www.bmwk.de/Redaktion/DE/Pressemitteilungen/2019/20190918-bundesregierung-verabschiedet-blockchain-strategie.html.

4. «Network Readiness Index. Benchmarking the Future of the Network Economy», [Online], available at : https://networkreadinessindex.org/countries/.

5. «Cy'frova adzhenda Ukrayiny' – 2020 (Konceptual'ni zasady')», [Online], available at : https://ucci.org.ua/uploads/files/58e78ee3c3922.pdf.

6. «Data for Better Lives. A World Bank Group Flagship Report. 2021», [Online], available at : https://www.worldbank.org/en/publication/wdr2021.

7. Derzhavni posluhy onlain. Derzhavni posluhy onlain, [Online], available at : https://plan2.diia.gov.ua/.

8. «Digital 2022: Germany. DataReportal», [Online], available at : https://datareportal.com/reports/digital-2022-germany?rq=ger.

9. «Digital 2022: Tajikistan. DataReportal», [Online], available at : https://datareportal.com/reports/digital-2022-tajikistan.

10. «Digital Transformation of Industries. World Economic Forum», [Online], available at : https://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/dti-executive-summary-20180510.pdf.

11. «Digital-Lithuania. A Hub for Innovation», [Online], available at : https://digital-lithuania.eu/.

12. «Digitalagenda. Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz», [Online], available at :

https://www.bmuv.de/digitalagenda.

13. «Digitale Wirtschaft und Gesellschaft. Bundesministerium für Bildung und Forschung», [Online], available at : https://www.bmbf.de/bmbf/de/forschung/digitale-wirtschaft-und-gesellschaft/digitale-wirtschaft-und-gesellschaft_node.html.

14. «Diia.City», [Online], available at : https://city.diia.gov.ua/.

15. «eCommerce – Lithuania. Statista Market Forecast», [Online], available at : https://www.statista.com/outlook/dmo/ecommerce/lithuania.

16. «eCommerce – Slovenia. Statista Market Forecast», [Online], available at : https://www.statista.com/outlook/dmo/ecommerce/slovenia.

17. «Elektroniniai valdžios vartai», [Online], available at : https://www.epaslaugos.lt/portal/.

18. «Embracing Innovation in Government. Global Trend 2020», [Online], available at : https://trends.oecd-opsi.org/wp-content/uploads/2020/11/OECD-Seamless-Government.pdf.

19. EUR-Lex – 32021R0694, [Online], available at : https://eur-lex.europa.eu/eli/reg/2021/694/oj.

20. EUR-Lex – 52021DC0118, [Online], available at : https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52021DC0118.

21. «European Central Bank», [Online], available at : https://www.ecb.europa.eu/pub/pdf/other/ecb.spacereport202012~bb2038bbb6.en.pdf.

22. «European e-commerce turnover grew by 14,3 % to reach € 423,8 bn in 2014». Futurium. European Commission, [Online], available at : https://ec.europa.eu/futurium/en/content/european-e-commerce-turnover-grew-143-reach-eu-4238bn-2014.html.

23. «European Ecommerce Overview: Slovenia – E-commerce Germany News», [Online], available at: https://ecommercegermany.com/blog/european-ecommerce-overview-slovenia.

24. «FAS Project on Government Secrecy (1991–2021)», [Online], available at : https://sgp.fas.org/crs/misc/R44283.pdf.

25. «GAIA-X – Purpose of GAIA-X», [Online], available at : https://www.data-infrastructure.eu/GAIAX/Navigation/EN/Home/home.html.

26. «Germany – preferred payment methods», [Online], available at : https://www.ppro.com/countries/germany/.

27. «High-Tech Strategy 2025 – BMBF. Federal Ministry of Education and Research», [Online], available at : https://www.bmbf.de/bmbf/en/research/hightech-and-innovation/high-tech-strategy-2025/high-tech-strategy-2025.html.

28. The World Bank (2013), *Connecting to Work: How information and communication technologies could help expand employment opportunities*. Washington, DC.

29. «IKT-Strategie der Bundesregierung «Deutschland Digital 2015», [Online], available at : https://www.post-und-telekommunikation.de/PuT/1Fundus/Dokumente/5._Nationaler_IT-Gipfel_2010_Dresden/ikt-strategie-der-bundesregierung,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf.

30. «Industry 4.0 Conference 2022», [Online], available at: https://industrie40.lt/wp-content/uploads/2019/03/Lithuanian-Industry-Digitisation-Roadmap-2019-2030_final.pdf.

31. ITU Publications. *Committed to connecting the world*, [Online], available at : https://www.itu.int/epublications/publication/D-STR-GCI.01-2021-HTM-E.

32. «Kepios», [Online], available at : https://kepios.com/?utm_source=DataReportal&utm_medium=Country_Article_Hyperlink&utm_campaign=Digital_2022&utm_term=Tajikistan&utm_content=Kepios_Home_Link.

33. Manyika et al. (2013), *Open Data: Unlocking Innovation and Performance With Liquid Information*. McKinsey & Company, [Online], available at : http://www.mckinsey. com/insights/business

_technology/open_data_unlocking_innovation_and_performance_with_liquid_information.

34. «Most popular payment methods in Lithuania», [Online], available at: https://www.ppro.com/countries/lithuania/.

35. «OECD Legal Instruments», [Online], available at: https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0406.

36. «Open Data Barometer», [Online], available at: https://opendatabarometer.org/?_year=2017&indicator=ODB.

37. «Open Data for Development», [Online], available at : https://www.od4d.net/.

38. «Plattform Industrie 4.0 – Startseite», [Online], available at : https://www.plattform-i40.de/IP/Navigation/EN/Home/home.html.

39. «Research and development expenditure by country, around the world», TheGlobalEconomy.com, [Online], available at : https://www.theglobaleconomy.com/rankings/research_and_development.

40. Science diplomacy. *German Federal Foreign Office*, [Online], available at : https://www.auswaertiges-amt.de/en/aussenpolitik/themen/science-universities/2209874.

41. Soul Partners. *Ukraine's E-commerce Market Data*, [Online], available at : https://soulpartners.com.ua/news/tpost/x2dve03v71-rinok-elektronno-komerts-v-ukran-dosyagn.

42. «The Digital Economy and Society Index (DESI)», [Online], available at : https://digital-strategy.ec.europa.eu/en/policies/desi.

43. «The Impact of Broadband on the Economy: Research to Date and Policy Issues», [Online], available at : https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf.

44. «The UNCTAD B2C E-commerce Index 2020: Spotlight on Latin America and the Caribbean», [Online], available at : https://unctad.org/webflyer/unctad-b2c-e-commerce-index-2020-spotlight-latin-america-and-

caribbean.

45. «Ukrayina 2030E – krayina z rozvy'nutoyu cy'frovoyu ekonomikoyu», [Online], available at : https://strategy.uifuture.org/kraina-z-rozvinutoyu-cifrovoyu-ekonomikoyu.html.

46. «UN E-Government Knowledgebase», [Online], available at : https://publicadministration.un.org/egovkb/Data-Center.

47. «What is the Digital Innovation Hub of Slovenia (DIH Slovenia)?», [Online], available at : https://dihslovenia.si/en/about-us.

48. World Bank Group. *Access to High Speed Internet is Key to Job Creation and Social Inclusion in the Arab World*. World Bank, [Online], available at : https://www.worldbank.org/en/news/press-release/2014/02/06/access-to-high-speed-internet-key-to-job-creation-social-inclusion-arab-world.

49. «Zastosunok Diia», [Online], available at : https://go.diia.app/.

UDC 339.92:004

Kateryna POLUPANOVA, Head of the International Projects Department
Pryazovskyi State Technical University,
19, Dmytro Yavornytskyi Avenue, Dnipro, 49005, Ukraine
Tetiana BODNARCHUK, PhD in Economics, Associate Professor
Oksana LAVRUK, PhD in Economics, Associate Professor
Vadym CHAPLINSKYI, PhD in Economics
Kamianets-Podilskyi Ivan Ohiienko National University,
61, Ohiienko str., Kamianets-Podilskyi, 32301, Ukraine

Chapter 3
THE NEW MODEL OF DIGITAL SINGLE MARKET: THE EUROPEAN APPROACH

Content

3.1. European digital single market model: concepts, principles, and components

Nowadays, digital technology is an integral part of human life. The Internet, big data, e-commerce, artificial intelligence transform modern economies in the direction of innovative development and economic progress. European economy and society are characterized by a high level of digital transformation, although in general the region ranks second in the world, behind the United States.

Switzerland, Sweden, Denmark, the Netherlands and Finland are the leaders in the level of digitalization on the European continent. According to the Digital Competitiveness Index in 2021, high positions in the top ten countries were occupied by Sweden (3rd position), Denmark (4), Switzerland (6), the Netherlands (7), Norway (9). According to the Global Connectivity Index (2020), again, the most rated are Switzerland (3rd place after the United States and Singapore), Sweden (4), Denmark (5), Finland (6), the Netherlands (7), the United Kingdom (8), and Norway (10).

Each European country has a national digitalization strategy, which involves the deep penetration of digital processes into all socio-economic processes and includes the development of "smart cities", improving e-government and e-medicine, as well as social services, enhancing digital literacy of Europeans, harmonization "Green transition", etc. [1, p. 39]. At the same time, for more than a decade, the European Commission, as the EU's governing body, has been working to develop and implement a joint digital development strategy for the member states of the regional union, which aims to create an integrated digital single market. The EU's digitalization strategy aims to maximize the benefits of this process for people and businesses, ensure the digital sovereignty of countries, create a basis for systematic and sustainable economic growth of economies based on artificial intelligence, big data, innovative technologies and more. Until recently, both individuals and businesses in the EU were affected by a number of barriers to online tools and services usage: consumers had limited access to certain goods and services, businesses could not take full advantage of digitalization in business interaction, the regulation of this process was stopped by the government [2]. That is why the formation of the digital single market aims to open new opportunities by eliminating key differences between online and offline worlds, removing barriers to online cross-border activities.

According to one interpretation, the EU's digital single market is a policy document of the European Single Market, which includes such components as e-

commerce, digital marketing, electronic communications system [3]. According to another approach, the interpretation of the EU digital single market is much broader and considers this concept as a holistic economic concept of creating an open market environment where buying and selling goods and services, business communication and interaction are carried out using digital tools. The central category of this concept is information, as the typical online consumer is nothing more than a set of data used by various economic entities (government, enterprises) to improve their own efficiency. At the same time, the digital single market as a platform for business cooperation is based on such principles as:

– economic freedom;

– fair competition;

– high level of consumer protection;

– maintaining the personal data confidentiality.

Digital single market is one of the EU's greatest achievements. This program destroys the borders between countries, allowing free access to goods, services, capital [4, p. 50]. This, in turn, promotes economic growth and increases economic efficiency, improves the standard and quality of an average European's life. The construction of the EU digital single market model was carried out in stages:

1. In 2010 enaction of the socio-economic development strategy of Europe untill 2020 "Europe 2020", which provided for the implementation of several major initiatives, including the "Digital Agenda for Europe". It already contained the foundations for the formation of a digital single market, ensuring the compatibility of IT equipment and programs, strengthening the security of Internet users, increasing digital literacy, introduction of high-speed Internet, conducting joint research in IT and innovation [5, p. 183–184].

2. In 2015 approval and start of the EU Digital Single Market Strategy implementation under the leadership of the President of the European Commission Jean-Claude Juncker. A package of legislative initiatives was

formed, aimed at building of the digital economy capacity, scaling up digital communication, and facilitating access to the Internet.

3. In 2019 enaction of an expanded strategy for the development of the digital single market (until 2024) under the leadership of the new European Commission President Ursula von der Leyen. The priorities of this stage were the development of artificial intelligence systems, improvement of innovative technologies, environmental protection, deepening the level of digital integration of EU countries.

According to the plan of European countries digitalization [6], the creation of a digital single market involves achieving the following main goals:

– expansion of network and information communication, as well as cooperation between countries;

– creation of a single European digital zone and strengthening of the EU's digital sovereignty, which provides for a common and "smart" policy in the field of innovation, research, technology and big data;

– harmonization of institutional and legal bases for the creation of an integrated secure Internet environment and strengthening cyber resilience;

– increasing the level of computing power of digital technologies and equipment;

– development of a single European database (integrated cloud service);

– transforming the EU into a global center of digital added value;

– encouraging the wider use of artificial intelligence based on innovative (limited) regulation;

– further development and deepening of the new technologies usage in the economy and society.

The digital single market model is one of the European Commission's political priorities and covers three component "pillars":

1. "Access": increases the reach of the goods and services market for consumers and businesses by expanding cross-border e-commerce, breaking

down geographical borders and facilitating access to online content while strengthening consumer protection.

2. "Environment": provides for the creation of appropriate conditions for the digital platforms expansion, intensification of online trade in services (e-education, e-medicine, e-government), development of high-speed, secure and reliable digital infrastructure while strengthening cybersecurity, confidentiality and protection personal data, the fight against Internet fraud and abuse, etc.

3. "Economics and Society": maximizes the benefits of digital change to ensure macroeconomic growth, strengthen the competitiveness of countries in the international arena, the formation of the data economy, business intensification, increasement of the employment level, ensuring human development and social progress.

Each of these "pillars" of the EU digital single market model includes a wide range of goals and directions (Table 3.1).

***Table 3.1* – EU digital single market model**

No	Model's 'pillars'	Directions of implementation	Goals and future achievements
1	*2*	*3*	*4*
1.	Access	– openness of online markets for goods and services; – development of telecommunications; – scaling of e-commerce; – introduction of the "One Stop Shop" service; – cessation of unjustified geoblocking; – regulation of e-commerce; – efficiency and availability of goods delivery system; – start of the antitrust e-commerce competition; – modernization of the copyright system; – reassessment of the Satellite and Cable Directives	– simplification of product distribution and cross-border movement of goods; – reduction of administrative burden on business; – expanding access to information; – prosperity of cross-border economic cooperation; – ensuring the transparency of electronic business agreements and communications; – improvement of pricing policy, optimization of sales processes; – development of a fair and competitive consumer market; – reduction of violations in the field of creativity and culture, restriction of plagiarism; – improving access to cross-border distribution of TV and radio programs

Continuation of Table 3.1

1	*2*	*3*	*4*
2.	Environment	– development of the European Code of Electronic Communications; – development of 5th generation wireless technologies; – restructuring of audiovisual media; – expansion of digital platforms	– deepening the integration of the average European into digital systems; – increasing the intensity and speed of Internet connection; – expanding borders and penetrating European media; – increasing the level of transparency of online communications, reducing the illegal Internet content
3.	Economics and society	– address barriers in the European data economy; – improving the standards and compatibility of digital interaction; – creation of a digital society	– increasing confidence in the network economy and the data economy; – ensuring the free movement of non-personal data; – minimization of legal uncertainties of the data economy; – high standards and compatibility of digital markets in the field of education, medicine, and transport; – bridging the digital division and the problem of digital inclusion

Source: complied by the author.

Some positive changes are already visible today. For example, in the last 2–3 years, the share of mobile users in Europe has grown to 97–98 %, more than 80 % of the population has access to the Internet, and the same proportion of users make purchases online. In 2021, almost 88 % of the corporate sector and 78 % of EU households are actively using digital technologies [7, p. 13]. If we talk about the business sphere, then medium and large corporations are more "digitalized", among micro and small businesses the share of "figures" users is 40–45 % [8, p. 11].

At the same time, the implementation of the digital single market strategy is complicated by the need for significant investment. In particular, in the medium term, up to 50 billion € needs to be raised for the digitalization of industry alone, including 37 billion € for the development of digital innovation; 5,5 billion € for

national and regional investments in digital innovation hubs; 6,3 billion € to launch production of next-generation electronic components; 6,7 billion € for the implementation of the European initiative on cloud technologies [5, p. 187]. On the other hand, the full implementation of the EU's digital single market strategy, according to the European Commission, will ensure an annual GDP growth of 415 billion € and will create a number of new job places [3]. First of all, digitalization will lead to a number of positive structural and dynamic changes in high-tech areas.

In view of this, today the further implementation of the digital single market strategy can be seen as an important determinant of strengthening the competitiveness of the European Union in the geopolitical space, development of various spheres of both traditional and neoeconomics, intensification of international trade and economic cooperation, improving the standard and quality of life of the European population.

Questions for self-control:

1. Define the concept of a digital single market.
2. Indicate the principles which the EU digital single market is based on.
3. Identify the stages of building a digital single market in the EU.
4. Justify the main objectives of building a model of the digital single market, based on the European market.
5. What elements does the EU digital single market model include?
6. What does such an element of the digital single market model as "Access" provide?
7. Describe the block "Environment" by areas of implementation, goals and future achievements.
8. Explain the features of the EU digital single market model element "Economy and Society".

3.2. E-commerce in the EU digital single market system

One of the main trends in the development of information and network economy is e-commerce. In the narrow sense, these are any trade or financial transactions that are conducted through the Internet. However, in a broad sense, this concept should be understood not only online buying/selling, but also a number of other business transactions, including marketing and advertising (digital marketing), information exchange, business negotiations, internal management of companies and more. Today, e-commerce creates a number of benefits for both manufacturers and consumers (Table 3.2).

***Table 3.2* – Advantages of e-commerce for market participants**

No.	Manufacturer/seller	Consumer/buyer
1.	Reduction of transaction costs due to remote interaction and delivery of products [9, p. 77].	Expanding consumer choice: facilitating access to diversified product and service markets.
2.	Improving productivity and efficiency.	Reducing the cost of buying and selling.
3.	Leveling borders and the possibility of entering new markets.	Open access to information about prices, reviews, product characteristics.
4.	Ensuring gender equality in entrepreneurship.	Convenience and comfort of the operation of purchasing and receiving products.
5.	Facilitating the management of production processes [9, p. 78].	Openness of interaction with the manufacturer / seller.
6.	Ability to avoid trade intermediation and establish direct contacts with the consumer.	Transparency of the purchase / sale transaction.
7.	Favorable competitive conditions and convenience of marketing research [10]	Possibility of confidentiality of purchase.

Source: complied by the author.

At the same time, it is worth pointing out certain shortcomings of e-commerce for both manufacturers and consumers. In particular, entering international markets creates more risks for the buyer of losing competitiveness, significant costs of ensuring proper IT infrastructure, increasing the likelihood of infringement of intellectual property rights, uncertainty and complexity of financial reporting and more. As for the buyer, the negative aspects of e-commerce are the high probability of fraud, the risk of obtaining substandard products, the possibility of losing the confidentiality of personal data, the difficulty of returning

or exchanging products and more. However, today almost all developed countries are trying to actively integrate into the online business world and expand e-commerce. Today, the European Union is the leader in the level of e-commerce development.

The implementation of the EU's digital single market strategy involves the creation of a consolidated e-commerce environment. The main objectives of this initiative are:

– facilitating access of all participants in market relations to online business communication, online buying/selling processes of goods and services;

– intensification and scaling up of virtual trade activities both within the EU and abroad, including the promotion of further integration of the region into the global electronic business system;

– simplification and reduction of the cost of the e-commerce process, in particular with regard to the procedure of cross-border supply of products, payment of VAT for online sales;

– cessation of unjustified geoblocking;

– facilitating access to audiovisual services;

– updating legislation and strengthening the protection of the rights of online consumers;

– improving the system of legal regulation of e-commerce, in particular, the adoption of the law on digital services.

Over the last decade, EU countries have tried to create favorable conditions for the development of e-commerce (non-discrimination, technological neutrality, the right to sign virtual agreements, electronic functional equivalents). At the same time, one of the main problems today is the lack of trust of both individuals and businesses in this area. The solution to this aspect is facilitated by the continuous improvement of the system of state and supranational regulation of online trade on the basis of international norms and the development of purely European standards. The EU's e-commerce guide is guided by the UNCITRAL

Model Law on Electronic Commerce, the UNCITRAL Model Law on Electronic Signatures, and various European directives, including e-commerce, electronic signature, consumer protection, personal data protection, payment services, e-invoicing, etc.

For example, the e-Commerce Directive (Directive 2000/31/EU of the European Parliament and of the Council dated June 8, 2000 on certain legal aspects of information services, including e-commerce, in the internal market) regulates a number of basic aspects, including: freedom and non-discrimination in the provision of information services, protection of data exchange and prevention of the spread of "garbage" information, the correctness of electronic contracts, liability for Internet fraud, dispute resolution, etc. [11, p. 20]. An act of e-commerce is the sale of goods or the provision of services or other interference in the circulation of goods for profit. The operation is carried out not only with the participation of the seller or buyer, but also other parties, including government agencies, NGOs, transport and logistics companies, post offices, banks, marketing and advertising agencies, IT companies, outsourcing companies. In general, the main subjects of directive regulation of e-commerce are the consumer and the seller, and the objects – the product itself, commercial transactions, payment and transport transactions (Table 3.3).

Table 3.3 **– The E-commerce components**

No.	Components	Definition in terms of e-commerce
1.	Product/service	Tangible/intangible good or service that the consumer orders from the merchant.
2.	Consumer	This is, whether we are talking about a natural or legal person, a person behind the screen of a computer, tablet or phone who checks the existence of the desired product or service on the merchant's website and places the order to the merchant.
3.	Merchant	This is, whether we are talking about an individual or a legal entity, a person or a group of people behind a computer screen, who manage the internal systems of the trader in order to deliver the good or service to the consumer.
4.	Payment systems	These are the systems used by the consumer to pay the merchant the value of the good or service purchased.
5.	Delivery	Service performed by the delivery service provider, which ensures the transport and delivery of goods purchased by consumers.

Source: [12].

One way to increase consumer confidence in online commerce and reduce potential risks is to enter into appropriate legal agreements. European law distinguishes between two types of such agreements: electronic agreement and remote contract. An electronic agreement is defined as an agreement to buy/sell online or provide online services through a website or other electronic means [12]. A distance contract is a broader concept and includes, in addition to an electronic contract, agreements concluded by means of distance communication.

To make an agreement in a proper way market participants should provide relevant information, namely: the full name and location of the seller's party; contacts; license information (if any); terms of operation (cost of goods and delivery, volume/quantity, terms of delivery, etc.) [13]. In addition, the electronic agreement must be supported by an electronic signature. The EU Directive on Electronic Signatures (Regulation 910/2014 of the European Parliament and of the Council from July 23, 2014 on electronic identification and authentication services for electronic transactions in the internal market) sets out the procedure for verifying the authenticity of concluded agreements. In particular, the EU has such types of signatures as electronic, advanced electronic and qualified electronic. And at the same time, only the latter has the same legal force as the handwritten signature [11, p. 20].

As mentioned above, one of the restraining factors in the development of e-commerce in the EU is the lack of public confidence. And this is not surprising, because today 50–60 % of European sites to a greater or lesser extent violate consumer rights. Major violations include false discounts, the difference between the bid and the final price, the lack of proper information on additional fees for delivery, payment, booking, lack of reference to the online dispute resolution platform (ODR), which is mandatory according to the EU law. In order to increase public confidence in e-commerce, the EU leadership is improving consumer protection mechanisms by improving information provision, consultation, consumer advocacy, cooperation between authorities and organizations

responsible for consumer law enforcement, information, education and conflict resolution related to consumer complaints, systemic market surveillance, policy regulation of purchase/sale transactions. In particular, in the field of consumer protection, European legislation includes directives on consumer protection when concluding contracts outside retail premises and offices, on unfair terms in contracts with consumers, on consumer protection in distance contracts, on consumer protection when establishing prices for goods offered to consumers (for setting prices), on some aspects of the sale of consumer goods and related guarantees.

European rules make it easier for member states to protect consumers online. For example, these policies allow you to delete sites or social media accounts where fraud has been detected; allow you to request information from Internet service providers or banks to track the identity of fraudulent online traders; determine the concept of the promotional price or sale and the procedure for its application (notification one month before the sale at the promotional price, limitation of the sale period from one day to one month); oblige Internet markets to inform consumers about their legal status (legal entity or sole proprietor); disclose the terms of concluding, terminating commercial contracts and resolving disputes, payment for purchase, return or exchange. From a legal point of view, the same goods are sold and bought online as through traditional channels (except for digital products), and therefore all aspects of such transactions fall under the relevant national and supranational consumer legislation.

The EU countries are cooperating to promote e-commerce in the following areas:

1. Simplification of the VAT payment system: currently cross-border sellers who fall into the category of payers have to pay VAT in the country of residence of the buyer, and they are obliged to register their company for VAT payment either in the customer's country or in the system "single window".

2. Cheaper cross-border delivery of orders: in the EU countries, prices for

delivery of products abroad are on average 3–5 times higher than prices for delivery within the country. In order to solve this problem, restrictions on delivery prices have been lifted, but companies must clearly indicate the price of the product so that the consumer can compare its full cost (with delivery). Consumers can find prices for parcel delivery on a special website on the European Commission's website [14]. At the same time, in the EU there are special bodies to monitor the cost of delivery of certain companies.

3. Unification of legislation on digital services: aimed at adopting a single Law on Digital Services, which will increase the security of digital space, provide equal access for business, more effectively protect consumers on the Internet, create a strong system of transparency and accountability for online platforms, will stimulate innovation and the expansion of the single market.

As in other regions of the world, in the European countries, e-commerce is implemented by various business models, namely: Business to Customer, Business to Business, Customer to Customer, Customer to Business, Business to Administration, Customer to Administration (Table 3.4).

***Table 3.4* – Models of e-commerce implementation**

No.	Model type	Main features	Examples
1	*2*	*3*	*4*
1.	Business to Customer (B2C)	– transactions between a business and a consumer; – selling the products by the use of online marketplaces and stores; – two types: direct sellers and online-intermediaries	Etsy, IKEA, Carrefour
2.	Business to Business (B2B)	– sales between businesses, such as a manufacturer and a wholesaler or retailer; – is not consumer-facing and happens only between business entities; – focus on raw materials or products that are repackaged or combined before being sold to customers	BigCommerce Enterprise, Shopify, OroCommerce
3.	Customer to Customer (C2C)	– customers sell goods or services to each other by means of some sites; – allow customers to trade, buy, and sell items in exchange for a small commission paid to the site	Ebay, Olx, Zibbet

Continuation of Table 3.4

1	*2*	*3*	*4*
4.	Customer to Business (C2B)	– consumers sell goods or services to businesses; – business pays for the right to use customers' products	Google AdSense, Shutterstock, Upwork
5.	Business to Administration (B2A)	– a business provides an online service for the government, generally through a website	Accela, OpenGov, TurboTax
6.	Customer to Administration (C2A)	– a consumer is providing something for the government	Electronic taxes, distance learning, e-health, online surveys

Source: complied by the author.

Over the last few years, the development of e-commerce in Europe has undergone significant dynamic changes, which has contributed to the introduction of a common digital policy. The COVID pandemic also had a positive impact on this area. For example, in the United States, the share of e-commerce in total trade in the "pre-COVID" period was 11 %, at the peak of the pandemic – 22 %, and today – 17 %; in the UK, the figure was 22 %, 31 % and 24 % respectively; in Germany – 9 %, 14% and 10%, in France – 9 %, 18 % and 11 % [15].

The most positive changes are observed in the EU countries. In particular, as of 2020, the largest share in the structure of European e-turnover fell on Western Europe, this region shows leadership in other indicators (Table 3.5).

***Table 3.5* – The share of e-commerce in the economy of the European region (data from 2020), %**

Region	The percent of e-commerce in trade	The percent of online GDP in general GDP	The percent of Internet users to the population	The percent of e-shoppers to the number of e-users
Western Europe	64,0	5,2	95,0	86,0
Northern Europe	6,0	3,5	96,0	82,0
Central Europe	8,0	3,0	88,0	75,0
Southern Europe	16,0	3,7	85,0	60,0
Eastern Europe	6,0	2,5	77,0	41,0

Source: complied by the author based on [16].

The growth rates of e-commerce in the B2C segment were dominated by EU countries, namely Greece (77 %), Switzerland (37 %), Sweden (36 %), Hungary

(35 %), Poland (34 %). In terms of the share of online GDP, in terms of countries, the highest rates were shown by the United Kingdom (9,9 %), Denmark (7,3 %), Estonia (6,8 %), Greece (6,6 %), the Czech Republic (5,7 %), Spain (5,6 %). Among some European countries, the share of online shoppers to the total number of Internet users in 2020 was led by the United Kingdom (92 %), the Netherlands (91 %), Denmark and Switzerland (90 % each), Germany and Norway (87 % each) [16]. At the same time, it is mainly dominated by users who make online purchases 1–2 times a month (Table 3.6).

***Table 3.6* – Frequency of e-purchases in the EU and the UK for three months in 2020, %**

Country	1–2 times	3–5 times	6 times and more
Austria	15	23	23
Belgium	28	24	8
Bulgaria	13	7	2
Greece	19	15	15
Dania	22	27	26
Estonia	19	22	22
Ireland	18	17	26
Spain	24	17	16
Italy	16	11	6
Cyprus	7	13	14
Latvia	21	13	9
Lithuania	20	18	11
Luxembourg	19	24	27
Malta	15	21	27
Netherlands	25	28	29
Germany	19	28	32
Poland	18	21	16
Portugal	14	16	14
Romania	14	10	2
Slovakia	22	18	12
Slovenia	30	18	11
Hungary	25	19	13
Finland	20	25	16
France	18	25	22
Croatia	14	19	19
Czech Republic	20	26	20
Sweden	20	29	25
UK	13	25	47

Source: [16].

Generally, in the EU the frequency of online purchases 1–2 times was 20 %, 3–5 times – 21 %, 6 or more times – 18 %. Regarding the geographical structure of online shopping, in the EU 90 % were purchases in national online stores, 30 % – in stores in other EU countries, 21 % – on the websites of sellers from other countries (outside the EU). Analysis of the product structure of online shopping shows that, mainly, Internet users in the EU for three months of 2020 ordered clothing (63 %), film products (31 %), furniture, household goods and gardening (29 %), restaurant food and catering (28 %), printed books, magazines, newspapers (27 %), computers, telephones and accessories (26 %), cosmetics, beauty products (26 %), music (25 %), medical and medicines (23 %), sports goods (21 %) [16]. In 2020–2021, mostly European e-shoppers bought products through Internet sites, less often – mobile applications. The use of social media in e-commerce is also active, among which Facebook, Instagram, Twitter, and Pinterest are in the greatest demand. For means of remote communication, online purchases using a mobile phone (90 % of orders), e-mail (74 %), company contact form (66 %), chat (47 %), fax (8 %) [16].

Credit and debit cards, bank transfer, and e-wallet dominate among the payment mechanisms used by the average EU citizen, an active user of online commerce (Table 3.7).

***Table 3.7* – Payment methods in selected European countries (2021), %**

Country	Credit card	Debit card	Bank transfer	E-wallet	Cash-on-Delivery	Prepaid card	Prepay	Other	E-invoices	Invoice
Ireland	87	–	–	8	–	–	–	4	–	–
Italy	33	9	9	18	11	12	5	2	–	–
Belgium	31	24	17	17	6	2	2	1	–	–
Finland	31	31	30	12	–	–	–	4	–	23
Spain	23	24	9	21	12	7	3	2	–	–
France	18	30	13	23	4	4	6	2	–	–
The UK	16	41	4	22	9	2	3	3	–	–
Germany	15	6	40	19	6	3	–	7	3	–
Sweden	14	41	16	7	5	1	–	2	15	–
Denmark	8	25	25	22	10	2	–	3	4	–
Netherlands	7	5	69	6	6	2	3	3	–	–

Source: [14].

Along with citizens, European business is actively integrating into the field of e-commerce. Enterprises create their own websites and mobile applications for the sale of products, actively use artificial intelligence systems and IT technologies for internal management, production and commercial activities (Table 3.8).

Table 3.8 **– European business activity in the field of e-commerce (according to 2020), %**

Type of integration into the field of e-commerce	Companies with up to 249 employees	Companies with more than 250 employees
Online sales companies through their own websites	20	43
Companies selling through mobile applications, e-platforms	17	28
Companies that use IT for data processing	2	11
Robotic companies	2	11
Companies with chat services	2	6
Companies with elements of artificial intelligence	6	17

Source: [16].

Thus, one of the main directions of the digital single market in Europe is to increase the intensity and concentration of e-commerce. Today, a comprehensive regulatory, legal, institutional, economic foundation has been formed for the digital integration of EU countries, active involvement in the field of e-commerce, both citizens and businesses. The single European digital policy is aimed at facilitating access to the e-commerce environment, intensifying cross-border supply, improving the system of consumer and personal data protection, improving information security, further innovation and IT development. Prospects for the development of e-commerce in Europe include strengthening the role of commerce through mobile applications, expanding the online payment system, expanding purchases on social networks, hyper-personalization of e-commerce and more. The importance of e-commerce as well as the digitalization process in general is due to the positive impact on the economy and the creation of conditions for sustainable development.

Questions for self-control:

1. What is e-commerce?
2. Indicate the advantages and disadvantages of e-commerce for market participants.
3. What are the main goals of e-commerce in building a model of the EU digital single market?
4. What are the components of e-commerce?
5. Identify the main regulations governing e-commerce in the EU.
6. What are the most common violations in the field of e-commerce?
7. Justify the directions of cooperation between EU countries to improve the mechanism of e-commerce.
8. What are the e-commerce business models? Describe them and give examples.
9. Analyze the trends of e-commerce in the EU on the basis of the statistics above.
10. Justify the promising areas of e-commerce in the EU.

3.3. Digital transformation of the economy and the European labor market

The world is undergoing great changes that radically change the functioning of the economy, and along with it many areas of human life. Continuous technological development is an important condition for companies to maintain their competitive advantage. Throughout history, representatives of various industries have always sought to meet the changing needs of consumers, which made inevitable continuous technological development. However, the most significant breakthrough in technology and the labor market occurred during the third and fourth industrial revolutions, when computer-controlled automation was

replaced by digital transformation, when devices communicate autonomously along the value chain [17–19].

The digitalization process has created opportunities for new products, technologies and processes, taking the form of new challenges for employers and employees. Digital technologies and services are changing the rules of employment and the requirements of competencies and knowledge. Job transformation requires different skills requirements, leading to widening skills gaps and labor market mismatches. Under the influence of digitalization and globalization, the labor market expands the scope of employment, requires constant updating of knowledge and competences, high willingness to adapt to new conditions and the formation of new regulatory mechanisms of a new type of social and labor relations.

Studies show that continuous progress in digital and robotic technologies will eventually lead to the death of non-automated labor [18–19]. An analysis by the McKinsey Global Institute estimates that by 2030, at least one-third of occupations can be automated in 60 % of jobs. In addition, predictions for job places automation by 2040 are as follows: half of existing jobs in the United States and the United Kingdom, two-thirds of jobs in India and three-quarters of jobs in China may disappear.

Despite this dangerous perspective, automation and digitalization processes are accompanied by some specific qualities, such as relieving people of repetitive tasks, providing 24/7 accessibility, convenient and useful, eliminating risky work in dangerous situations, eliminating workflow inefficiencies and saving resources and increase productivity. At present, all this is the basis for further economic growth.

The current political agenda of the EU is based on the paradigm of the Fourth Industrial Revolution (national programs “Industry 4.0”, “Employment 4.0”, etc.), digitalization, the knowledge society and social inclusion. At the same time, EU policy is clearly focused on “human-centered” approaches developed by the

Global Commission on the Future of Labor, which provide for increased investment in the development of human skills and labor institutions, in decent and stable employment [21].

The meaning of the Fourth Industrial Revolution is complex automation and robotization of production, cyberphysical systems, biotechnology, 3D printing, alternative energy, artificial intelligence, network economy, augmented reality, circular economy, Internet of Things, blockchain technology, cloud computing, quantum technology. The use of such technologies has led to the digitalization of the real sector of the economy, changes in traditional business models, and increased employment on platforms. As a result, social and labor relations are being modernized in global and national societies, remote employment is spreading, "digital jobs" are being created, and a new category of labor market actors is emerging: the so-called "smart workers".

The peculiarity of labor usage is flexibility, mobility, rapid updating of knowledge, change of subject-object relations of management, the development of creative self-realization in labor processes. According to some estimates, the share of the global information economy, including digital skills and digital capital, is 22,5 % of the global economy [23]. This poses serious challenges for all countries in the world without exception and is likely to lead to the degradation of inefficient, non-innovative economies that will not be able to meet these challenges. Therefore, national economies are faced with the need to ensure their own competitiveness and innovation, the ability to respond to the latest challenges of digitalization, to identify opportunities for transition to new technological systems.

The tendency to use the latest technologies in most sectors of the economy creates a transformation of all activities, including in the field of labor [24–26]. Automation, artificial intelligence and digitalization have far-reaching implications for the labor market [27]. All these processes lead to the creation of more goods and services with fewer jobs and higher productivity. However, the

same processes can lead to the risk of technological unemployment or lower wages. At the same time, new technologies create “new employment opportunities in various industries and in emerging markets” [28].

Some researchers point out that in addition to the positive, well-known effects, new technologies and digitalization can increase inequality, increase job insecurity and threaten the availability of adequate employment opportunities [29].

Recent researches suggest that digital technology will reduce labor activity in the future [30]. However, the generally accepted view of the impact of digitalization on the labor market has not yet been reached. Thus, researches suggest that even with the automation of routine activities, it would be possible to maintain a long-term balance in the market, creating a large number of new jobs. In recent years, there has been a trend where more than 60 % of jobs in developing countries are being automated [31]. Therefore, understanding the relationship between digitalization, job loss and unemployment is becoming more important, as digitalization is positively correlated with the level of economic development.

The impact of digitalization on the labor market can also be considered in terms of recruitment. Researches show that recruitment and selection methods will be much more sophisticated, as sophisticated digital tools already exist for selecting and testing candidates, for team building, and for feedback [32]. Such a platform, used in a virtual environment, can significantly reduce the cost for small businesses that need specialized assistance, such as accounting or marketing assistance when launching a product. Moreover, digitalization is changing personnel strategies. Instead of the traditional training and development of staff within the company’s organization, qualified specialists are now being recruited. Such a change in strategy does not require organizations to pay attention to the training of professional skills, which involves saving time and direct employment of those who already have the necessary skills and competencies [33]. In addition, new technologies and digitalization will affect the autonomy and redistribution of

powers between professional groups [32], with implications for privacy and the ability to counter electronic monitoring and intrusive surveillance systems.

Digitalization has also changed the trajectory of job evolution in the public sector. In recent decades, developed countries have used digital technology as an advantage to provide public services and to restructure the public sector [34]. Digitalization also has a significant impact on all activities: education, tourism and services, the automotive industry, the transport system, which promotes innovation and productivity. Thus, the way of performing tasks specific to various works in the system of transport services in other areas has changed, as the use of the Internet involves increasing the speed and volume of information processing, facilitates statistical accounting (e.g., online taxis). In addition, the ability to collect data in real time allows you to analyze information quickly and facilitates management decisions.

Digitalization affects the demand for various Soft Skills, such as teamwork, communication skills and problem-solving skills [35]. According to a report by the World Economic Forum, a serious problem arises in this context: who will pay for retraining and how flexible skills for critical thinking and analysis, active learning, resilience, stress and flexibility will be developed [36].

The COVID-19 pandemic has significantly accelerated online work in many areas, and this fact itself has significantly changed the parameters of the labor market. The current context shows that any major changes quickly lead to a systematic rethinking of the entire labor market.

In the current pandemic crisis, digital knowledge has become important for both workers and businesses. Companies and organizations had to quickly create e-commerce websites, develop programs and platforms, transfer saturate document storage on cloud storage servers and make it faster and more accessible. However, the success of these operations largely depended on the level of digital skills of their employees.

At present, the functioning of the global and national economies must

achieve balance and coherence based on the paradigms of digital, sustainable security. And in the context of the COVID-19 pandemic, this request is of particular importance and requires appropriate research in the methodological, strategic and tactical areas. The key principle of counteracting the negative consequences of the COVID-19 pandemic, in particular in the field of labor and employment, is the principle of "Build Back Better", without returning to the level they were before the COVID-19 crisis [37]. It has been established that digitalization processes directly affect the change of forms of employment and the range of professions in the labor market, for example, the spread of employment through online platforms, on demand through mobile applications and more.

The French Conseil d'Orientation pour l'Emploi (COE) states that at least 10 % of jobs in France are at risk due to digitalization, while half of the existing jobs are likely to change in terms of content and organization [38]. It has been widely demonstrated that manufacturers more often sell services in addition to their products to compete in increasingly tough global markets.

At the same time, the spread of digital technologies is displacing workers in some tasks or creating completely new jobs, transforming existing professions and industries. There is a wider use of networking and freelance platforms, as well as remote applications: Etsy allows millions of handmade manufacturers to sell their products to a global customer base, Uber allows individuals to provide transportation services and Airbnb – to provide accommodation services to homeowners. More advanced services also support digital technology: the Upwork online marketplace, for example, brings together about nine million freelancers in areas such as mobile development and software, with more than 3,6 million companies to perform individual tasks or assignments. Undoubtedly, the digital economy gives employees the opportunity to either completely switch to new ways of performing their professional duties, or to supplement the income from more traditional activities.

Technological progress also leads to the creation of new jobs (Table 3.9).

***Table 3.9* – Examples of new professions and new skills in the 21st century**

Profession	Description	Needed skills
Robotics engineers	Research, design, development or testing of robotic programs.	Critical thinking. Comprehensive problem solving. Quality control analysis.
Biostatistics	Development and application of bio statistical theory and methods for the study of life sciences.	Inductive thinking. Oral statement. Mathematical thinking.
Chief specialists in sustainable development	Communication and coordination with management, shareholders, customers and employees to address sustainability issues. Implementation or control of the corporate sustainability strategy.	Comprehensive problem solving. HR. Service orientation.
Engineers with nanosystems	Design, development or control of production of materials, devices or systems of unique molecular or macromolecular composition, applying the principles of nanoscale physics and electrical, chemical or biological engineering	Critical thinking. Science.
Videogames designers	The main features of video game design. Innovative game and role mechanics, storylines and biographies of characters. Creating and maintaining project documentation. Collaboration with production staff to create games by design.	Programming. Critical thinking. Comprehensive problem solving.
Wind energy engineers	Design of systems of underground or aboveground collectors of wind power plants. Preparation and development of site specifications.	Active learning. Comprehensive problem solving. System analysis.

Source: [38].

Table 3.9 provides examples of new occupations in the Professional Information Network (O*NET), which maintains an updated database of new jobs emerging in fast-growing sectors of the economy. Importantly, many of these professions are directly related to the emergence of new technologies, including distance learning coordinators, nanosystem engineers, and wind energy engineers.

Also, digitalization causes a change of place of work, i.e. the performance of duties by individual employees does not require a permanent stay at work, creating opportunities for permanent stay of the employee online, for a flexible work schedule. The concept of the workplace is changing. So, digital workplaces

can be email, instant messaging, corporate social networking, virtual meeting tools, and more. At the same time, the requirements for technical equipment of workplaces are growing.

The digital workplace needs access devices (smartphones, tablets), communication, telecommunications in the workplace, including audio, video and web conferencing.

Fig. 3.1 highlights the flexibility that digitalization brings in terms of where, how and what activities are performed. This can have benefits for both employers and employees in terms of increased autonomy and productivity, improved work-life balance, and reduced costs. Flexibility also requires and can lead to new types of management and skills.

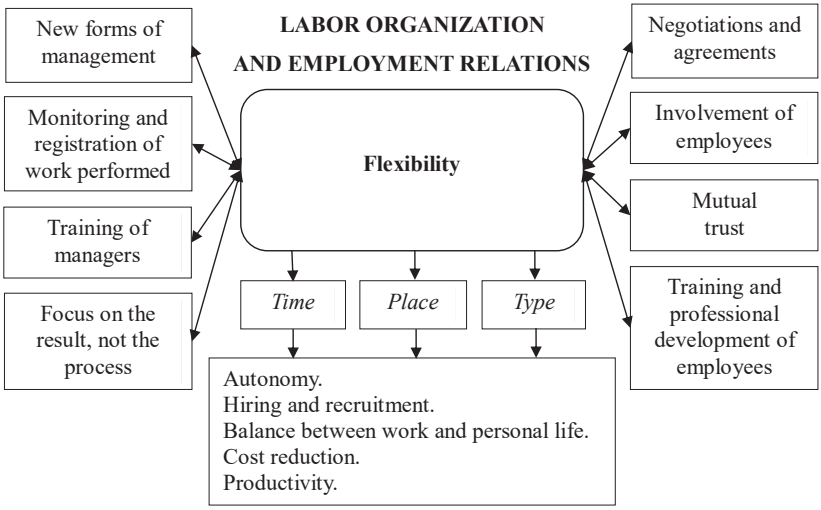


Fig. 3.1 – The structure of the impact of digitalization on work [26]

The introduction of digital technologies has created a new demand for digital skills, covering a wide range of abilities and competencies – from access to interfaces and basic manipulation of spreadsheets to advanced analytics and programming.

The last decade has advanced digital technology and digitalization to more sectors of the economy, not only in Europe but around the world. Competency

and job surveys in Europe show that 43 % of EU workers have been involved in changing and/or replacing the technologies they have used in the workplace over the last five years. At the same time, 47 % of EU workers mentioned changes in current work patterns and processes, and more than half of workers in Ireland, Malta, Slovenia, Finland, Sweden and the UK said they were affected by digital changes in the work environment [39]. These changes have occurred, for example, in how products and services (product/service innovations) are made and how they interact with customers.

However, most of the changes in digitalization have taken place in the information and communication technology sector (in particular, 57 % of jobs have been affected by digital technologies). About a quarter of EU workers believe that their skills and use at work are unlikely to be relevant in the next five years. In addition, the share of workers in this situation varies depending on the sector of the economy in which they work: 29 % in the information and communication technology sector, 24 % in the financial and insurance sectors and 23 % in the professional, scientific and technical services sector. According to the same study, about 10 % of jobs in the EU are at very high risk of becoming obsolete due to digital skills of workers. The most affected EU countries are Estonia (23 %), Slovenia (21 %) and the Czech Republic (19 %) [39].

According to experts, structural changes in the labor market in Europe are closely linked to the very high demand for advanced digital skills in the coming years. There is a strong correlation between the projected number of jobs that will increase over the next ten years and the need for advanced digital skills to be applied. For example, 71 % of EU staff say they need basic and intermediate digital skills to do their job, and 14 % say they need advanced digital skills in the workplace. It has been found that more than 80 % of the EU workforce, including Denmark, Ireland and Sweden, requires basic digital skills to work, while in Greece, Cyprus and Romania this percentage is 60 % [39].

It is investigated that there are still differences in digital skills between EU

member states. Thus, in 2017, the share of the population with digital skills above the base level was in Luxembourg (55 %), the Netherlands (48 %), Denmark (47 %), Sweden and the United Kingdom (46 % each) and Finland (45 %). Most EU citizens are positive about digital technologies and their impact on the economy (75 %), quality of life (67 %) and society (65 %). Countries that believe that digital technologies have a very positive impact on the economy are Malta (40 %), Lithuania (30 %), Germany, the Czech Republic, Slovenia, Cyprus (29 % in each country) and Bulgaria (28 %). It is noted that citizens with a higher level of education are more positive about the impact of digital technologies [40].

It is clear that digital skills are at the top of European politicians' agendas. In the "New Skills Agenda for Europe", the European Commission highlighted the steps that need to be taken to develop digital skills in Europe. Another important recent proposal is the Digital Skills and Jobs Coalition initiative, which aims to support people in career choices and training, improve skills forecasting, analyze skills needs and implement digital skills at all levels of education (in collaboration with a number of stakeholders, including national governments, social partners and educational institutions).

Over the last 10 years, the EU has launched a series of programs and policy initiatives aimed at stimulating the digitalization of economic, only to realize that the labor market lacks digital skills and competences. According to the European Commission, 44 % of Europeans do not have basic digital skills, 37 % of the workforce – farmers, bankers and factory workers – also do not have enough digital skills, despite the growing need for such skills in all jobs [39]. Accordingly, the European Commission has issued a number of policy documents, programs and actions aimed at improving the digital skills of the workforce.

In 2018, the Coalition of Digital Skills and Jobs launched the following initiatives:

1. The Digital Opportunity Internship Scheme is a pilot project under Horizon 2020 and Erasmus+ that provides students and recent graduates with

practical training in digital areas such as cybersecurity, artificial intelligence, coding or digital marketing.

2. The European Digital Skills Awards will celebrate initiatives that have improved the digital skills of Europeans at school, at work, for ICT professionals, for vulnerable groups and society at large. Thus, in the last decade, the digitalization of the economy has become a global trend, and even more significant over the past five years. Digitalization has changed the structure of the labor market, affecting employment and income distribution. In the coming years, digital literacy will become more widespread as information and communication technologies continue to transform the activities of European firms. Therefore, over the last decade, the European Union has launched many programs and initiatives to encourage people to acquire the digital skills needed for both social and professional life.

Questions for self-control:

1. How has digitalization changed the structure of the labor market?
2. Indicate the positive and negative effects of the digital revolution on European labor market.
3. Name the new forms of non-standard work, formed in the XXI century under the impact of active development of innovation processes and transformation economy.
4. How digital technologies and services are changing employment rules and competency and knowledge requirements?
5. List examples of new professions and new skills in the 21st century.
6. Give examples of the formation of a new demand for digital skills employees as a result of the digital technologies introduction.
7. What are the differences in digital skills between EU Member States still exist?

3.4. Integration of Ukraine into the European digital single market

In the conditions of formation and development of the post-industrial economic system, the issues of digitalization and a number of other information and digital processes acquire new significance for the national policy of economic development of Ukraine. The development of digital technologies is a fairly broad process and concerns many areas of modern life – from education and jobs to the social security system and the impact on public administration. Digital tools ensure transparency of power and reduce the impact of the human factor, promote economic growth, production and exports, by increasing the productivity of existing industries and creating fundamentally new areas of the digital economy with increased added value. Digitization also simplifies the conditions for business development, attracts investment and provides greater opportunities to meet the interests and protect the rights of consumers.

The EU Digital Single Market Strategy was proposed by the European Commission in 2015 in order to achieve synergies between EU countries in the field of new technologies, cross-border trade and the provision of services within the Digital Single Market. The strategy aims to enable Europe's economy, industry and society to reap the full benefits of the new digital age.

In autumn 2018, the Government of Ukraine prepared a Strategy for Ukraine's integration into the EU ECR ("road map") and an action plan for its implementation during 2018–2023, taking into account new EU acts. On October 4, 2019, the Verkhovna Rada of Ukraine approved the Program of Activities of the Cabinet of Ministers of Ukraine, the goals of which are to join the EU digital space and meet the criteria for membership in the European Union. At the level of the state apparatus, total digitalization of management and information exchange processes is planned. On October 6, 2020, the Ukrainian government identified a key sectoral vector of EU integration, noting the digital market as the most important and of high priority.

Ukraine's digital market is relatively new and requires a clear state regulatory policy on the activities of entities and facilities. The synthesis of the formation of a new digital market with an integration process allows Ukraine to implement the latest EU standards in the field of electronic communications immediately, which will provide many benefits when entering international markets, as it comprehensively provides mutual access to online markets and digital services, including Ukraine's accession to common rules, standards and procedures with the EU in the digital sphere.

It should be noted that this integration creates a complex effect, as it is also an essential tool for deepening the overall economic integration into the EU market.

Due to the standardization of the Ukrainian digital market to EU requirements and the creation of the Digital Single Market (DSM) we will get a ban on unjustified geoblocking practices, abolition of roaming charges, guarantees of net neutrality, cross-border parcel delivery, electronic identification and electronic trust services for electronic transactions, data and cybersecurity rules, copyright and related rights protection on the DSM, online consumer protection, requirements for contracts for the supply of digital content and digital services, measures to deploy high-speed electronic communications networks and a number of other benefits [41].

The economic benefits of the EU DSM are related to two main areas:

1) the benefits of the single market – regulatory harmonization and the removal of barriers between Member States in the digital sphere, the promotion of cross-border digital trade in the EU;

2) advantages of digitalization – further promotion of digitalization of EU countries, increasing the use of digital technologies in the EU, the development of public digital services and e-government [42].

Removing barriers for digital cross-border trade increases the overall efficiency of the EU's internal market for goods and services. The creation of the

DSM simplifies and reduces the cost of cross-border electronic transactions between Member States, improves cross-border access to online markets and new digital products and services for businesses and consumers. As a result, the benefits of the single market include lower prices, more choice of goods and services and improved convenience for consumers and businesses, and economies of scale.

In addition, the benefits of digitalization include increasing the productivity of the EU economy, optimizing business processes and reducing transaction costs for business, developing innovative products, services and processes, and increasing the EU's competitiveness [42].

The importance and prospects of the DSM for Ukraine is obvious, but the process of adaptation and accession to the union has its difficulties:

– convergence of regulatory and legal regulation;

– creation of market regulators that correspond to the best practices of EU member states;

– clear division of powers between Ukrainian regulators, if there are several in the field of electronic communications;

– identical and technically understandable regulation and standardization of the sphere.

Ukraine's integration into the EU digital market is possible provided that all these components are brought closer to European norms, rules and standards. Reform of the EU regulatory framework for electronic communications networks and services is a key step towards achieving a single European digital space and inclusive information society. Provisions describing the protection of the rights of end-users with disabilities have been significantly strengthened.

The process of Ukraine's integration into the DSM imposes a number of commitments to enhance the existing level of e-government, digital competition and network readiness. Today, according to the EGDI (e-Government Development Index) for 2020, Ukraine ranks 69th out of 193 countries (total score

0,7119) and is one of the countries with a high level of e-government development. Ukraine received the lowest scores for Telecommunications Infrastructure (0,5942), Public Online Services (0,6824), and the highest for Human Capital (0,8591) [43].

Examining the components of EGDI, it can be noted that this index is a weighted average normalized assessment of the three most important indicators of e-government, namely:

– human capital, expressed as a human capital index – Human Capital Index;

– quality and volume of online services – Online Service Index;

– Telecommunication Infrastructure Index [44].

Compared to the previous EGDI rating in 2018, Ukraine improved its position in 2020 (from 82nd to 69th place). Nevertheless, Ukraine is behind its neighboring EU member states, which belong to the group of countries with a very high level of e-government development (Poland, Hungary, Slovakia, Romania, Bulgaria, Latvia, Lithuania, etc.). In addition, many other neighboring countries are also ahead of Ukraine in the overall EGDI rankings: Turkey – 53rd, Georgia – 65th.

Analyzing the above data, it can be argued that in Ukraine a large part of the population can not fully enjoy all the opportunities and benefits of digitalization of the country due to insufficient development of the electronic services market. This, in turn, can be a brake on Ukraine's integration into the EU DSM, as the pace of innovation in the EU is quite high, so to achieve this level it is necessary to attract huge investments and revolutionize the development of Ukraine's digital market.

The Networked Readiness Index (NRI) assesses the development of countries' information and communication technologies based on 62 indicators [45].

The index includes 4 components: Technology (access, content, future technologies), People (citizen participation, business, government), Public

administration (trust, regulatory conditions, inclusiveness) and Impact (economic, social and humanitarian impact of digital transformation).

In the NRI ranking in 2019, Ukraine ranked 67th out of 121 countries. Ukraine lags the most behind Future Technologies (82nd out of 121), Government ICT Use and Government Online Services (87th) and Regulatory Environment (72nd). And the highest positions were related to Content and Use of ICT by business. In the NRI ranking, EU countries occupy high positions (Poland – 37, Latvia – 39, Czech Republic – 30, Croatia – 44) [45].

Other neighboring countries are ahead of Ukraine (Turkey – 51) or occupy positions similar to the Ukrainian (Moldova – 66, Georgia – 68). The World Digital Competitiveness Ranking (WDCR) consists of three main components: Knowledge (measures the ability to understand and study new technologies) (digital skills, abilities, scientific developments), Technology (assesses the economic conditions for developing new digital innovations, including regulatory), (environment, access to capital, technological base) and Readiness for the future (assesses the readiness of business, citizens, the state for digital transformation, digital adaptability, mobility and e-participation).

In 2019, Ukraine ranked 60th out of 63 countries included in the WDCR ranking (lost 2 positions compared to 2018 – 58 position) [46].

Ukraine is behind the EU and other neighboring countries. In particular, Ukraine received the highest result in the Knowledge component (40th place out of 63 countries), while in terms of Technology and Readiness for the future it was at the end of the ranking (61st and 62nd place respectively). A review of international digital development rankings shows that Ukraine lags behind EU countries, including from the new EU member states, most of which have a lower level of digital development than the EU average.

In general, the new EU member states have shown more dynamic digital development in recent years compared to Ukraine. Accordingly, for the successful integration into the DSM it is necessary to involve as many institutions and

investments as possible, as the effect will be complex and quite tangible from the economic point of view.

According to a study by the Center for International Trade Analysis Trade+ at the Kyiv School of Economics and the NGO "Ukrainian Center for European Policy" commissioned by the Ministry of Digital Transformation of Ukraine, the economic effect of integration into the EU DSM is quite significant.

Thus, according to the study, the gradual approximation of the regulatory environment and digital development of Ukraine to the EU level in the framework of integration into the EU Digital Single Market will affect bilateral trade between Ukraine and the EU: growth of exports from Ukraine to the EU – 11,8–17,0 % (2,4–3,4 billion USD), services – by 7,6–12,2 % (302,5–485,5 million USD).

It will also affect the productivity and economic growth of Ukraine: Ukraine's GDP growth – by 2,4–12,1 % (3,1–15,8 billion US dollars), welfare of citizens – by 3,6–7,8 % [47].

According to the calculations of the Trade+ Center for International Trade Analysis at the Kyiv School of Economics in partnership with the Ukrainian Center for European Policy commissioned by the Ministry of Digital Transformation of Ukraine and supported by the International Renaissance Foundation within the project "Calculation of Benefits from Ukraine's Integration into the EU DSM for Ukraine and the EU" it is noted that an increase in the digitalization of the Ukrainian economy and society by 1 % may lead to an increase in Ukraine's GDP by 0,42 %.

Accordingly, depending on the level of digitalization that Ukraine will gradually approach, the positive cumulative impact on Ukraine's GDP may amount to 2,4 to 12,1 % of additional growth throughout the approaching period.

That is, there is significant potential for economic growth in Ukraine in the case of increasing digitalization and productivity in various areas of the Ukrainian economy and society – including development of digital infrastructure and improvement of access to it, integration of digital technologies into business

activities in all areas of economic activity, development of digital skills and competencies of citizens, e-government.

Bringing the regulatory environment and digital development of Ukraine closer to the EU level due to Ukraine's integration into the EU DSM can increase exports of services from Ukraine to EU countries by 7,6–12,2 %, and exports of goods – by 11,8–17,0 %. At the same time, exports of services from the EU to Ukraine may increase by 5,7–9,1 %, exports of goods from the EU to Ukraine – by 17,7–21,7 %. This is the potential for a cumulative increase in bilateral trade between Ukraine and the EU throughout the period of reforms to bring Ukraine's regulatory and digital rapprochement closer to the EU. It includes the effect of reducing the overall level of non-tariff restrictions and barriers in trade between Ukraine and the EU as a result of the digitalization of trade transactions and regulatory convergence with the EU in the digital sphere.

Ukraine will benefit from reduced trade costs in bilateral trade with the EU due to the reduction of digital regulatory barriers – the well-being of citizens may improve by 3,6–7,8 %. The impact on the well-being of EU citizens is much smaller than for Ukraine and is mostly positive [48].

Given all the features and prospects of Ukraine's integration into the EU DSM, it should be noted that the process of "merger" is methodologically and technically quite complex.

At the first stage, Ukraine needs to build the Data Economy, which is registered in the EU DSM. That is, you need to remove restrictions, such as location, that force service providers to build expensive local infrastructures (data centers) in each region or country. In addition to regulating the movement and protection of personal data, the DSM also regulates the free movement of non-personal data [49].

Free cross-border access to public and private sector data, scientific information, is seen as a catalyst for economic growth, innovation and digitalization in all sectors of the economy, especially for small and medium-sized

businesses and startups, and for society as a whole.

The European Cloud Initiative covers 3 main areas of development: the European Open Science Cloud, High Performance Computing and the European Data Infrastructure. Big data, cloud services and the Internet of Things are key aspects for developing the EU's competitiveness.

In December 2018, in pursuance of the European Artificial Intelligence Strategy, the EC presented a coordinated plan to promote the development and use of AI in Europe, offering joint actions for closer and more effective cooperation in four key areas: increasing investment, accessing more data, empowering talent and ensuring trust.

The integration into the DSM of the EU envisages the formation of an inclusive electronic society and interoperability, standardization.

That is, there is a common understanding between Member States of the basic requirements for interoperability and compatibility, based on the European Interoperability Framework, according to which Ukraine should standardize with a focus on technologies and areas considered critical to the digital single market standards in such areas as health care (telemedicine, e-health), transport (travel planning, e-freight), former environment and energy.

An inclusive digital single market in which citizens and businesses have the necessary skills and can use interconnected and multilingual e-services: e-government, e-justice, e-health, "smart" energy supply or transport in Ukraine is gaining ground and practical use, special activation began in 2019–2021, developed a number of new multifunctional applications for citizens and businesses, creating a single portal of services, development of modern electronic methods of personal identification (such as Smart ID).

Ukraine also has significant achievements in the development of e-government, e-democracy and open data. In December 2018, an Administrative Arrangement was signed with the EU on cooperation in the field of e-government development. In particular, Ukraine has gained access to the EU's ISA² program,

which oversees the development of common standards for the provision of electronic services. A number of new public digital initiatives and coalitions have been established, such as the E-Government Coalition, the E-Democracy Coalition and the Digital Transformation Coalition.

Questions for self-control:

1. What does the Strategy for Ukraine's Integration into the EU Digital Single Market envisage?
2. Indicate the main advantages of forming a digital single market for Ukraine.
3. Describe the directions of Ukraine's integration into the EU digital single market.
4. Describe the essence and components of the main indices of digital development of the country.
5. What does the development of the data economy consist in?
6. What is the European Cloud Initiative and what are the main directions of its development?
7. Explain the concept of an inclusive digital single market.
8. Identify trends in the formation of an inclusive electronic society in Ukraine.

References:

1. Hrytsenko, A. and Burlai, T. (2020), «Vplyv tsyfrovizatsii na sotsialnyi rozvytok», *Ekonomichna teoriia*, No. 3, pp. 24–51.

2. «What is the Digital Single Market about?», [Online], available at : https://ec.europa.eu/eurostat/cache/infographs/ict/bloc-4.html.

3. Machuskyy, V. (2021), «Yedynyi tsyfrovyi rynok Yevropeiskoho Soiuzu», *Business Law Electronic Resource*, April, [Online], available at : https://www.businesslaw.org.ua/single-digital-market/.

4. Efremova, K.V., *Yedynyi tsyfrovyi rynok Yevropy ta Ukrainy*, [Online], available at : https://ndipzir.org.ua/wp-content/uploads/2018/04/Yefremova.pdf.

5. Shnyrkov, O.I., Filipenko, A.S., Zablotska, R.O. et al. (2020), *Didzhytalizatsiia suchasnoi systemy mizhnarodnykh ekonomichnykh vidnosyn*, monografija, Kyiv, 236 p.

6. Ploger, I., Hackenberg, W. and Ziesemer, M., *10-Point Plan for Europe towards a Digital European Economy*, [Online], available at : https://english.bdi.eu/publication/news/10-point-plan-for-europe.

7. «Digital Economy Report: UNCTAD», [Online], available at : https://unctad.org/system/files/official-document/der2021_en.pdf.

8. Weiss, Ch., Ficarra, M., Rückert, D. and Virginie, A. (2021), *Digitalization in Europe 2020–2021: Evidence from the EIB Investment Survey*, European Investment Bank, 98 p.

9. Palamarchuk, D.M. and Tymoshenko, A.S. (2018), «E-komertsiia yak instrument staloho rozvytku: dosvid Yevropeiskoho Soiuzu», *Zbirnyk naukovykh prats Cherkaskoho derzhavnoho tekhnolohichnoho universytetu «Ekonomichni nauky»*, No. 49, pp. 76–83.

10. Patramanska, L.Yu. (2015), «E-komertsiia: perevahy ta nedoliky», *Efektyvna ekonomika*, No. 11, [Online], available at : http://www.economy.nayka.com.ua/?op=1&z=4505.

11. Kregul, Yu. and Batrymenko, V. (2019), «Harmonizatsiia systemy rehuliuvannia elektronnoi komertsii Ukrainy z YeS», *Zovnishnia torhivlia: ekonomika, finansy, pravo*, No. 1, pp. 13–25.

12. Tofan, M. and Ionel, B. (2022), «Some Implications of the Development of E-Commerce on EU Tax Regulations», *Laws*, No. 11: 13, pp. 1–26.

13. Chervona, O.Y. (2020), «Tendentsii rozvytku elektronnoi komertsii», *Naukovyi visnyk Khersonskoho derzhavnoho universytetu «Ekonomichni nauky»*, No. 39, pp. 65–68.

14. Lone, S., *The European ecommerce market – key trends and*

developments, [Online], available at : https://thepaypers.com/expert-opinion/the-european-ecommerce-market-key-trends-and-developments--1255316.

15. «COVID-19 boost to e-commerce sustained into 2021, new UNCTAD figures show», [Online], available at : https://unctad.org/news/covid-19-boost-e-commerce-sustained-2021-new-unctad-figures-show.

16. «European e-commerce report. 2021», [Online], available at : https://ecommerce-europe.eu/wp-content/uploads/2021/09/2021-European-E-commerce-Report-LIGHT-VERSION.pdf.

17. Silva, V.L., Kovaleski, J.L., Pagani, R.N., Silva, J.D. and Corsi, A.M. (2020), «Implementation of Industry 4.0 concept in companies: Empirical evidences», *International Journal of Computer Integrated Manufacturing*, Vol. 33 (4), pp. 325–342.

18. Frey, C.B. and Osborne, M.A., *The Future of Employment: How Susceptible Are Jobs to Computerisation?*, [Online], available at : https://www.oxfordmartin.ox.ac.uk/downloads/academic/future-of-employment.pdf.

19. Acemoglu, D. and Restrepo, P., *Robots and Jobs: Evidence from US Labor Markets*, [Online], available at : https://economics.mit.edu/files/19696.

20. «What the Future of Work Will Mean for Jobs, Skills, and Wages: Jobs Lost, Jobs Gained | McKinsey», [Online], available at : https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages.

21. Kostrytsia, V.I. and Burlay, T.V. (2020), «Dysbalansy i dyverhentsiia u sferi zainiatosti: pidkhody YeS ta Ukrainy do yikh podolannia», *Ukrainskyi sotsium*, No. 1(72), pp. 83–107.

22. Petrova, I. (2019), «Sfera zainiatosti i dokhodiv v umovakh tsyfrovoi ekonomiky: mekhanizmy rehuliuvannia, vyklyky ta dominanty rozvytku», *Transformatsiia zainiatosti v umovakh tsyfrovoi ekonomiky*, zbirnyk materialiv konferentsii, KNEU, Kyiv, pp. 225–228.

23. Knickrehm, M., Berthon, B. and Daugherty, P. (2016), *Digital disruption: The growth multiplier. Optimizing digital investments to realize higher productivity and growth*, Accenture Strategy, 11 p.

24. Servoz, M. (2019), *AI Report: The Future of Work? Work of the Future! On How Artificial Intelligence, Robotics and Automation Are Transforming Jobs and the Economy in Europe*», European Commission, 155 p.

25. Berger, T. and Frey, C. (2016), «Structural Transformation in the OECD: Digitalisation, Deindustrialisation and the Future of Work», *OECD Social, Employment and Migration Working Papers*, No. 193, [Online], available at : http://dx.doi.org/10.1787/5jlr068802f7-en.

26. De Groen, W.P., Lenaerts, K., Bosc, R. and Paquier, F. (2017), *Impact of Digitalisation and the On-Demand Economy on Labour Markets and the Consequences for Employment and Industrial Relations*, CEPS: Brussels, Belgium, 74 p.

27. Tegmark, M. (2017), *Life 3.0: Being Human in the Age of Artificial Intelligence*, Alfred A. Knopf: New York, USA, 384 p.

28. «ICTs and Jobs: Complements or Substitutes?», *OECD Digital Economy Papers*, No. 259, [Online], available at : https://doi.org/10.1787/5jlwnklzplhg-en.

29. Holtgrewe, U. (2014), «The future and present of work in ICT», *New Technology, Work and Employment*, No. 29, pp. 9–24.

30. Freeman, R. (2015), «Who owns the robots rules the world», *IZA World of Labor*, No. 5, [Online], available at : https://doi:10.15185/izawol.5.

31. Schlogl, L. and Sumner, A., *The Rise of the Robot Reserve Army: Automation and the Future of Economic Development, Work, and Wages in Developing Countries*, [Online], available at : https://www.cgdev.org/publication/rise-robot-reserve-army-automation-and-future-economic-development-work-and-wages.

32. Petrakaki, D. and Kornelakis, A. (2016), «We Can Only Request What's in Our Protocol: Technology and Work Autonomy in Healthcare», *New Technol.*

Work Employ, Vol. 31, pp. 223–237.

33. Popelo, O., Kychko, I., Tulchynska, S., Zhygalkevych, Zh. and Treitiak, O. (2021), «The Impact of Digitalization on the Forms Change of Employment and the Labor Market in the Context of the Information Economy Development», *International Journal of Computer Science and Network Security*, No. 21(5), pp. 160–167.

34. Schou, J. and Hjelholt, M. (2018), «Digital state spaces: state rescaling and advanced digitalization», *Territory, Politics, Governance*, Vol. 7, pp. 438–454.

35. Kornelakis, A. and Petrakaki, D. (2020), «Embedding employability skills in UK higher education: Between digitalization and marketization», *Industry and Higher Education*, Vol. 34 (5), pp. 290–297.

36. «The Future of Jobs Report», [Online], available at : https://www.weforum.org/reports/the-future-of-jobs-report-2020.

37. Wang, B., Liu, Y., Qian, J. and Parker, S.K. (2021), «Achieving effective remote working during the COVID-19 pandemic: A work design perspective», *Applied Psychology: An International Review*, Vol. 70 (1), pp. 16–59.

38. Berger, T. and Frey, C.B., *Digitalisation, jobs and convergence in Europe: Strategies for closing the skills gap? Report prepared for European Commission: DG Internal Market, Industry, Entrepreneurship and SMEs*, [Online], available at : https://www.oxfordmartin.ox.ac.uk/downloads/reports/SCALE_Digitalisation_Final.pdf.

39. «Insights into skill shortages and skill mismatch: learning from Cedefop's European skills and jobs survey», [Online], available at: http://data.europa.eu/doi/10.2801/645011.

40. Folea, V. and Kaeva, M. (2019), «Analysis of the Digital Skills in the Eu Labor Market. A Case Study of the Banking Sector», *European Journal of Economics and Business Studies*, Vol. 5, pp. 66–78.

41. «The ubiquitous digital single market, Fact Sheet», [Online], available

at : http://www.europarl.europa.eu/factsheets/en/ sheet/43/the-ubiquitous-digital-single-market.

42. «Contribution to Growth: The European Digital Singe Market», [Online], available at : https://www.europarl.europa.eu/RegData/etudes/ STUD/2019/631044/IPOL_STU(2019)631044_EN.pdf.

43. «UNE-Government Survey. 2020», [Online], available at : https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/ un/2020-Survey/2020 UN E-Government Survey (Full Report).pdf.

44. «United Nations e-Government Survey. 2018», [Online], available at : https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/ un/2018-Survey/E-overnment%20Survey%202018_FINAL%20for%20web.pdf.

45. «The Global Talent Competitiveness Index. 2020», [Online], available at : https://networkreadinessindex.org/wp-content/uploads/2020/03/ The-Network-Readiness-Index-2019-New-version-March-2020.pdf.

46. «World Competitiveness Ranking. 2019», [Online], available at : https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2019/.

47. «Economic benefits of integration into the EU Digital Single Market: real numbers», [Online], available at : https://thedigital.gov.ua/news/ekonomichni-perevagi-vid-integratsii-v-ediniy-tsifroviy-rinok-es-nazvani-realni-tsifri.

48. «Integration of Ukraine into the Digital Single Market of the European Union», [Online], available at : https://ucep.org.ua/wp-content/uploads/2021/01/dig_ukraine_eu_15.12.2020-_WEB_3.pdf.

49. «Regulation (EU) 2018/1807 of the European Parliament and of the Council», [Online], available at : https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1807.

50. «The draft state budget for 2020 provides for the financing of the Ministry of Finance in the amount of UAH 227,1 million», [Online], available at : https://ua.interfax.com.ua/news/economic/622907.html.

UDC 338.2

Daria TRACHOVA, Doctor in Economics, Professor
Olena DEMCHUK, PhD in Economics, Associate Professor
Dmytro Motornyi Tavria State Agrotechnological University,
66, Zhukovsky str, Zaporizhzhia, 69600, Ukraine
Oleksiy MINTS, Doctor of Sciences, Professor
Pryazovskyi State Technical University,
19, Dmytro Yavornytskyi Avenue, Dnipro, 49005, Ukraine

Chapter 4
BLOCKCHAIN, INNOVATION MANAGEMENT AND DISRUPTIVE TECHNOLOGY

Content

4.1. Technologies that draw attention to blockchain

Digitalization and the introduction of modern technologies are radically transforming the existing principles and tools in the financial markets of the economies of most countries of the world. thanks to innovations, many operations that previously required personal presence and took a lot of time can now be available “in one click” and can be performed in a few minutes. And it is no secret that the most popular of these technologies is currently blockchain.

Let’s start by recalling what blockchain is and why it has so many supporters

among startups and investors. Blockchain is a distributed data registry (or database, if it is clearer), which are formed into blocks and recorded sequentially one after another using cryptographic encoding. This registry is distributed across multiple computers, and each copy is updated each time the blockchain changes.

Due to its distributed nature, blockchain has become interesting to specialists from the following areas of the traditional IT industry.

1. Rendering. You can render special effects for a new advertisement or movie on a processor or video card. The process requires a significant amount of time and power and can last for weeks. It is also well parallelized, because the video is made frame by frame, so each frame can be calculated by a separate machine.

2. Machine learning. Everyone has heard about neural networks. They help Google to find exactly what the user is looking for, and Tesla autopilots to arrive exactly where the owner wants. But these networks need to be trained. The process is long, by trial and error. Everything is calculated most quickly on video cards, because a video card has 2–3 thousand cores we need, and a regular processor usually has from 2 to 30 cores. That is, there are more cores in video cards, but they are small, but for machine learning just right.

3. Website hosting and data delivery networks. When you go to YouTube and watch a video in 99 % of cases, the video is downloaded for you not from distant America, but from a server in your city or from your provider. YouTube and similar sites keep copies of data (videos, movies) closer to viewers. This is called Content Delivery Network (CDN). And the equipment on the ground (people and miners) is perfect for this purpose.

4. Scientific computing. Scientific computing has traditionally been done on distributed systems (long before the advent of blockchain). Supercomputers used to do this work, but such centralized resources are few and expensive, and blockchain users' computers are often idle.

There are already several projects that bring these bold ideas to life, for

example:

1. **Golem** *(https://www.golem.network)* – a platform, that is, a system that connects many computers into a network on an old insecure paradigm. Payment for power – for each calculation. Rendered one picture – paid one coin. That is, the cost does not depend on the speed of calculations – even an hour, even a minute, the main thing is that you do one unit of work – you get one coin. If you want to earn more – take more powerful hardware. Among the advantages: relatively simple architecture of task parallelization (for users). It is easy to check the integrity of hardware suppliers: if a node claims to have solved a task, it can be given to another node and the results can be compared.

2. **SONM** *(https://sonm.com)* – is IaaS (Infrastructure as a Service) – infrastructure as a service, a platform for cloud computing. The principle here is different: exclusive equipment rental. If you need to render something, you rent a powerful machine and can render or run a website there – anything. You pay an hourly or daily fixed price for the rented configuration. The system is suitable for running any programs without modification. But users need to parallelize the calculations themselves. Checking suppliers is more difficult because not everything can be simply repeated on another node and compared.

Also, the blockchain is a decentralized environment (at least to some extent), that is, there is no one node that would make decisions, all operations must be done with the consent of the majority of blockchain participants. But with a large number of participants, it can take a lot of time to make a decision. Therefore, to perform any action with the registry, in most modern blockchains, a certain condition is required – this is called consensus. There are many types of consensus, for example, it can be a complex mathematical calculation (Proof of Work – PoW). Without this consensus, no new blocks are created and no changes are made.

And one more feature of the blockchain. It is designed in such a way that the data in the block cannot be changed, and interference with the blocks is almost

impossible. Even if information is recorded with an error, you will need to make another record, but with corrected data.

All this means that with the help of blockchain, companies can build trust in the veracity and security of information even in cases where there is little or no trust between the parties. Trust is the most important criterion that attracts investors to blockchain-related projects.

Of course, as a carrier of such features as distributed and decentralized, blockchain has attracted the attention of specialists from many industries. However, in the work of modern companies, in addition to storage (even if it is very reliable), there is a need to automate the processing of information received both from devices and by staff input.

To understand what exactly needs to be automated, consider the simplest example from real life – buying or selling goods.

In this diagram, we see that in order to simply record information about the purchase into the blockchain, several operations must first be performed:

1) accept the terms of the transaction (price, quantity of goods);

2) make inquiries on the Internet to find out whether the terms of the transaction are fulfilled (payment, delivery of goods);

3) process the results of the request (convert to another currency, etc.);

4) and finally, make a record in the blockchain.

Therefore, in the second generation of the blockchain, the ability to automatically perform some actions was implemented. For this purpose, support for so-called “smart contracts” was added to the blockchain. In the diagram, we can see that it is the smart contract that accepts the terms of the transaction, processes the results of the request and writes to the blockchain, but for security reasons, it does not have access to the outside world (to prevent attacks from the outside and reduce network downtime). Therefore, secure interaction of the blockchain with systems outside the network requires an additional piece of infrastructure, known as an “oracle”, to connect the two environments. And the

request to the internet is actually divided into two parts – from the smart contract to the oracle (2a) and from the oracle to the internet (2b).

Fig. 4.1 shows an example where a blockchain-based smart contract is used to monitor and execute a buy/sell transaction.

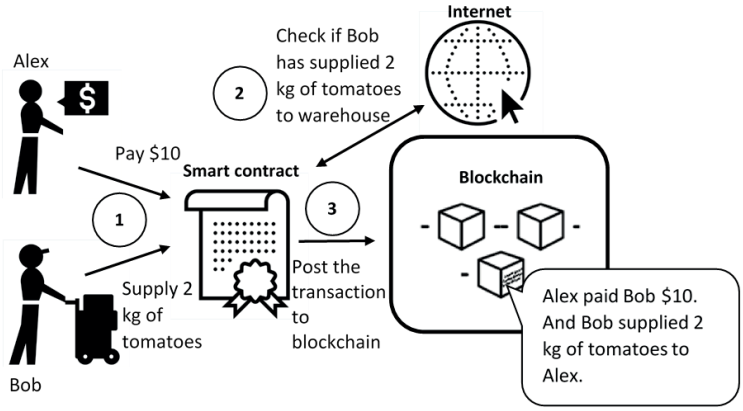


Fig. 4.1 – Scheme of how a smart contract works on the example of a simple purchase and sale transaction

Source: created by the authors.

When the buyer and supplier agree on a deal, they note that the money can only be transferred when the goods arrive at the warehouse. This condition is encoded into a smart contract, which is then embedded into the blockchain. Once all conditions are met, the transaction information will be added to the blockchain.

Now let's take a closer look at what a smart contract is and how it is used in blockchains. A smart contract is a computer algorithm designed to conclude and maintain contracts executed in a software environment. The main function of smart contracts is that they provide an opportunity to perform reliable and confidential transactions without the participation of external intermediaries represented by banks or government agencies. In addition, such transactions are traceable, transparent and irreversible. Smart contracts not only contain information about the obligations of the parties and sanctions for their violation, but also automatically ensure the fulfillment of all the terms of the contract.

The first ideas of smart contracts were proposed in 1994 by Nick Sabo. He described a smart contract as a computer protocol that, based on mathematical algorithms, independently conducts transactions with full control over their implementation. For the first time, Sabo's ideas were put into practice with the emergence of the first cryptocurrency Bitcoin and the underlying blockchain technology. However, most modern blockchains, including bitcoin, do not have the so-called "Turing completeness" (i.e. they do not have the ability to implement any computable function), so their "contracts" are relatively simple constructions, such as multi-signature or deferred execution transactions. Smart contracts became widely used with the emergence and development of the Ethereum project. The main network of which was launched by Vitalik Buterin in the summer of 2015. Ethereum includes Ethereum Virtual Machine (EVM) – a virtual computing environment that is responsible for the execution of smart contracts written using the Solidity programming language.

According to the degree of automation, smart contracts can be divided into three categories:

1) fully automated;

2) with a copy on paper;

3) contracts, most of which are on paper, and a small part in the form of program code.

Blockchain solutions are only at an early stage of development. The technologies are being tested and refined, so in practice, really complex smart contracts have hardly been used yet. To date, the vast majority of smart contracts belong to the third type, where only certain aspects of transactions are automated, in particular, the exchange of funds for property rights.

But supporters of smart contracts are convinced that many types of contractual relations can be partially or fully self-executing. And their main argument is that the cryptography underlying smart contracts provides a higher level of security than traditional contracts based on law. Smart contracts can also

reduce transaction costs and eliminate the risks of ambiguous interpretations of terms or unfair court decisions. Thus, the main advantages of smart contracts include:

1) *autonomy* (there is no need to look for an intermediary, for example, a broker or a bank or a notary, to conclude and confirm the transaction);

2) *reliability* (the contract is stored in an encrypted form in the blockchain) and security, which is guaranteed by mathematical laws and makes hacker attacks and retroactive replacement of information unlikely;

3) *economy and speed* – thanks to the blockchain, many intermediaries are eliminated and processes are automated;

4) *accuracy* – due to automation and minimization of manual work, the likelihood of errors that often appear when filling out forms in the approval process and when manually conducting various operations under the contract is reduced.

But smart contracts are still far from ideal. Among their shortcomings is the imperfection of the blockchain infrastructure, in the code of which there are critical errors. In addition, there are many gaps in the legal regulation of smart contracts, and in some industries it does not exist at all. Also, the underdevelopment of blockchain oracles – programs that are designed to link the digital world to the real one and provide contracts with input data for their execution – has a negative impact. All this creates certain obstacles to the integration of smart contracts into the daily activities of organizations and individuals. In addition, smart contracts are often less flexible than conventional contracts. Also relevant are the problems of scaling and speed of execution of commands in smart contracts. Therefore, the efforts of many developers are aimed at solving these problems and limitations, and they are solved differently within different platforms.

For example, in September 2022, Ethereum made an update to switch from Proof-of-Work (PoW) consensus to Proof-of-Stake (PoS). The purpose of this

upgrade is to make the blockchain platform more scalable, secure, and decentralized. This can be achieved due to the fact that after the transition of Ethereum to Proof-of-Stake, validators will replace miners in the network. To become an Ethereum validator, you need to make the so-called "staking" – that is, to deposit at least 32 ether (ETH) on the deposit contract (in other words, to block this amount on your wallet). And the system will start requesting confirmation of new transactions and accrue rewards for this. At the same time, the Proof-of-Stake algorithm assumes that the "weight" of the validator's vote depends on the number of coins deposited in the staking. As for the staking yield, as of September 2022, it is 4,0–4,5 %. It should be noted here that for supporters of the old principles of work, Ethereum has created a separate blockchain Ethereum Classic (ETC), which works on the Proof-of-Work consensus.

However, the use of Proof-of-Stake is not the only update in Ethereum. They are also introducing the ability to create subnets (this is called sharding) and the transition to a new virtual machine with support for multiple languages for smart contracts.

Previously, we have already mentioned the so-called blockchain oracles several times. Now it's time to take a closer look at it. We already know that most operations in decentralized applications are performed using smart contracts. But to work, they may need various data from external sources. For example, when exchanging one cryptocurrency for another, you need the exact rate of these cryptocurrencies. Therefore, only data from external sources (in particular, from platforms that aggregate trading data and prices from many exchanges) allow calculating the most "fair" price, as close to the market as possible. However, a smart contract is unable to receive information outside the blockchain in which it is deployed. This is where the oracles come to the rescue, which perform an intermediary function between the contract and the desired data source. Blockchain oracles are algorithms that usually run on the nodes of a particular blockchain.

Oracles are divided according to different criteria: the principle of operation, the sources of data received and their direction, as well as the form of organization. Let's look at the most popular types:

Software and hardware – the first take data from digital sources: databases, servers, cloud storages and broadcast it to the addressee in real time. Hardware collects data using physical devices: "smart" sensors, chips, barcode scanners, etc.

Input and output – oracles can have a specific specialization – either to transmit information or to receive from external sources. This may be necessary to increase reliability and solve the problem of single point of failure.

Centralized and decentralized. A centralized oracle is managed by a single operator who usually uses it in his application. This type of oracle was the first to appear, but due to problems with the vulnerability of such a system, the crypto industry gradually switched to the standard of decentralized blockchain oracles. These are systems that combine many oracles. A group of nodes is selected from it, each oracle of which performs its own part of the request. The first project that implemented the principle of decentralized blockchain oracles was Chainlink.

Today, oracles in the crypto industry are mainly used to transfer data flows, in particular price feeds, which are a table with a list of price values for different dates and their source. Feeds allow smart contracts to receive cryptocurrency quotes from centralized trading platforms and trading aggregators.

The recognized leader in the decentralized oracle market is Chainlink. Its ecosystem includes more than 1300 projects in the financial (DeFi), gaming (Game-Fi) and NFT sectors (more on NFT later). Chainlink does not have its own network: the project deploys nodes in different blockchains, applications in which it serves. Chainlink oracles work in Solana, Ethereum and EVM-compatible networks, including BNB Chain, Arbitrum, Optimism, Polygon, Avalanche and Fantom. We can also highlight Band Protocol, which has about 80 integrations. Unlike Chainlink, the project runs on its own BandChain blockchain, created using the Cosmos SDK. Band also develops tools for WebAssembly developers

that allow creating oracles. BandChain is managed by a network of validators and works with applications on the Celo, Oasis and Cronos networks. The project's native coin is BAND.

Other major oracle providers are: Berry Data, Kylin Protocol and DIA.

Questions for self-control:

1. Basic concepts of blockchain
2. What is a smart contract?
3. How is a smart contract used in blockchains?
4. What are the disadvantages of smart contracts?

4.2. The main industries where blockchain is used related to smart contracts

Of course, the most common area of blockchain application is cryptocurrencies. We have a separate lecture dedicated to this topic, so now we will consider the use of smart contracts in cryptocurrencies. Earlier we have already noted that only simple smart contracts, such as multisignature or deferred execution transactions, are used in the cryptocurrency industry.

Multisignature is the simplest classic example of a smart contract. Access to money stored on a multi-signature wallet is possible only when two or more signatures are provided simultaneously. A simple analogy is a bank cell or safe with two locks and two keys. One key is kept by one customer and the other by the other. They can open the cell only if they present both keys at the same time. Separately, they cannot open the cell without the approval of the other. Multisignature is a type of signature implemented as a check of the conditions specified by the basic scripting language of the cryptocurrency. That is, it is supported by most cryptocurrencies.

The main types of multisignatures:

1-for-2: a joint account of two business partners – the signature of either party is enough to spend money.

2-of-2: a joint savings account of two business partners – both signatures are required to spend funds, which does not allow one of the account holders to spend funds without the approval of the other.

2-of-2: a wallet with two-factor authentication: one is stored in the computer, the other in the smartphone. Funds cannot be spent without the signature of both devices.

3-5: low trust donation address – each of the five trusted project participants keeps a private key. Three persons can spend funds, but anyone can transfer donations to the project address. This scheme reduces the risk of embezzlement, hacking, virus infection and loss of funds due to the fact that one participant loses interest in the project. The blockchain displays which private key was used in the final signature, which improves the possibility of accounting.

2-to-3: buyer-seller with escrow account that does not require trust – the buyer transfers money to a 2-to-3 address, the seller acts as a third arbitrator. If the transaction is successful, the buyer and seller both sign the transaction, returning the funds to the seller. If there is a failure, they can sign a transaction to refund the buyer. If they can't agree, both go to a third party who acts as an arbitrator and provides a second signature to whichever party they feel deserves it. The arbitrator cannot steal the funds as he has only one key.

2-of-3: a board of three trustees holds the funds of the company or organization – these funds cannot be spent without the consent of any two of the three trustees. For larger organizations, larger multi-signature transactions are possible – 3-5, 5-9, etc.

2-3: hot storage wallet for business. Bitcoin exchange stores one private key online, another private key as a paper backup. A separate cybersecurity company stores the third key online and signs transactions only after checking a number of

factors (absence/presence in black and white lists, not exceeding the limit of the number of withdrawals for a certain period, two-factor authentication, compliance with regulatory standards, etc.) If an exchange or company's hot wallet is hacked, bitcoins cannot be stolen. If a cybersecurity company goes out of business, the exchange can access the funds in the form of a paper reserve.

2-of-3: decentralized cold storage unit – one of the keys is kept by the user in a safe at home, the second in a bank cell, and a copy of the third key is kept by a close friend of the user and his relative in his office. The home is protected from robbers, as spending money requires a visit to a friend, bank or office.

1 or 3 out of 4: distributed backup – the primary user can use the wallet at will, but if that owner loses their private keys, they can be recovered by three out of four other trusted friends/organizations. One key is stored in the bank cell, the other three are stored with friends. In case of death of the owner, the cell with the funds, according to his will, can be transferred to one of the trusted friends or to someone who can benefit from the help of trusted friends.

Next, we will talk about industries that are closely related to the concept of "token". So now let's look at what it is and how it is used in blockchain. A token is a unit of account used to represent the digital balance in a certain asset. Tokens are kept in a database based on blockchain technology, and access to them is carried out through special programs using electronic signature schemes.

As of now, there is no clear classification of tokens in the world, but usually tokens are divided into the following main types:

1. **Equity tokens, tokens-shares** – are needed to finance new startups and further build the network. They do not provide access to services, but offer to participate in the life and development of the platform.

2. **Utility tokens, appcoins** – reflect a certain value within the business model of the online platform. It can be reputation, points for certain actions, game currency, etc.

3. **Asset-backed tokens** – digital obligations for real goods or services (for

example, kilograms of carrots, an hour of work of a builder, etc.

But it should be understood that these are only basic types and each of them can contain dozens of other subtypes. For example, a "governance token" or a havernance token is a digital asset whose owners can participate in decision-making on the development of a blockchain project. What kind of token is it a variation of? Yes, that's right – utilitarian.

And a few more words about tokens, or rather about tokenization. Tokenization is a process of transforming asset accounting and management, in which each asset is represented as a digital token. The essence of tokenization is to create digital analogues for real values in order to work with them quickly and safely. For example, the owner of a bakery creates an electronic accounting system in which he issues digital obligations for buns – tokens. Having a good enough reputation, the owner of the bakery can pre-sell buns by selling tokens on trading platforms on the Internet. In this case, any token holder can come to the bakery and exchange one token for one bun. By the way, what do you think this token belongs to? Yes, that's right – this is an Asset-backed token.

If we talk about the degree of popularity, then the second place after the cryptocurrency should definitely be the so-called "Initial Coin Offering" or Initial Coin Offering (ICO). Also, instead of ICO, the term "crowdsale" is often used. What is it? ICO is a process during which the project team sells its digital tokens (coins) for cryptocurrencies or fiat money among investors. Later, these coins can be used on the project platform as an internal currency or traded on exchanges. By issuing its own tokens and exchanging them for popular cryptocurrencies (e.g. Bitcoin or Ethereum) or for fiat currencies (dollars or euros), the project raises the funding it needs to launch or develop. As a rule, ICOs are held in the early stages of the projects' existence, before the creation of their full-fledged infrastructure. The funds raised go to finance the final stage of development, marketing or are directed to special development funds to support projects in the long term.

But it should be understood that currently ICO cannot be called both legal

and illegal way to attract investments. Its legal status, procedure and requirements for companies that are going to raise funds in this way are currently not defined in any country in the world. In addition, it is difficult to determine the legal nature of the relations arising during the ICO. Since it is difficult to call such relations financial relations in their classical sense. At the same time, it is safe to say that this process is based on the reputation of the people behind the cryptocurrency startup and the trust of users (potential investors).

And what, in fact, attracts investors to ICOs? Firstly, it is the fact that by buying the tokens offered at the ICO, investors primarily expect to benefit from their sale at a higher price in the future. A classic example is Ethereum, whose tokens during the ICO in the summer of 2014 cost less than one cent, and at the end of September 2022 their price rose to almost $ 1270. In addition, investors have the opportunity to use tokens for their intended purpose, receiving services at a lower price.

But there are also risks – first of all, this is a common fraud, when the creators of the project have only one goal: to collect money from users. In addition, since there are currently no laws regulating cryptocurrency crowdsales, from the investor's point of view, this transaction is always based on trust. It cannot be ruled out that the project may not survive to the product stage or disappoint the investor with its implementation. In addition, in fact, many ICOs are fraudulent. A 2018 study based on public information and sources claims that almost 80 % of initial coin offerings (ICOs) are frauds, and only 8 % of ICOs can reach the trading stage on the various cryptocurrency exchanges.

Decentralized finance (DeFi) is a publicly available ecosystem of financial applications/services based on public blockchains, mainly Ethereum. The DeFi ecosystem covers all aspects of financial services and transactions, including lending, borrowing and trading within decentralized structures. Any Internet user can interact with the ecosystem and manage assets through peer-to-peer (P2P) networks, i.e. those that provide and decentralized applications (dApps).

decentralized finance can provide anyone with access to traditional financial services, eliminating the need for intermediaries and reducing entry barriers.

What are the key features and benefits of DeFi? First, it is of course decentralization and self-governance. There are no centralized management structures in DeFi: the rules of business operations are written in the smart contract. Once the smart contract is launched, the DeFi application can work independently with minimal or no human intervention.

Transparency. The source code of DeFi applications is open for audit, which allows any user to understand the functionality of the contract or detect errors in the code. All transaction activity is public – transactions are pseudo-anonymous by default. That is, a one-time violation of security measures (for example, buying cryptocurrency through a regular bank transfer) leads to the disclosure of the owner's identity.

Cross-border. Most DeFi applications are available to any Internet user. In addition, they are potentially useful both for residents of countries with unstable economies and in developed countries, especially in the field of lending, investing and developing new income models.

Inclusivity The DeFi ecosystem is inclusive – anyone can create an app and use it. Unlike the traditional financial sector, there are no controllers and accounts that require complex forms to be filled out. With the help of wallets, users interact directly with smart contracts.

Flexibility of user experience. If the user does not like the application interface, he can use a third-party interface or create his own. Because smart contracts have an open architecture, and therefore anyone can create applications for them.

Interoperability. New applications can be created by combining other DeFi products (stablecoins, decentralized exchanges, prediction markets, etc.). This feature of DeFi resembles a model within which a certain structure can be assembled in various combinations.

And one more point about – during 2021, the so-called DeFi 2.0 services began to appear. DeFi 2.0 is the second generation of decentralized finance, whose projects are aimed at solving the problems of the first version. This includes more efficient use of capital, liquidity stabilization mechanisms and long-term incentives for users.

And now let's discuss the use of blockchain in the field of accounting. It should be noted that as of now, this issue is still under study. And large organizations are just beginning to delve into how best to implement blockchain technology into their accounting infrastructure. In general, the use of blockchain in accounting comes down to its application within the so-called triple-entry method. The main content of this method is that when performing a monetary transaction, each of the two parties makes one record (two in total), as well as another record (the third) in an independent data storage. And blockchain has become such an independent (and, as we know, centralized and securely protected) storage.

At the moment, there are at least 4 blockchain projects related to triple-entry accounting: Abendum, Balanc3, Pacio and Request Network.

The sale and purchase of real estate is always associated with the need to involve intermediaries, lawyers, the state, banks, etc. A large number of participants in the process increases the risk of inefficiency and human error. And correcting each mistake in such cases requires not only time, but also financial losses. In some cases, it may happen that, for example, due to martial law or a natural disaster, the owner will not even be able to confirm his ownership. The use of blockchain technology can eliminate most of these shortcomings. Using smart contract technology, the seller and the buyer can agree on all the necessary conditions, and the contract is activated automatically. As soon as the buyer pays the agreed price, the blockchain will fix the property, and the subject of the contract will change the owner, which will become generally recognized. Smart contracts can contain elements of security deposits, which are automatically

activated in case one party deviates from the contract. At the same time, all this can happen with incomparably lower costs than the costs associated with the classic processes of buying and selling.

And then some of the most successful examples of blockchain implementation in real estate. Let's start with a joint project of iNation and the International Blockchain Real Estate Association (IBREA), which teamed up in 2015 to create a global blockchain-based database of real estate owners and transactions.

In 2016, the Swedish cadastral chamber began to create a system that registers land ownership rights and records them in the public distribution register.

Something similar was planned to be done in Ukraine and on June 21, 2017, at a meeting of the Cabinet of Ministers of Ukraine, Resolution No. 688 was adopted on the transfer of the State Land Cadastre to the blockchain. However, in practice, only the procedure for checking the extract from the land cadastre was transferred to the blockchain. Cadastre administrators continue to store all data on land plots and transactions in the old electronic registry.

There are also ATLANT and Propy projects focused on creating blockchain platforms for buying and selling real estate using smart contracts. With their help, individuals and legal entities conclude transactions without intermediaries and guarantors.

In Ukraine, on September 25, 2017, for the first time in the world, an electronic transatlantic transaction was conducted under a real estate exchange agreement using a smart contract on the Ethereum blockchain. The American company purchased an apartment in Kyiv with the help of the startup Propy. At the same time, the seller, Kyiv and New York real estate magnate Mark Ginsburg, was in New York at the time of the transaction, and the representatives of the buyer's company and the seller (by power of attorney) were in Kyiv.

But in addition to simplifying the process of buying and selling real estate, blockchain can simplify the process of investing in real estate. We know that now

such investments are available only to those who have a lot of free money – from $ 50 thousand. For particularly promising projects, the entry threshold is $ 200–500 thousand. But blockchain services are already being developed today, thanks to which developers can launch a separate ICO with their tokens for each new construction and sell them on financial markets. An investor will simply buy a token of an object located in another part of the world for $ 100 or $ 1000, and after the growth of the rate – sell it, as traders do with stocks, gold or currency in the financial markets.

You can already invest a small amount in real estate on platforms such as BRent, NEST, Slice, ATLANT and Propy. Their functionality is generally similar, the only difference is in the popularity and listing of objects available for investment.

NFT (an abbreviation of the English "non-fungible token") are so-called irreplaceable tokens, which are certificates of ownership of various digital objects: texts, images, audio recordings, game items or characters, etc.

If cryptocurrencies are conditionally interchangeable – for example, one bitcoin in one user's wallet is equal and identical to one bitcoin in another user's wallet – then one NFT token representing a painting is not equal to another NFT token with the same painting by the same author, since they are objects of art and each of them may have a different value. Therefore, each NFT token is unique and exists in singular. Non-fungible tokens are unique – they cannot be copied. Each contains identifying information recorded in smart contracts.

Experiments with NFT began in 2013 with the emergence of solutions that made it possible to tokenize assets on the Bitcoin blockchain. Currently, the number of projects related to NFT is already more than 20. Most of them are art marketplaces. Such services are a kind of combination of auctions, galleries and release protocols. Some of them, for example, Nifty Gateway and SuperRare, invite creators with a high reputation to the platform themselves. Others, such as OpenSea and Rarible, are more versatile and allow creators to submit their works

themselves.

Recently, a new type of indispensable tokens has appeared – **PFP** (Picture for Proof, literally "Picture for Proof") – images used as an "avatar". One of the first NFT/PFP projects was Bored Apes Yacht Club (BAYC), which was launched in April 2021 by Yuga Labs. This is a collection of 10,000 high-quality images of "bored monkeys" with an arbitrary combination of accessories – smoking pipes, necklaces, glasses, hats.

Among the characters are both ordinary primates and exotic ones – with golden skin, crowns, etc. (Fig. 4.2.).

Fig. 4.2 – Example NFT images from Yuga Labs

Initially, the company sold images for 0,08 ETH. In September 2021, the cheapest monkey already cost about 40 ETH. (Please calculate how much it is now in dollars.) In the same month, Sotheby's auction house sold a set of 107 monkey images for $ 24,4 million.

Questions for self-control:

1. How is blockchain technology used in accounting?
2. How is blockchain technology used in real estate transactions?
3. How is blockchain technology used in NFT?

4.3. Internet of things

Internet of things (IoT) is a concept of data transmission between physical objects ("things") equipped with built-in means (usually sensors for data collection) and technologies for interaction with each other or with the external environment. It is assumed that the organization of such networks can exclude the need for human participation from some actions and operations. There are already quite a few examples of the Internet of Things applications: from a smart home that automatically regulates heating and lighting to a smart factory that monitors industrial machines to find problems and then automatically adjusts to avoid failures.

The term "Internet of Things" was coined by entrepreneur Kevin Ashton, one of the founders of the Auto-ID center at MIT – Massachusetts Institute of Technology. Ashton was part of the team that discovered how to link objects to the Internet using RFID tags (those familiar metal labyrinth tags found on books and other goods that trigger an alarm if you take the item out without paying). He first used the phrase "Internet of Things" in a presentation in 1999, and since then it has become popular.

Now it is difficult to overestimate the importance of this technology, but another confirmation of this is that in the 2008 report of the US National Intelligence Council, the Internet of Things appears as one of the six disruptive technologies, that is, it refers to innovations that lead to the fact that old products become competitive. But, as always, despite the fact that the Internet of Things provides a number of benefits, it also has an important set of problems. Below are some of them:

1. **Security** – all IoT devices use the Internet to communicate or interact. The system provides little control despite any security measures and can be controlled by various types of network attacks.

2. **Privacy** – even without active user participation, the Internet of Things

system provides significant personal data with maximum detail.

3. **Centralized data** – all data is stored in a central data storage. If this server fails, the entire device will be impossible to control.

As we can see, all of these disadvantages can be leveled with the help of blockchain. But it is most widespread where the end user directly interacts with IoT devices. We remember that the blockchain, among other things, allows you to formalize agreements between counterparties directly, without intermediaries, right? Therefore, it is here that it came in handy as a means of formalizing relations through the conclusion of an agreement between the customer of the service and its supplier. These industries include: firstly, everything related to home automation (or as we call it – smart home), in addition to retail, medicine, transport, logistics, agriculture and the so-called sharing economy. And now let's talk about some of these industries in more detail.

"Smart house" or "home automation" is a system of home devices capable of performing actions and solving certain everyday tasks without human intervention. The most common examples of automatic actions in a "smart home" are automatic switching on and off of lights, automatic correction of the heating system or air conditioner, and automatic notification of home intrusion, as well as fire or water leakage.

Sensors used to implement smart home scenarios are divided into several main groups:

1. **Motion sensors** – most often used to automatically turn on the lights or trigger an alarm.

2. **Door and window opening sensors** – there are two parts, when opened, an alarm signal is sent to the hub (or in some cases directly to the central monitoring station of the security company).

3. **Leakage sensors** – they are located in places of probable leaks – in the bathroom, near sinks, washing machines, dishwashers, etc. When water gets on their contacts, an alarm signal is sent.

4. **Smoke detectors** – in new buildings of recent years, their use is mandatory for developers, so in a new apartment building such sensors will be superfluous.

Temperature, lighting, humidity sensors. Together with heating and humidifying devices, they allow maintaining a comfortable microclimate in the house or, for example, automatically watering flowers.

But sensors only record some change, and other devices react to it. The most common among them are:

– *smart sockets* – electrical sockets that are able to turn on or off the devices connected to it – fans, heaters, etc. at the user's command (or a signal from the sensor). They also allow you to measure electricity consumption.

– *electronic locks* – for locking and unlocking doors.

– *electric taps* – for closing and opening water in pipes.

– *electric drives* – for closing and opening gates, blinds, curtains, etc.

– *smart devices* – vacuum cleaners, air conditioners, washing machines, etc.

The popularity of this technology is growing every year. For example, the UK government has set a goal to replace all conventional sensors that measure electricity consumption with smart ones. And in 2022, this has already been achieved by 47 %. The Indian government wants to turn the country into one of the largest centers of smart homes and plans to build 500 smart cities. And in the United States in 2022, the number of households using home automation reaches 2 % of all households.

But as popularity grows, so does the risk of security breaches in these systems. Therefore, many companies have turned their attention to blockchain. So last year, Walmart (the world's largest wholesale and retail chain) published a patent describing the use of blockchain for secure smart home management. According to Walmart's concept, homeowners will be able to store information from connected devices in a blockchain-enabled database, where each device will be given a digital identifier. With the help of encrypted private keys, owners will

be able to configure certain settings for devices and perform transactions in a secure network. Moreover, users will be able to dynamically change access levels and parameters for connected devices through a special management portal. By integrating their smart devices with the portal, they will control access from a distance via the Internet of Things. At the same time, this solution will store configuration information and change logs in a permanent, immutable blockchain database.

Next, and actually very close to the Internet of Things in the context of its practical use is the so-called "sharing economy". In fact, this is just a familiar rental of premises, vehicles, etc., but there is also such a wording – it is an economic model defined as a peer-to-peer activity of providing shared access to goods and services, which is often facilitated by an online platform.

Why is blockchain very promising in the sharing economy? Firstly because blockchain-based smart home technologies are already being widely adopted by owners of rental properties. Secondly, the decentralized nature of blockchain networks allows sharing providers to connect more directly to users in a true peer-to-peer mode, i.e. without intermediaries at all. As a result, blockchain can make it cheaper to create and manage an online platform. For example, transactions can be performed automatically using smart contracts. Currently, those who use sharing platforms such as AirBnb, Uber and others have to pay a transaction fee to these platforms. By eliminating intermediaries from the sharing economy, blockchain will allow users to avoid the aforementioned fees.

In addition, given the still decentralized nature of the technology, blockchain solutions for the sharing economy can also be more secure. Traditional centralized solutions are more accessible to hackers and many of them have had cases of serious data breaches. For example, in 2017 Uber reported that in 2016 hackers accessed the personal information of 57 million passengers and drivers from its platform and the company paid $ 100,000 as ransom. Airbnb also faced several cases of data leakage. In such an incident, hackers hijacked the accounts of top-

rated users and used them to book hosts' homes, which they then had to rob. In a blockchain-based exchange solution, hackers will never be able to access user accounts, let alone manipulate them to provide a false identity.

Blockchains also seek to eliminate fragmentation. Traditionally, users must register and download an app for each of the many sharing economy solutions they want. If there are five sharing economy companies in your area, for example, you would need to register with each company to access all of their services.

However, with blockchain-based solutions such as the ShareRing project, all services can be available on one platform and payments can be made through the same platform. This means that you don't need to register multiple times and even when traveling abroad, you don't have to worry about finding local sharing apps as the blockchain-driven approach will connect you to local sharing economy solutions. In addition, this application will allow users to pay for goods and services using tokens, effectively eliminating the need to carry cash or debit cards.

One of the most promising areas for the implementation of the Internet of Things is medicine. According to a study conducted by analysts from the Hewlett Packard Network Products Department, six out of ten global healthcare organizations are already using IoT devices. Due to this, several positive trends are observed at once:

– medical staff is becoming more mobile;

– the process of collecting, transmitting, analyzing patient data and making a diagnosis is accelerated;

– the efficiency of medical care is increasing.

The most common sensors of the Internet of Things used in medicine include the following:

1. Continuous glucose monitor (CGM) is a device that helps diabetics continuously monitor their blood glucose levels for several days by taking regular readings.

2. The Automated Device for Asthma Monitoring and Management

(ADAMM) is an intelligent asthma monitor worn on the patient's body and designed to detect the symptoms of an asthma attack before it starts. It vibrates to notify the wearer of an impending asthma attack and can also send a text message to a designated caregiver at the same time. This device can also detect and track inhaler use if the patient is unable to remember if they have used it.

3. Swallowable sensors. Proteus has created pills that dissolve in the stomach and produce a weak signal that is picked up by a sensor worn on the body. The data is then transmitted to a smartphone app, confirming that the patient has taken the medication as directed.

4. Intelligent contact lenses. In 2014, Google Life Sciences (now known as Verily, a subsidiary of Google's parent company Alphabet) announced that it would develop contact lenses that could measure glucose levels in tears and provide an early warning system for diabetics.

5. Coagulation sensors. In 2016, Roche launched a system that allows patients to check how fast clots are forming in their blood.

Blood pressure and heart rate monitors and blood oxygen saturation monitors. In addition to devices specially designed for this purpose, sports bracelets and smart watches with advanced sensors have recently become widespread. They allow not only to monitor the vital signs of the body, but also to diagnose some nervous diseases. For example, there is an Apple Watch app that tracks depression, and another one that allows you to monitor the symptoms of Parkinson's disease.

But a study published in March 2022 found that 75 % of medical infusomats contain one or more of 40 known software vulnerabilities or at least one of 70 known security flaws in IoT devices. Therefore, it is not surprising that many companies related to the Internet of Things and medicine have also turned their attention to blockchain. Thus, according to some estimates, in 2028, the total value of the global market for blockchain applications in the field of healthcare will reach 9,5 billion US dollars. Here are some of the leading companies that

have successfully earned the best blockchain applications in healthcare.

Blockpharma is developing an anti-counterfeit drug application that helps control pharmaceuticals throughout the supply chain, from the production stage to the end customers.

Pokitdok – helps to collect information from IoT devices and other sources for users registered in the Dokchain service and uses blockchain technology to provide secure and decentralized access to patient information.

Blockpill monitors the active ingredients of medicines offered by different specialists so that their actions are not repeated. And when necessary, it offers alternatives.

As for agriculture, blockchain technology is being implemented in several areas, but the most massive of them are:

– smart agriculture;

– optimization of the food supply chain;

– electronic trade in agricultural products;

– crop insurance.

Smart agriculture. The Internet of Things has acquired a special role in agriculture in the context of the so-called "smart agriculture". Smart agriculture is a concept that allows a plant or livestock to receive exactly the amount of fertilizer, water or medicine or feed that they need right now. The short scheme of this technology is as follows:

1. First, data on soil moisture or the content of microelements in the soil is collected using various sensors.

2. Then, based on the collected data, a field map is formed, which indicates in which part of the field how much fertilizer or insecticide should be applied.

3. And according to the resulting map, with the help of modern devices, the required amount of substances is applied exactly where it is needed.

Thus, the farmer will receive cost savings and more environmentally friendly products (which can also be earned now). But, although smart technologies have

been available for agriculture for some time, the main challenge in applying this technology is related to the creation of a reliable and comprehensive security system for the proper management and use of the collected data. In the traditional smart technology management system, all mechanisms are usually centralized, which leads to various inaccuracies and distortions in data collection. Blockchain, on the other hand, helps to maintain data transparency and ensures that all figures are preserved. The decentralization offered by blockchain is definitely its biggest advantage when it comes to smart agriculture. Therefore, companies are now emerging that offer their customers to connect smart agriculture and blockchain. An example of this is Filament, a brand that offers devices that can connect various networks to physical objects using smart agriculture technology. The company has developed coin-sized hardware to help people perform secure transactions on the blockchain.

Optimization of the food supply chain. Providing information about the origin of food products is essential to ensure customer loyalty and trust. Blockchain can essentially make any fruit or vegetable as safe to buy as the one grown on a local farm nearby. With traditional supply chains, food retailers have no effective way to ensure that all products are grown under the conditions specified by a given supplier. This is why retail giants such as Walmart, Unilever, and Carrefour are already using blockchain to trace the origin of food products. In addition, the time required to trace the origin of food is significantly reduced. For example, it took Walmart almost a week to track the origin of their mangoes. Thanks to blockchain, this time is reduced to only 2 seconds. If a product does not meet a retailer's standards, limiting the time it takes to trace the source of a product is crucial as it allows retailers to isolate that product faster, minimizing the risk of harm to people. For example, Ripe is a startup developing a transparent blockchain-based digital food supply chain that stores data on product quality.

Electronic trade in agricultural products. Blockchain in agriculture is uniquely positioned to help not only simplify transaction processes, but also level

the playing field for small farmers and large crop producers, especially those from poor regions. An estimated $ 940 billion worth of food is wasted globally each year. This is partly due to the fact that farmers and producers from less developed countries do not always have access to large markets, so they are unable to sell all of their produce. AgUnity is one of the blockchain startups that addresses this problem by giving small players access to their own blockchain-based platform to trade agricultural products and build trust between market participants. Their product allows individual market participants to create small cooperatives and work together.

Crop insurance. In agriculture, smart contracts have a unique application in the form of helping farmers insure their crops and claim damages from insurance companies. This is usually a very slow and cumbersome process for both the producer and the company that insures them. Due to unpredictable weather anomalies, it is difficult to correctly assess and quickly report the exact losses they cause. This leaves room for fraud and turns the process into an operational nightmare. By establishing individual blockchain smart contracts, a claim for damages can be triggered by changes in weather conditions that meet certain criteria, making the process easier for farmers and insurers. An example of such companies is Etherisc, a blockchain startup that offers crop insurance to farmers through its decentralized insurance programs.

To summarize the topic of blockchain in agriculture, it should be noted that in 2023, the size of blockchain innovations in the agricultural market is expected to grow to 430 million USD, which is an impressive 47,8 % annual growth rate compared to 41 million USD in 2017. Therefore, we can already conclude that blockchain is changing the way of doing business in the industry, reducing the risk of fraud, increasing the speed of transactions, helping farmers to monitor and analyze crops and much more.

Earlier we talked about the first transatlantic real estate transaction, but this is not the only example. In 2018, a voting system was tested in the NEM

blockchain test environment (28 nodes) in Ukraine. According to the experiment, the estimated cost of posting election results in the context of each polling station in the public NEM blockchain will be 8765 XEM = $ 1227. It is believed that this is a small fee for lifelong storage of socially important data.

In June 2022, Ukraine received observer status within the European Blockchain Partnership (EBP). This status makes it possible to use blockchain technologies to provide cross-border public services.

According to the leading blockchain analytical company Chainalysis, Ukraine ranked third in the ranking of the global index of crypto assets use in 2022.

> ***Questions for self-control:***
>
> 1. How is blockchain technology used in smart home management?
> 2. What is the sharing economy?
> 3. Identify the pros and cons of using centralized and decentralized blockchain solutions.

4.4. Cryptocurrency exchanges

A cryptocurrency exchange is a place where you can exchange regular, fiat money (dollars, hryvnias and euros) for cryptocurrency and back. Or sell one cryptocurrency for another.

Here a question may arise: What is the difference between an exchange and an exchanger? First of all, when you buy cryptocurrency in an exchanger, you do it directly from the exchanger and get a fixed rate that the exchanger sets daily.

And on a cryptocurrency exchange you:

– buy cryptocurrency from other users, like on a marketplace;

– you see all the offers to buy/sell from other users (this, by the way, is called

a “glass”);

– you can set the price for the purchase or sale of cryptocurrency yourself – your application will get into the “glass” and the transaction will take place when a counter offer is found.

If we draw an analogy with modern online trading, we can say that the exchanger is an online store, and the exchange is a marketplace.

Exchangers earn on the difference in rates plus commissions. They buy cryptocurrency on different platforms a little cheaper, then sell it a little more expensive.

The main income of the exchange is the commission from transactions. And the trades themselves and the inflow of cryptocurrencies are provided by traders. The exchange of currencies takes place between them, the exchange appears as an intermediary.

What else can you do on a crypto exchange besides currency exchange? Almost every self-respecting exchange has additional ways to earn money on cryptocurrency. For example, in a bank you can not only keep money and change currency, but also open a bank deposit.

The cryptocurrency world has its own earning tools, they are part of the world of DeFi – decentralized finance, that is, cryptocurrency.

On exchanges you can:

– keep fiat money and crypto on deposit and receive interest for it;

– lend money secured by cryptocurrency and receive interest for it.

Earn on arbitrage: trade on different exchanges and earn on the difference in rates. Deposit, transfer, withdraw to different wallets and bank accounts.

Exchanges mainly differ in one parameter – centralization. There are three types of crypto exchanges:

– traditional or centralized (CEX);

– decentralized (DEX);

– peer-to-peer (P2P).

How do centralized crypto exchanges differ from decentralized ones? The main difference is where users' cryptocurrency is stored. In a centralized exchange, all users' money is stored on the exchange. Such an exchange has access to your money – with all the risks and possible bonuses.

A centralized exchange is similar to a regular bank: if you want to buy dollars from a bank, you first deposit money into a bank account and only then convert them into dollars. Then you take them from the bank through the cash desk or ATM.

To start trading on a centralized exchange, you need to replenish your deposit, and then you can start trading. You can replenish your account on centralized exchanges by transferring from card to card, PayPal or in cash at the offices of the exchange.

The main advantage of a centralized exchange is that you can come there with fiat (real) money, for example, hryvnia, and buy cryptocurrency for it. In decentralized exchanges, only cryptocurrency can be exchanged.

You cannot trade anonymously on centralized exchanges. All centralized exchanges require KYC – passport verification, when you send them photos of the document and a selfie with it. This is how exchanges protect themselves from "dirty" cryptocurrencies that have been involved in the trade of illegal substances and even worse.

But KYC has its advantages – with a passport you can restore access to your wallet if you have lost your password. In any other wallets, the loss of the password and passphrase means that the money is gone forever.

Centralized exchanges are the easiest to use, so many beginners choose them. Examples of centralized exchanges:

– Binance (American);

– CoinBase (American);

– WhiteBit (Lithuanian with Ukrainian roots).

There are two types of commissions (and both are unavoidable):

1. *Network fee* – this is the commission of the blockchain network itself for executing a transaction. It always exists, for any cryptocurrency, for any wallet. All transactions in the blockchain are performed by miners (their devices literally record who transferred coins to whom) and this commission is your payment to the miner for burning electricity and performing your transaction.

2. *Service commission* – and this is the commission that each service (exchange, exchanger) bites off for itself and which you can influence by choosing an exchange with more favorable conditions.

What exchanges take money for:

– trading commissions – for cryptocurrency exchange;

– deposit replenishment fees;

– fees for withdrawing funds.

Advantages of a centralized cryptocurrency exchange:

– you can trade cryptocurrencies of different blockchains: for example, sell Bitcoin for USDT;

– you can work with fiat (hryvnia, dollars, euros);

– it is convenient to engage in arbitrage – a large spread of buy and sell offers at different prices;

– accrue interest on the storage of money in the accounts of the exchange;

– additional ways to earn money: for example, borrowing cryptocurrencies;

– there is technical support;

– you can restore the password by passport if you have lost the password.

Cons of a centralized cryptocurrency exchange:

1. If you store cryptocurrency on the exchange, then the exchange has access to your money. Exit – do not keep large amounts on the exchange wallet, use the exchange for trading.

2. Some exchanges have very high commissions. Way out – do not choose a greedy one.

3. Will have to upload your passport.

4. Brief description of the decentralized exchange.

5. Carries out crypto exchange between users without storing funds on their wallets. The exchange is managed by a smart contact – a special program in the blockchain that ensures the transaction and its reliability.

6. Works only for cryptocurrency, fiat funds (hryvnias, dollars, euros) are not suitable here.

7. A decentralized exchange does not require a deposit – you connect your crypto wallet and exchange with other users directly.

Continuing the analogy with a bank and buying foreign currency: if a centralized crypto exchange is a bank, then a decentralized one is an algorithm that combines a system of smart safes. Imagine that every home would have a smart safe that would store different currencies. And after pressing one button, part of your dollars would change to hryvnias – the exchange would take place directly between you and the owner of another safe. This is approximately how a decentralized crypto exchange works: using an algorithm, it instantly changes two cryptocurrencies in two user wallets.

The arrangement of smart contracts for the exchange of crypto between wallets allows you to change currency only within one blockchain network. This means that you can change Bitcoin to Ethereum because they operate on different blockchains. Most decentralized exchanges work on the Ethereum blockchain.

Conclusion: in order to start using a decentralized exchange, you will one way or another first have to go to either a centralized exchange or an exchanger to buy some cryptocurrency.

Pros of a decentralized cryptocurrency exchange:

1) your coins are stored with you: the exchange takes place directly between two wallets;

2) decentralized network is safer;

3) no human factor – everything is controlled by smart contracts;

4) you can trade anonymously.

Minsuis of a decentralized cryptocurrency exchange: on such an exchange, you cannot exchange cryptocurrencies from different blockchain networks – for example, you cannot exchange bitcoin for ether; if you forget your password and passphrase – no one will help you; the user interface may not be as intuitive as that of centralized exchanges; there is no technical support; there are only thematic communities where people in their free time can help you deal with the problem; you cannot enter with fiat money.

Separately, we can distinguish platforms for peer-to-peer (p2p) transactions. What distinguishes such platforms from a full-fledged crypto exchange is that there is no regulation on them – neither the company that provides the platform nor smart contracts guarantee the reliability of the transaction.

A bot for p2p crypto exchange is similar to the telegram chats that have recently emerged to sell dollars at the market price: it simply connects you with someone who is ready to sell or buy the specified cryptocurrency at a certain cost. And you make the deal yourself.

Trading is the purchase and sale of financial assets (instruments) on the stock exchange. Of course, any trade is impossible without analyzing the situation. As for trading on exchanges, such analysis is called Technical Analysis.

There are many indicators on the basis of which crypto traders develop their own strategies. Most of them are quite complex, but there are also effective strategies that have gained great popularity due to their simplicity. Further, we will talk about such strategies, which will be easy to understand for a beginner, but at the same time they will help in trading.

Technical indicators reflect real market indicators and help to determine key support/resistance levels, overbought/oversold, trend direction and much more. With the help of indicators, crypto traders can find optimal entry points into the market and receive signals to buy and sell cryptocurrency with a certain accuracy. Based on the indicators, traders create their own strategies. As a rule, the indicators used are combined for more accurate signals so that the trader can see

a more comprehensive picture of what is happening in the market. This eliminates unnecessary noise and allows you to get the necessary information faster and better.

As a rule, crypto exchange terminals contain pre-configured basic indicators that a trader can use in his trading, such as SMA (Slippery Averages), MACD, Volume and others. For example, Binance charts have 3 moving averages with different periods and a Volume indicator. MA indicators smooth out price fluctuations and calculate average price values, allowing you to understand in which direction the trend is currently directed. And the Volume indicator reflects the current market activity: how much buyers (bulls) or sellers (bears) prevail.

Traders can add, remove and customize the indicators they need according to their individual trading preferences. But for beginners, the standard settings will be enough – they are recommended by the creators of these indicators and are often used by professional traders. As you gain experience, you will learn to adjust the parameters for yourself. Next, we will look at popular trading strategies and explain how to use them in crypto trading.

Scalping is not the easiest strategy for beginner crypto traders, but with proper risk management, it can bring good results. The essence of scalping is to make many transactions during the day to make a small profit of up to several percent. However, cryptocurrencies are highly volatile assets, and their price can change by 10–50 % or more during one day. But this carries increased risks for traders, especially beginners.

Therefore, it is important for a trader to determine at least two key parameters: support/resistance levels and trend direction. With the help of support and resistance levels, a trader can determine at what moments it is best to open/close positions. When the price bounces from the lower boundary, it is a buy signal, and a bounce from the upper boundary is a sell signal.

Special attention should be paid to moving averages. The MA crossing can indicate both local and global trend changes. The Volume indicator will

additionally help to form a picture of the market and indicate bearish and bullish divergence. For example, if the indicator shows red, but it is green on the chart, it indicates that the strength of the bears is running out and the price is preparing for a breakout.

Since it is necessary to determine the direction of the trend and key support and resistance levels, trend indicators as well as volume indicators are suitable for trading: SMA, MACD, Parabolic SAR, RSI, Volume.

The trend can change at any moment and it is impossible to predict it. Therefore, it is important to make sure that trend indicators keep their direction.

Binance and many other popular platforms use charts of the popular tradingview.com service. To add an indicator to the chart, you need to click on it with the right mouse button and start entering the indicator name in the field. Then select the desired indicator in the list.

Another popular strategy among beginner traders is trend trading. In this case, you need to determine in which direction the price is moving at a given time. Trends can be local and global. Global trends are suitable for medium and long-term trading.

How to understand that the trend is uptrend? During an uptrend, the price moves in a staircase in a narrow channel and may slightly go beyond it. And, as a rule, each local minimum is higher than the previous one. The same is true for local highs.

So, when you have determined that the trend is directed upwards, it is necessary to identify key support and resistance levels – we will start from them. Accordingly, the support zone is suitable for opening long positions, and the resistance zone – for closing.

As you can see in the picture, the price of the cryptocurrency fluctuates in a narrow corridor. And local lows and highs are higher than the previous ones (in the screenshot, the lows are marked with white horizontal lines).

In a downtrend, a breakout of the resistance level will be a signal to start

trading. However, sometimes the breakout can be false. If the price after the breakout quickly retraced and returned to the initial position, it may indicate a false breakout. At this time, it is better to wait until the trend is clearly revealed. We will talk more about the strategy based on the breakout of levels in the next paragraph of the article.

What indicators to use? Since the strategy under consideration involves trading on the trend, it is logical to use trend indicators:

– MA (SMA, EMA, etc.);

– Stochastic RSI;

– MACD.

This strategy is used when a new trend has not yet formed, but the breakout of a key level may indicate its change. For a certain period of time, the price may bounce from support and resistance levels for a long time.

But sooner or later, the market forces prevail in the other direction: the price cannot move only in one direction. When the rate grows significantly, the buyers weaken and the bears are actively involved in the game. The opposite is also true.

How to determine that the trend may change? When approaching this moment, the price amplitude begins to decrease, that is, the price is in sideways movement or flat. The beginning of an uptrend can be indicated by the breakdown of the resistance level. Before that, sellers “push” the price closer and closer to the resistance level.

One of the characteristic signs of a trend change can be observed when the resistance level practically does not change, and the support level approaches it, closing the chart in the form of a wedge. At some point, the resistance level is broken and the price starts to grow, indicating the emergence of a new uptrend. It is important that the price does not immediately roll back to the previous level – this phenomenon is called a false breakout.

How to trade? There is no need to hurry and open a position immediately after the price has broken above the resistance level. It is necessary that the

condition is fulfilled: the newly formed support level must provide not lower than the previous resistance level. In this case, you can open a long and then trade the trend.

What indicators to use? Again, trend indicators are suitable here. But in addition to them, it is better to use momentum and volume indicators. The list of suitable indicators for the strategy for the breakout of key levels:

– MA (SMA, EMA, etc.);

– RSI;

– Parabolic SAR;

– Volume.

MACD (moving average convergence/divergence) is one of the most popular and simplest indicators in trading. It is the simplicity of its use that has caused such popularity of the indicator.

How to trade? The signal to buy cryptocurrency will be the crossing of the fast and slow MA lines below the zero level of the MACD. In this case, the fast moving average should cross the slow MA from the bottom up – this is what signals a price reversal to growth.

Accordingly, a sell signal will be the crossing of the slow MA from top to bottom. It is not necessary that this crossing is above the zero level of MACD.

What indicators to use? As we wrote earlier, two basic indicators with standard settings are enough for this strategy:

– MA (part of the MACD);

– MACD.

Not all trading strategies can be based on indicators, although they may imply their use as an additional tool. In periods of high volatility on the crypto market, there is often a difference between the quotes of different exchanges and in different trading pairs. The difference between quotes can reach 5 % or more.

Types of cryptocurrency arbitrage. There are two main types of crypto arbitration:

– inter-exchange;

– intra-exchange.

Inter-exchange arbitrage works like this:

1. Buy cryptocurrency on the first platform at a lower price.

2. Transfer coins to the second crypto exchange.

3. Sell at a higher price.

In this case, you need to calculate commissions when withdrawing cryptocurrency from the exchange and for the exchange. In addition, there are still risks that the cryptocurrency rate will change dramatically during a period of high volatility, and you will not only lose profits, but also suffer losses. This is especially true for cryptocurrencies such as Bitcoin and Ethereum: their blockchains have expensive and slow transactions that can take up to an hour or more. During this time, the rate can change a lot.

Intra-exchange arbitrage involves using an intermediate trading pair within the same exchange. The rate in different pairs can also vary greatly. An example of intra-exchange arbitrage:

1) exchanging BTC for ETH;

2) buying LTC for ETH;

3) selling LTC for BTC.

It turns out a kind of triangle. And here the profit is made with the help of the price spread. As a rule, the higher the liquidity, the lower the spread. But pairs such as LTC/ETH or BTC/LTC are less liquid, so the spread can be much higher, which opens up good opportunities for crypto arbitrage. But with lower liquidity, orders can take longer to execute – this is the main risk of intra-exchange arbitrage.

These are just some of the trading strategies used by beginners. There are many equally popular trading strategies based on Bollinger Band, Fibonacci levels, Parabolic SAR and other well-known indicators.

If you want to learn more about trading, trading strategies and new promising

directions, then subscribe to the official resources of Top Traders Academy.

Cryptocurrency lending is a lending process involving digital money. Individuals (creditors) can give their crypto-savings to other persons (crypto-exchanges, other enterprises) who need them at the moment. The loan is made at a certain interest rate, and there is also the nature of debt amortization (mainly depends on how long it will take to return the money and how the interest payment is structured).

For the lender, such activity has only advantages – his cryptocurrency is not just in the wallet, but works and brings passive income. Cryptocurrency landing is usually associated with margin trading lending and investments in landing programs. In the first type of lending, the lender lends the borrower money for margin trading and receives a certain percentage for their use.

The borrower provides his funds as collateral at the moment when he believes that the price of the coin will definitely move in a certain direction; this will allow him to increase the efficiency of trading. He borrows additional funds through an exchange that supports margin trading and undertakes to return them with interest after a certain amount of time. Secondly, the lender subscribes to an available landing page and receives interest on the deposit. The annual interest rate depends on the cryptocurrency used.

There are five main types of cryptocurrency lending on the market now:

1. Margin lending on exchanges The most common type. This is secured lending, in which traders borrow money on the exchange from other traders, hoping that the price of cryptocurrency will rise or fall in the near future. The option is not suitable for beginner traders, as it also increases the level of risk. But experienced ones actively use it. Cryptocurrency is usually provided as collateral; interest and limits vary from platform to platform. Margin lending is available on many major exchanges.

2. Bitcoin loans for collateral. This is a type of lending where a person can get direct peer-to-peer loans in Bitcoin using other assets as collateral. This type

of service differs from margin lending in details; in particular, it has fixed interest rates. Individuals set up their own loan offers with the desired interest rates and collateral at their own discretion. Borrowers research the market, find a suitable offer and respond to it. An example of such a service is BTCPOP, which has been operating since 2014.

3. Hybrid loans based on fiat and Bitcoin. These are loans that you take in fiat and return to BTC. The borrower gives, for example, US dollars, receives Bitcoins; If the price of Bitcoin rises during the loan period, he will need to return less, since the debt is calculated in fiat. This type of landing is used to minimize risks and those who hold cryptocurrency, but temporarily want to transfer part of it to fiat. One of the well-known platforms offering such services is the German Bitbond, a regulated microcredit marketplace operating in USD and EUR-backed zones. Requires mandatory proof of identity.

4. Cryptocurrency loans based on reputation. These loans work on the principle that lenders issue loans based on the personal reputation of borrowers. You can build a reputation in different ways – having a large amount of collateral, or a positive repayment history (both on the platform used and on some other platform, for example, eBay. A similar method is used on the already mentioned BTCPOP.

5. Fiat loans with cryptocurrency as collateral Allow individuals to give their BTC as collateral to obtain a loan in fiat funds, perhaps the most popular service of this kind is SALT, it uses its own cryptocurrency, SALT tokens, they are purchased for one of five cryptocurrencies or two stablecoins, and then in return. you can get fiat.

Advantages and disadvantages of cryptocurrency landing pages:

1. Pros:

– the possibility of cryptocurrency earnings on free funds held as investments;

– many platforms allow you to choose an investment plan or customize the

investment criteria to get the maximum benefit with your financial capabilities;

– for developers, landing pages can be a good way to promote little-known tokens;

– it is often more profitable than using traditional bank deposits. The average yield on landing per year can be about 10–12 %.

Landing is also popular because you can lend not only cryptocurrencies but also fiat funds.

2. Cons:

– a small selection of offers;

– there are limits on deposits;

– many fraudulent sites that simply close without returning funds to users.

In the case of landing, the guarantor for the lender is the exchange, which provides loan servicing, monitors the timely liquidation of traders' positions so that the lenders' funds remain safe. In the history of crypto trading, due to technical aspects, there have been cases of loss of funds used for margin collateral, but since the reputation of exchanges is extremely important, and a massive outflow of users will immediately affect the earnings of the exchange itself, such losses have always been reimbursed at least over time.

Yield farming is the process of obtaining additional profit (usually in the form of control tokens) by users of DeFi protocols for granting or receiving loans, as well as for providing liquidity to decentralized exchanges (DEX).

The first successful project in the field of farming is considered to be a decentralized derivatives platform. Synthetix, but the boom in profitable farming began after the launch of the Compound protocol control token (COMP). With the help of its distribution, the project attracted many liquidity providers and the price of the token increased significantly. Almost immediately, other projects followed Compound's example.

Types of earnings on profitable farming. Earnings on interest through borrowing funds. Both receiving and granting a loan involve placing the

participant's funds in a liquidity pool either as collateral or as a deposit. The farmer registers with the project that issues loans and transfers the funds to another user who applies for a loan subject to further payment of interest. The farmer's income is the bonus tokens received along with the loan interest.

The liquidity pool is a smart contract on decentralized exchanges (DEX) based on automated market making (AMM) technology. During trading, the ratio of tokens in the pool changes, as well as the price of tokens. For example, a user purchases 100 ETH using the ETH/USDT pool. The volume of USDT in the pool increases, and the volume of ETH decreases. At the same time, the price of ETH increases.

The liquidity-providing participant receives two types of coins: lucrative LP tokens, which serve as a share and confirmation that liquidity has been provided to the pool and are "burned" in the blockchain when liquidity is withdrawn; and bonus tokens of DEX or DeFi protocols, which are rewards for activity.

The pool can incentivize participants to provide more liquidity on a particular asset through an increased reward in bonus tokens. The pool's profit commission is distributed in proportion to the funds that participants place.

The farmers sell the bonus tokens on the exchange in exchange for the underlying liquidity, which is again supplied to the specific pool and the participants are again awarded bonus tokens. Such manipulations take place as long as they remain profitable, overlapping trading commissions and fees of the Ethereum network.

How to calculate the profit from profitable farming? Profit from profitable farming is calculated in the form of annual interest, like in a bank. The most common metrics are the annual percentage rate (APR) and the annual percentage yield (APY). The difference between them is that APR does not take into account the accrual of compound interest. In this case, the accrual of compound interest means direct reinvestment of income in order to obtain greater profit.

What are the risks associated with profitable farming? Among the main risks

associated with pharming are errors and vulnerabilities in smart contracts, fraud, token crash due to inflated profitability or economic insolvency of the project as a whole. Smart contracts. In the DeFi sector, many protocols are developed by small teams with a limited budget, which increases the risk of bugs and vulnerabilities in the code. High fees in Ethereum, which can make pharming operations unprofitable.

Withdrawal of funds from liquidity pools. Any user of the DeFi platform can withdraw their liquidity from the market, except for those scenarios when it is blocked by a third party mechanism. In addition, in most cases, developers manage large amounts of underlying assets and can dump these tokens on the market.

AMMs operate on the basis of constant token value functions in liquidity pools. Due to price changes in external markets, quotes in AMMs may diverge from them, which is used by arbitrageurs. At withdrawal, liquidity providers may receive fewer tokens due to the risk of volatile losses.

Questions for self-control:

1. Applications for medical use with blockchain technology.
2. The use of blockchain technologies in the concept of smart agriculture. Optimizing the food supply chain using blockchain technology.
3. Use of blockchain technologies in electronic trade of agricultural products and crop insurance.

4.5. Ecosystems of cryptocurrency exchanges

Binance is an ecosystem that includes a centralized cryptocurrency exchange with the world's largest trading volume, the BNB Chain blockchain platform, a training center, investment and charitable funds, an NFT marketplace and other

products.

The first and main product of Binance is the cryptocurrency exchange, which began operating in 2017. It offers various tools: spot trading in digital assets and leveraged transactions, derivatives, a section for P2P exchange. In addition, users have access to the possibility of passive earnings on cryptocurrencies through staking and farming, the function of issuing a debit card and other services.

According to the official website, as of April 2022, Binance supports more than 600 crypto assets and more than 40 fiat currencies. The platform has 90 million registered users.

Binance does not disclose financial data. However, according to various estimates, its revenue in 2021 ranged from $ 14,6 billion to $ 20 billion. According to media reports, in 2021, the company's own valuation was $ 200 billion. The exact number of Binance employees is also unknown, but at the beginning of 2022, the project's CEO Changpeng Zhao said that the remote staff of employees numbered about 4000 people.

The founder of Binance – Changpeng Zhao was born in the Chinese city of Jiangsu, then moved with his parents to Canada, where he graduated from McGill University. After graduation, he completed an internship at the Tokyo Stock Exchange, where he developed software for high-frequency trading. Then he worked for Bloomberg for several years. In 2005, Zhao founded his first company, which was engaged in the development of high-frequency trading algorithms. In 2017, Zhao founded Binance and since then has served as its CEO and is its largest shareholder. In 2022, Changpeng Zhao became the leader of the ranking of the richest representatives of the blockchain industry, compiled by Forbes. The publication estimated his fortune at $ 65 billion.

An interesting feature of Binance is that it guarantees users a refund in case of large-scale hacking of the exchange. For this purpose, in 2018, the company opened a special fund called Secure Asset Fund for Users (SAFU). In particular, the stolen cryptocurrencies worth $ 40 million were compensated from it in 2019.

SAFU receives a share of the commissions paid by users. According to official data, as of the end of January 2022, the size of the fund was $1 billion. The fund is kept in BNB, BUSD and BTC.

At the end of 2021, Binance launched a $ 1 billion fund to support BNB Chain. The developers intend to bring the total number of users of applications based on this blockchain to 1 billion people.

The main products of the Binance ecosystem are:

1. PancakeSwap is a decentralized exchange (DEX) that operates on the basis of an automatic market-making mechanism. Ranks third in terms of trading volume among DEX.

2. Venus is a protocol for creating decentralized markets and issuing tokens and algorithmic stablecoins.

3. Era7: Game of Truth – a tactical strategy using NFT cards.

4. Cream – a landing protocol with the ability to borrow tokens issued in the BNB Chain.

5. Biswap – a decentralized exchange.

6. BNB is a native coin of the Binance ecosystem. It is in the TOP-10 by capitalization. Works in the BNB Chain network.

The main ways to use BNB:

– discounts on trading fees for transactions in Binance;

– payment of commissions for transactions in BNB Chain;

– staking;

– payment for services and goods in some services and online stores;

– participation in tokensales on Binance Launchpad;

– payments with Binance Visa Card;

– using liquidity pools and decentralized protocols on the BNB Chain;

– donations to Binance Charity.

BNB Chain is an EVM-compatible blockchain launched by Binance in 2019. In February 2022, it became a single blockchain platform after the merger of BNB

Beacon Chain (formerly Binance Chain) and BNB Smart Chain (formerly Binance Smart Chain). BNB Chain works on the Proof-of-Staked_Authority consensus algorithm and is focused on the operation of decentralized applications with a large number of users. The main directions of the network development are decentralized finance (DeFi), non-fungible tokens (NFT), games on the blockchain (GameFi) and meta universes (MetaFi).

Binance USD (BUSD) is a stablecoin project founded by Binance and the American company Paxos. The asset price is pegged to the US dollar in a 1:1 percentage ratio. BUSD ranks fourth in terms of capitalization among stablecoins. It works in the BNB Chain and Ethereum network.

The stability of the BUSD price is provided by dollar reserves on the account of a special company operating in the United States. It is regulated by the New York State Department of Finance and is audited monthly. The amount of reserves corresponds to the number of Binance USD stablecoins in circulation.

In addition to the crypto exchange, the Binance ecosystem includes the following products:

1. Binance Labs is a business incubator designed to support entrepreneurs, projects and communities in developing blockchain startups using the BNB Chain. Currently, there are more than 120 projects in the Binance Labs portfolio.

2. Binance Academy is a training portal with a database of educational articles and videos about digital asset trading, blockchain technologies, projects and companies.

3. Binance Charity Foundation – a non-profit charitable organization that implements a number of charitable programs in the field of poverty alleviation.

4. Binance Launchpad – an exclusive platform for tokensales. Among the major projects that have been launched on Binance Launchpad are: Axie Infinity, The Sandbox and Celer Network.

5. Binance Research is a cryptocurrency market research and analysis department that releases research and provides professional data.

6. Binance NFT is a trading platform that features all kinds of digital artwork and collectibles.

7. Binance Card is a cryptocurrency debit card of Visa system.

8. Binance Pay is a cross-border cryptocurrency transfer service.

9. Binance has also acquired several crypto projects that continued to operate, while maintaining their brand and autonomy.

10. CoinMarketCap – the most visited aggregator of data on trading in digital assets.

11. Trust Wallet – a cryptocurrency wallet with support for a large number of digital assets.

12. WazirX is the largest crypto exchange in India.

Uniswap is a decentralized protocol for trading cryptocurrencies based on smart contracts, which operates on the Ethereum network and is one of the top five DeFi applications in terms of blocked funds. Uniswap was the first project to implement an automated market maker and liquidity pools.

The author of the Uniswap protocol is Hayden Adams. In the summer of 2017, he resigned from Siemens, where he worked as a mechanical engineer after graduating from college. On the advice of his friend Karl Flersch, who was then working at the Ethereum Foundation, Adams began to learn how to develop smart contracts.

A few months later, Carl suggested that Adams create an application for trading digital assets that would use the Automated Market Maker (AMM) mechanism.

The idea of AMM on Ethereum was first proposed by the developer of the Gnosis project Alan Liu. His colleague Martin Koppleman passed the concept on to Vitalik Buterin, who publicized it on Reddit in 2016 and on his personal blog.

In August 2018, Adams received a $ 100,000 grant from the Ethereum Foundation to implement the concept.

In the creation of Uniswap, Adams was assisted by Microsoft and Google

developer Kallil Capuozzo, programmers Uchiel Wilchis, Philip Dayan, Dan Robinson, Andy Milenius and others.

By March 2018, the developers presented a demo version of Uniswap. On November 2, 2018, the full version of the protocol was launched. Presenting Uniswap, Adams listed its main characteristics: “There is no central token or platform fee. No special treatment for early investors, users or developers. The token listing is free. All smart contract features are open, they can be improved”.

Adams originally wanted to name the protocol Unipeg – a derivative of the words Unicorn and Pegasus. When Karl Flersch first told Vitalik Buterin about the project, he said: “Nipeg? Uniswap sounds better”. Adams agreed with the proposal.

How does Uniswap work? The Uniswap protocol includes a series of smart contracts that allow any user to trade directly with each other on the Ethereum blockchain. Technically, it is a decentralized exchange (DEX).

Uniswap is a publicly available tool that distributes rewards among liquidity providers. Providers support the exchange by locking tokens, which allows other users to trade in a decentralized system.

The platform does not require registration and KYC and AML procedures. To use it, you only need a browser wallet with support for the Ethereum network, such as MetaMask.

Since Uniswap is a decentralized project, it does not have an administration that selects new cryptocurrencies for listing, as on centralized exchanges. Anyone can add a new ERC-20 asset on Uniswap.

To do this, you need to open a liquidity pool – a separate market for a particular trading pair. To open a pool for a new token, you need several new tokens, as well as the base currency of the ERC-20 standard for the same amount.

Uniswap does not connect sellers and buyers to set the price of digital assets, but uses the equation: $x \times y = k$. In the equation, x and y represent the number of tokens available in the liquidity pool; k is a constant value.

Based on the balance between the tokens in the pair, as well as between supply and demand, the equation calculates the price of a particular token. This pricing and quoting mechanism is called an automated market maker (AMM).

Each token has its own smart contract and at least one liquidity pool. Any Uniswap user can trade this coin or deposit funds into the liquidity pool, receiving a reward from the fees.

Each time new tokens are added to the Uniswap liquidity pool, the user receives an ERC-20 pool token (LP). Pool tokens can be exchanged, moved and used in other decentralized applications.

When the funds become in demand, the pool tokens are burned. Each such token represents the user's share of the total pool assets. It also allows the holder to receive a proportional share of the exchange fees that the pool collects.

Uniswap v2. In April 2019, the project team raised more than $ 1 million in an investment round led by Paradigm Investment Company. These funds were used to create the second version of Uniswap (Uniswap v2) with a number of new features.

If in the first version of the protocol, a new asset could only be placed in a pair with ETH, then in Uniswap V2, any ERC-20 token can be placed in a pool with any other asset of this standard. In the main contracts, Wrapped Ether (WETH) is used instead of ETH, although end users can use ETH through ancillary contracts.

If two ERC-20 tokens do not form a direct pair and do not have a common pair with each other, their swap is possible as long as there is a path between them. Router Contracts are used to optimize direct and multi-step swaps.

Improved control of quotes.

Uniswap v2 provides improved control of quotes through the use of oracles. Instant swaps. Instant swaps provide the ability to withdraw any number of coins to make, for example, arbitrage and margin trading operations.

What is UNI token? UNI is a governance token designed to participate in the

Uniswap governance system, in particular for voting. The project authors suddenly announced its release in September 2020.

They decided to distribute tokens in an unusual way. Instead of a tokensale, the project team decided to conduct an airdrop: they credited a fixed amount of UNI to each user of the decentralized exchange who has ever performed any actions on it.

Immediately after the issue, the value of Uniswap (UNI) increased several times, and it entered the TOP 50 cryptocurrencies by capitalization. According to CoinMarketCap, in early May 2022, the total capitalization of this digital asset exceeds $ 7 billion, traded on all leading cryptocurrency exchanges.

Development of Uniswap.

As of the beginning of May 2022, Uniswap remains one of the main DeFi projects: it ranks fifth in the DeFi Pulse ranking in terms of blocked funds with an indicator of $ 7 billion.

In December 2020, Uniswap managed to gather a quorum to make the first decision. Community members approved a grant program for the development of the ecosystem using UNI tokens.

In May 2021, exactly a year after the presentation of the second version, the third version of the decentralized exchange – Uniswap v3 – was launched. It provides radically new features and components, including concentrated liquidity, limit range orders and multiple positions within one pool.

Shortly thereafter, Uniswap users supported the launch of the Ethereum network protocol of the second-tier Arbitrum solution. In July of the same year, the decentralized exchange launched an alpha version of the platform on the main network Optimistic Ethereum. At the end of the same year, Uniswap was deployed on the Polygon network.

Under pressure from regulators in the summer of 2021, Uniswap stopped trading 129 tokens in its interface due to the “evolving regulatory landscape”. Since April 2022, the exchange has been blocking users who are under sanctions.

In the spring of 2022, the project team launched Uniswap Labs Ventures, a venture capital arm to invest in Web3 products.

Uniswap v3. What distinguishes the new version of Uniswap from the previous one is the emphasis on capital efficiency made through the concept of concentrated liquidity. Liquidity providers (LPs) are now able to choose a specific price range for providing funds to the pool.

This will allow market participants to concentrate liquidity where most trading activity takes place. As a result, LPs can increase the return on capital by allocating free funds to other pools and investment instruments. This approach allows for better risk diversification.

Uniswap v3 also introduces the concept of active liquidity. If the price moves out of the LP's assigned range, liquidity is effectively removed from the pool, ceasing to generate commission income.

When this happens, the liquidity flows entirely into one of the assets in the pool. At this point, the LP can either wait for the price to return to a given range or change the price range to a more relevant one.

Uniswap has also introduced a new order type – Range Limit Orders. It allows LPs to allocate tokens of the same type to a certain range above or below the current market price. When the price enters the range specified by the user, one asset is sold for the other. When using this feature within a narrow range, you can achieve an effect similar to using a standard limit order.

Also with the new release, multiple positions have appeared in the protocol: LPs can provide liquidity to the same pool according to different price ranges, which may overlap with each other.

Uniswap v3 provides for a three-tier structure of liquidity provider fees with rates of 0,05 %, 0,3 % and 1 % per transaction. The company expects that commissions of 0,05% will be used mainly for pairs with stablecoins. The 0,3 % tariff will be used in pools like ETH/DAI, and 1 % – for trading much more volatile pairs with low-liquid assets.

Questions for self-control:

1. Do you know about examples of the application of blockchain technologies in your country?
2. Is there a regulatory basis for the use of blockchain technology in your country?
3. What are the prospects for using blockchain technology in 10 years?

References:

1. Bagranoff, N., Simkin, M., Norman, C. (2010), Core Concepts of Accounting Information Systems.

2. Cai, C. (2019), Triple-entry accounting with blockchain: How far have we come? Accounting and Finance 61(2). DOI: http://dx.doi.org/10.1111/acfi.12556.

3. Corbett, J.C., Dean, J., Epstein, M., Fikes, A., Frost, C., Furman, J.J., Ghemawat, S., Gubarev, A., Heiser, C., Hochschild, P., Hsieh, W.C., Kanthak, S., Kogan, E., Li, H., Lloyd, A., Melnik, S., Mwaura, D., Nagle, D., Quinlan, S., Rao, R., Rolig, L., Saito, Y., Szymaniak, M., Taylor, C., Wang, R., Woodford, D. (2013), Spanner: Google's globally distributed database, ACM Trans. Comput. Syst. 31 (3) 8:1-8:22, [Online], available at : https://dl.acm.org/doi/pdf/10.1145/2491245.

4. Dai, J., Vasarhelyi, M. (2017), Toward Blockchain-Based Accounting and Assurance. Journal of Information Systems (31) 3, 5-21. DOI: http://dx.doi.org/10.2308/isys-51804.

5. Deloitte (2016), Blockchain: Enigma, Paradox, Opportunity, [Online], available at : https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-blockchain-full-report.pdf.

6. Diffie, W. (1988), The first ten years of public-key cryptography. Proceedings of the IEEE 76 (5): 560–577. DOI: https://doi.org/10.1109/5.4442.

7. Fanning, K., Centers, D.P. (2016), Blockchain and its coming impact on financial services. Journal of Corporate Accounting and Finance 27 (5): 53–57.

DOI: https://doi.org/10.1002/jcaf.22179.

8. Grabchuk, I. (2018), Orhanizatsiya zakhystu oblikovoyi informatsiyi v umovakh hibrydnoyi viyny (ukr.). Problemy teoriyi ta metodolohiyi bukhhalters'koho obliku, kontrolyu i analizu, (3(41), 20–24. DOI: https://doi.org/10.26642/pbo-2018-3(41)-20-24.

9. Grigg, I (2005), Triple Entry Accounting. Systemics, Inc., [Online], available at : http://iang.org/papers/triple_entry.html.

10. Grigg, I (2011), Is Bitcoin a Triple Entry System?, [Online], available at : http://financialcryptography.com/mt/archives/001325.html.

11. Hitt, L.M., Wu, D.J., Zhou, X. (2002), Investment in enterprise resource planning: Business impact and productivity measures. Journal of Management Information Systems 19 (Summer): 71–98.

12. Ijiri, Y. (1986), A framework for triple-entry bookkeeping. The Accounting Review 61 (4): 745–759.

13. ISO/IEC 27002:2022. Information security, cybersecurity and privacy protection – Information security controls, [Online], available at : https://www.iso.org/ru/standard/75652.html.

14. Jacynycz, V., Calvo, A., Hassan, S., and Sa'nchez-Ruiz, A.A. (2016), Betfunding: A distributed bounty-based crowdfunding platform over Ethereum. In Distributed Computing and Artificial Intelligence, 13th International Conference, 403–411, [Online], available at : https://link.springer.com/chapter/10.1007/978-3-319-40162-1_44.

15. Kiviat, T.I. (2015), Beyond Bitcoin: Issues in regulating blockchain transactions. Duke Law Journal 65: 569-608.

16. Kokoris-Kogias, E., Jovanovic, P., Gasser, L., Gailly, N., Syta, E., Ford, B. (2018), Omniledger: A secure, scale-out, decentralized ledger via sharding. IEEE Symposium on Security and Privacy, SP 2018, Proceedings, 21–23 May, San Francisco, California, USA, pp. 583–598.

17. Kuhn, J.R., Sutton, S.G. (2010), Continuous auditing in ERP system

environments: The current state and future directions. Journal of Information Systems 24 (1): 91–112. DOI: https://doi.org/10.2308/jis.2010.24.1.91.

18. Law, C.C., Ngai, E.W. (2007), ERP systems adoption: An exploratory study of the organizational factors and impacts of ERP success. Information and Management 44 (4): 418–432. DOI: https://doi.org/10.1016/j.im.2007.03.004.

19. Luu, L., Narayanan, V., Zheng, C., Baweja, K., Gilbert, S., Saxena, P. (2016), A secure sharding protocol for open blockchains. Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security, Vienna, Austria, October 24–28, pp. 17–30.

20. Muravskyi, V. (2021), Accounting and cybersecurity: Monograph. ISBN: 978-0-578-33183-6.

21. Nakamoto, S. (2008), Bitcoin: A Peer-To-Peer Electronic Cash System, [Online], available at : https://bitcoin.org/bitcoin.pdf.

22. Pacioli, L. (1514), Paciolo on Accounting (Summa de Arithmetica, Geometria, Proportioni e Proportionalita: Distintio Nona – Tractatus XI, Particularis de Computis et Scripturis), translated by Brown, R.G., and K.S. Johnson. New York, NY: McGraw-Hill.

23. Peters, G.W., Panayi, E. (2016), Understanding modern banking ledgers through blockchain technologies: Future of transaction processing and smart contracts on the Internet of Money. In Banking Beyond Banks and Money, 239–278. New York, NY: Springer International Publishing.

24. Pilkington, M. (2016), Blockchain Technology: Principles and Applications, [Online], available at : https://papers.ssrn.com/sol3/papers.cfm?abstract_ id=2662660.

25. Rainer, R. Kelly, Prince, B., Cegielski Casey, G. (2014), Introduction to Information Systems 5th Edition. ISBN-10: 1118988531.

26. Sangster, A. (2016), The genesis of double entry bookkeeping. The Accounting Review 91 (1): 299–315. DOI: https://doi.org/10.2308/accr-51115.

27. Swan, M. (2015a), Blockchain: Blueprint for a New Economy. Boston,

MA: O'Reilly Media, Inc.

28. Swan, M. (2015b), Blockchain Thinking: The Brain as a DAC (Decentralized Autonomous Organization). Presented at the Texas Bitcoin Conference (March 27–29), [Online], available at : https://www.researchgate.net/publication/292391320_Blockchain_thinking_The_brain_as_a_dac_decentralized_autonomous_organization.

29. Szabo, N. (1994), Smart Contracts, [Online], available at : http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html.

30. Tyra, M.J. (2014), Triple Entry Bookkeeping with Bitcoin, [Online], available at : https://bitcoinmagazine.com/articles/triple-entry-bookkeeping-bitcoin-1392069656.

31. Wang, J., Wang, H. (2019), Monoxide: Scale out blockchains with asynchronous consensus zones. 16th USENIX Symposium on Networked Systems Design and Implementation, NSDI 2019, Boston, MA, February 26–28, pp. 95–112.

32. Wright, A., De Filippi, P. (2015), Decentralized Blockchain Technology and the Rise of Lex Cryptographia. Working paper, [Online], available at : https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2580664.

33. Yermack, D. (2017), Corporate governance and blockchains. Review of Finance (forthcoming). DOI: https://doi.org/10.1093/rof/rfw074.

34. Yizhong, L., Jianwei, L., Marcos, A., Zongyang, Z., Tong, L., Bin, H., Fritz, H., Rongxing, L. (2021), Building Blocks of Sharding Blockchain Systems: Concepts, Approaches, and Open Problems. DOI: https://doi.org/10.48550/arXiv.2102.13364.

35. Zamani, M., Movahedi, M., Raykova, M. (2018), Rapidchain: Scaling blockchain via full sharding. Proceedings of the 2018 ACM SIGSAC Conference on Computer and Communications Security, CCS 2018, Toronto, ON, Canada, October 15–19, pp. 931–948.

UDC 004.330.1

Ganna IEFIMOVA, Doctor in Economics, Professor
Oleksiy PASHCHENKO, PhD in Economics, Associate Professor
Viacheslav IVATA, PhD in Economics, Associate Professor
Liliya FILIPISHYNA, Doctor in Economics, Professor
Admiral Makarov National University of Shipbuilding,
9, Geroiv Ukrainy av, Mykolaiv, 54007, Ukraine
Olena KHADZHYNOVA, Doctor in Economics, Professor
Pryazovskyi State Technical University,
19, Dmytro Yavornytskyi Avenue, Dnipro, 49005, Ukraine

Chapter 5
DIGITAL PERFORMANCE IN BUSINESS AND ECONOMICS

Content

5.1. Digital efficiency and its importance for business and economy

The development of information and computer technology (ICT) is characterized by rapid technical progress, which has rapidly reduced the prices of ICT products, ensuring that the technology can be applied in all sectors of the economy at a low level of costs. In many cases, falling prices caused by advances in technology and the demand for constant innovation have influenced many of the key technologies that have fuelled the growth of the digital economy.

The digital economy has given rise to several new business models. Although many of these models have parallels in traditional business, modern

advances in ICT have allowed business to grow on a much larger scale and spread over greater distances than was previously possible. Some of these business models can complement each other, and in some cases combine with each other (for example, payment for services can be combined with e-commerce or cloud computing). While innovation in the digital economy is fuelling the rapid development of new business models, it can also rapidly render existing companies obsolete.

Business models of the digital economy

Electronic commerce. Electronic commerce or e-commerce in a broad sense is defined by the OECD Working Group as "the sale or purchase of goods or services carried out over computer networks by methods specially designed for the purpose of receiving or placing an order. <…> An e-commerce transaction can be between businesses, households, individuals, governments, and other public or private entities".

E-commerce can be used either to facilitate the ordering of goods or services, which are then delivered through conventional channels (indirect e-commerce), or to complete ordering and delivery electronically (direct e-commerce). Although e-commerce covers a wide range of businesses, in general, several types can be distinguished among them:

1. B2B (business-to-business) models. Most of the e-commerce consists of transactions in which a business sells goods or services to another business (the so-called business-to-business (B2B) model). This may include online versions of traditional operations in which a wholesaler buys lots of goods over the Internet and then sells to consumers from retail outlets. It may also include providing goods or services to support other businesses, among them:

– logistic services (transportation, storage and distribution);

– application services (deployment, placement and management of software from a central facility);

– outsourcing services (e-commerce support functions, web hosting, cyber

security, supervision);

– services of performing auction operations in real time via the Internet;

– website content management services;

– services for providing online shopping opportunities.

2. B2C (business-to-consumer) models. Business-to-consumer (B2C) models are among the oldest forms of e-commerce. A business operating in a B2C business model sells goods or services to individuals. B2C models fall into several categories, including:

– "pureplay" providers on the Internet (without physical stores or offline presence);

– "clicks-and-mortar" businesses that have added online sales to their existing business, and manufacturers that use their online business to allow customers to order directly.

The goods or services sold by the B2C company can be tangible (for example, CDs with music) or intangible (that is, received by consumers in an electronic format). With the digitization of information, including text, sound and visual images, an increasing number of goods and services can be delivered digitally to customers who are increasingly distant from the seller. B2C e-commerce can dramatically shorten supply chains in many cases, eliminating the need for many wholesalers, distributors, retailers and other intermediaries to use traditional material flows. In this case, intermediation of B2C business usually involves large investments in advertising and customer service, as well as in logistics. B2C reduces operational costs (especially search costs) by increasing consumer access to information.

It also lowers barriers to entry, as the cost of maintaining a website is generally lower than running a traditional retail store.

3. C2C (consumer-to-consumer) models. Consumer-to-consumer (C2C) transactions are becoming more common. C2C e-commerce businesses act as intermediaries that help individual consumers sell or lease their assets (such as

residential real estate, cars, motorcycles, etc.) by publishing their information on a website and facilitating transactions. These enterprises can charge the consumer of these services. This type of e-commerce exists in several forms, in particular:

– auctions organized on the portal, which allows for online bidding on items for sale;

– single-level systems that allow file exchange between users;

– ad portals that offer an interactive network on the Internet for negotiations between buyers and sellers.

The Internet facilitates operations such as ordering goods and services. This means that many operations that took place without the Internet can be carried out more efficiently and at lower costs. In addition, the Internet has expanded the scope of activities of small and medium-sized businesses, giving them the opportunity to enter markets where they would not have been able to enter without the Internet. As a result, the number of firms carrying out business operations has increased dramatically over the last decade.

Payment services. Payment for online transactions traditionally requires the transfer of certain funds, such as through a bank account or credit card. Accordingly, making a transaction requires information about the supplier and a high level of trust in him. This is not always possible in the case of an unknown supplier, especially in the case of C2C transactions. Online payment service providers help solve this problem by providing a secure way to make payments online without requiring the exchange of financial information between transaction parties.

A payment service provider acts as an intermediary (typically using a software-as-a-service model) between online buyers and sellers, accepting payments from buyers using various payment methods, including credit card payments or real-time bank payments, processing those payments, and depositing funds into an account seller.

Electronic payment systems have a number of advantages for users:

– protection against fraud, as the seller and the buyer do not exchange confidential information;

– faster payment delivery compared to traditional payment methods;

– in many cases, the ability to perform transactions in several currencies.

Payment service providers usually charge a fee for each completed transaction, which can be either a flat fee or a percentage of the transaction value, although some payment service providers also charge monthly fees or set-up fees for certain additional services.

However, several other alternative payment options are also used on the Internet, including:

1) ***solutions for cash settlements*** – the customer makes purchases online and pays in cash using a barcode or payment code at participating stores. Used when merchants offer a payment method that customers do not want to use online to make online purchases, but want to pay in a safe place and in a secure way;

2) ***electronic wallets or cyber wallets*** – is an alternative to using a credit card. They are often used for micropayments because it is not economically viable to use credit cards for frequent small payments;

3) ***solutions for mobile payments*** – cover all types of technologies that enable payment using a mobile phone or smartphone, in particular, mobile card data processing using connected smartphone card readers, in-app payment for virtual products and on-site, short-range wireless technologies for information exchange.

The digital economy has also spawned virtual currencies, discussed earlier, that can be used to buy goods and services from businesses that agree to accept them, as an alternative to paying for the service.

Application stores. The growth of Internet access via smartphones and tablets has increased and led to an increase in the use of online services and the development of app stores – digital distribution platforms for software that is often provided as a component of the operating system. Application stores typically take

the form of centralized platforms accessible through a consumer's device through which the consumer can browse information and reviews about software products, purchase, automatically download, and install the application on their device.

The availability of software stores changes. Some app stores are only available to consumers with certain devices. These stores may represent the only way for users of this device to obtain applications. There are stores available to consumers of any device using a certain operating system. Others may be used by consumers with service contracts with a specific mobile network. Finally, some others are freely available and do not depend on the type of device, proprietary software or service provider.

Applications can be downloaded for free or for a fee. Free apps may be ad-supported. In addition, there are applications that move to the "freemium" model, in which the basic functionality is provided for free, but customers can pay for additional content or features. Typically, an app store hosts apps created by developers in multiple countries. Additionally, many app stores target customers in specific geographic markets. However, there is often a cross listing of apps in multiple stores targeting multiple geographies. The use of app stores continues to grow rapidly.

Advertising on the Internet. Online advertising uses the Internet as a means of targeting and delivering marketing messages to customers. Internet advertising offers a few advantages over traditional advertising. For example, many online advertisers have developed sophisticated consumer segmentation techniques that allow more precise targeting of ads. Many online advertisers have also developed ways for clients to track ad performance by observing how users interact with their brands and learning what current and potential customers are interested in. Advertising on the Internet comes in many forms, but mainly this:

– display ads, in which the advertiser pays to display ads related to certain content or user behaviour;

– search engine ads, in which the advertiser pays to appear in Internet search

results.

Internet advertising covers a number of players including:

– web publishers who agree to integrate advertising into their online content in exchange for compensation;

– advertisers who produce advertisements for display on content and ad networks;

– web publisher intermediaries that connect web publishers with advertisers to reach online audiences.

Ad network intermediaries include a range of players, including search engines, media companies and technology providers. These networks are supported by exchanges of customer data collected through online tracking and content providers. This data can be analysed, combined and processed by specialized data analysers into a user profile.

In advertising business models, content publishers are often content publishers willing to offer free or subsidized services to consumers to ensure a large enough audience to attract advertisers. The most successful advertising comes from companies that combine a large user base with calibrated algorithms for collecting, analysing and processing data from these users, which allows for targeted advertising. While traditional advertising involved paying for ad exposure over a period, with little control over visibility or user response, online advertising has given rise to a number of new payment and billing methods, including:

– "cost per thousand" (CPM), in which advertisers pay for a thousand impressions of their message to users;

– "cost per click" (CPC), where advertisers pay only when users click on their ads;

– "cost per action" (CPA), in which advertisers pay only for a specific action (such as a purchase) performed by a user.

Internet advertising is growing rapidly both in terms of total revenue and in

terms of share of the total advertising market.

Cloud computing. Cloud computing is the provision of standardized, on-demand computing services over the Internet that may include computing, data storage, software, and data management using shared physical and virtual resources (including networks, servers, and applications).

Since the service is provided online using the ISP's hardware, users can usually access the service using different types of devices wherever they are, provided they have a suitable internet connection.

The resources accessed by cloud computing clients are not stored on the same computer. Instead, they reside in networks of computers available to anyone with access to that "cloud" of computing resources (which, depending on the cloud, may be unique to an organization, a community of organizations, the general public, or a combination of these).

Cloud computing often provides customers with a cost-effective alternative to purchasing and maintaining their own IT infrastructure, as the cost of consumer resources is typically spread across a wide range of users. The benefits of cloud computing are largely due to economies of scale in infrastructure setup and maximizing server utilization by sharing space among clients (their space and computing power needs can vary greatly).

Network platforms for participation. A participatory online platform is an intermediary that enables users to collaborate and contribute to the development, enhancement, evaluation, commenting and distribution of user-generated content. User Generated Content (UGC) includes various forms of media and creative works (text, audio, visual and mixed) created by users. There are a few different distribution platforms, including blogs, online encyclopaedias, group aggregation sites, social networking sites, podcasting, and virtual worlds.

UGC is generally created with no expectation of profit, but may monetize content in a variety of ways, including through voluntary contributions, charging viewers for access to a particular product or subscription, advertising-based

models, licensing content, selling goods and services, providing services with selling user data for market research to other firms.

The infrastructure of the digital economy

Digital (or online) markets are obviously different from brick-and-mortar markets. The main features of digital markets include:

– direct network effects;

– indirect network effects;

– economies of scale;

– "switching" costs and blocking effects;

– complementarity.

Direct network effects. In digital markets, the utility of consuming a particular good or service often depends on the number of other end users consuming the same goods or services. This effect in economics is called an externality. In this case, this is a positive externality, since the larger the network, the greater the benefit for the end user. An obvious example is social networks and Internet messengers. Both applications are virtually useless to the user if he or she were to use them alone. However, their value increases with the number of other users. The effect is also obvious, for example, in the case of online games.

Indirect network effects. In contrast to direct network effects, indirect network effects occur in the context of multilateral markets. They occur when a certain group of end users (such as users of a social network) benefit from interactions with another group of end users (such as advertisers on a social network). Digitization has enabled the emergence of online platforms and networks in many different sectors of activity, such as for example rental accommodation, transport or e-commerce.

Economies of scale. In many cases, the production of digital goods and services entails relatively higher fixed costs and lower variable costs. Software development, for example, requires significant investment in infrastructure and human labour; however, once the final program is developed, it can be

maintained, sold, or distributed with very low marginal cost.

"Switching"costs and blocking effects. Digital transactions can be made on a variety of electronic devices; however, end-user devices often run on different operating systems. As a result, customers may be "stuck" on a specific operating system if they purchased a specific device. This effect is due to the psychological as well as monetary switching costs that end users must incur to move from one system to another. Again, social media or email services are good examples, as switching from one application to another involves the transfer of a wide range of personal data and contacts. Another example is the change of a specific smartphone (including the operating system) to another one, which involves the loss of access to previously accumulated applications and data.

Complementarity. Many goods and services traded in digital markets are add-ons; that is, customers benefit more from consuming two (or more) goods that complement each other. For example, the usefulness of using a laptop or smartphone is greatly increased when it is used together with appropriate software, such as operating systems, applications or games. Likewise, the utility of time spent on a social media platform increases when the user also has a smartphone with a variety of apps that allow him or her to share more content.

These features can be used to describe specific aspects of digital or non-digital markets; as such, they are not exclusive to the digital economy. Nevertheless, the constant shift towards digital products and transactions has significantly increased their relevance and has already led to a deeper structural transformation in the economy. In particular, the low marginal costs and global reach of the Internet allow digital companies to quickly scale up their operations. Direct and indirect network effects increase the value created by digital business.

Digital markets are often non-competitive in the sense that individual firms become large enough to influence market prices. On the one hand, this means that it may be more difficult for new firms to gain significant market share if a company already dominates the market. On the other hand, the low marginal costs

and non-competitive nature of many digital goods also mean that new entrants can replace an incumbent firm in a relatively short time simply by offering a superior product. Once a critical mass of end users has switched to the new product, the former dominant firm may lose market share in a short period of time. This was the case, for example, with search engines, web browsers, and social media or networking platforms.

The impact of this digital transformation is further amplified by the fact that digitalization has also led to an acceleration of economic activity. In the digital space, agreements between end users in different jurisdictions can be concluded without loss of time, and digital content can be accessed directly from any device connected to the Internet. As a result, digital products and services spread faster, ideas spread faster, and it becomes much easier for companies to identify, attract and grow their customer base. This increased dynamism of economic activity means that businesses can gain significant competitive advantages by first entering and potentially dominating a new market.

In general, these structural changes led to the strengthening of digitalization of the economy, and, accordingly, to the emergence of new business models, as well as a significant transformation of old ones. In particular, the concepts of indirect network effects and multilateral markets are critical to understanding the success of several of the world's most innovative digital companies. Let's consider these concepts in more detail.

Digital multilateral markets

Digital or online markets, like offline markets, can be one-way or multi-way. In one-sided markets, sellers interact with only one specific set of customers, such as a reader buying a book in a bookstore. In multi-sided markets, there is more than one set of customers who buy different goods and services from a company. Multi-sided markets have existed before, for example in the form of television, where advertising is shown to a wide audience, and newspapers also present advertising to all readers. However, digitalization in the economy has contributed

to the emergence of companies that are localized in multilateral markets.

Digitalization has significantly reduced communication costs, allowing businesses to quickly reach a global base of suppliers, users or customers and create networks of users in different jurisdictions through websites, online platforms and mobile applications. New digital enterprises often function as intermediaries, connecting different groups of users who would otherwise find it difficult to interact directly in a non-digital environment. By being able to create such a network and enable mutual exchange between different groups of end users, a company has enormous potential for value creation.

Multilateral markets can be defined by the simultaneous combination of two characteristics: indirect network externalities and neutral pricing strategies. ***Indirect network effects*** occur when an increase in end users on one side of the market increases the utility of end users on the other side of the market. Take for example an online platform that helps people rent housing by connecting hosts and guests. The online platform plays a crucial role in the exchange, connecting both sides of the market; without it, most deals wouldn't happen, and guests would likely book more traditional accommodations (which is Airbnb's business model). From this point of view, an internet platform basically provides intermediary services to different parties of the digital market and can vary depending on the degree of control over its users.

The economic success of digital business models based on intermediation between different groups of end-users is largely dependent on reaching a critical mass of end-users on both sides of the market. The Internet has enabled digitized companies to reach many participants. At the same time, a key feature allows online platforms to achieve significant scale by adapting their pricing structures by charging different fees to each market participant.

This leads to the second characteristic of the multilateral market – ***a neutral pricing structure***. A preponderance of positive indirect externalities means that a firm operates on a platform and can benefit beyond the marginal utility of end

users, allowing it to increase the number of users (or transactions) by charging more to one side of the market and cutting the other side's price. As a result, pricing is not neutral in the sense that optimal prices may be below the marginal cost of providing a service to one side of the market, while being higher for the other side; the price for end users with less price elasticity will tend to be inflated, and vice versa. This result also implies that platform operators may, depending on the magnitude of indirect external network effects as well as price elasticity, provide goods or services to end users from one (or potentially more) sides of the market for free. As a result, so-called barter transactions may arise, which involve the effective trade of goods or services without monetary compensation in exchange for other valuable resources (such as user engagement, user data, or user-generated content). This strategy is, for example, adopted by many social media platforms, email services or media providers. In these cases, end users often enjoy "free" access to a particular service.

However, platform operators typically compensate for this by collecting user and transaction data, and by selling this information to the other side of the market. A prime example is selling customer-targeted advertising to advertisers on the other side of the market.

Emergence of new business models in digital markets

In the digital economy, businesses interact with users through many different types of online or web interfaces, platforms, including:

1. Platforms that allow end-users to exchange information and carry out transactions, while leaving mostly to the provider control rights and obligations to customers; end users join the platform and interact between market parties, so that indirect network effects have become crucial. Examples: Uber, Airbnb, BlaBlaCar, Amazon Marketplace, Facebook, Google, Deliveroo, Foodora, UberEATS.

2. Multi-sided platforms – enterprises that will purchase products (including control rights) from suppliers and resell them to buyers; resellers

control prices and take responsibility for customers; they do not allow for end-user interaction and do not necessarily require customers to join an online platform. Example: e-commerce Amazon, Alibaba, Spotify, Netflix (purchasing content).

3. Resellers – enterprises that have acquired ownership of suppliers of individual goods and services and thus integrated the entire supply of goods and services within their business. Example: Amazon e-commerce (warehousing and logistics), Xiaomi (user devices and applications), Huawei (hardware and cloud computing), Netflix (film production and screening).

4. Vertically-integrated Firms – enterprises or individuals that supply resources necessary for the production process of goods or services to another firm. Unlike multilateral platforms, input suppliers are not intermediaries and interact only with other firms and not with end users (for example, Intel).

5. Input suppliers.

Although all of them can use websites, applications or similar interfaces to sell their products and interact with customers, only the first group of enterprises can fully be considered a multilateral platform.

The characteristics of the indicated digital business models according to the group of criteria are shown in the figure below (based on the OECD study) (Fig. 5.1).

Digitalization was necessary for the emergence of multilateral platforms and the involvement of suppliers, while intermediaries and vertically integrated companies were already standard organizational structures used long before the digitalization of the economy. Some of the big digital companies started with one business vector – a multi-sided platform, gradually growing into more integrated or hybrid structures with additional business vectors. In terms of market dynamics, traditional, vertically integrated firms have sometimes found themselves threatened by newly created multilateral platforms, suggesting that in some cases the latter may have a comparative advantage over the former.

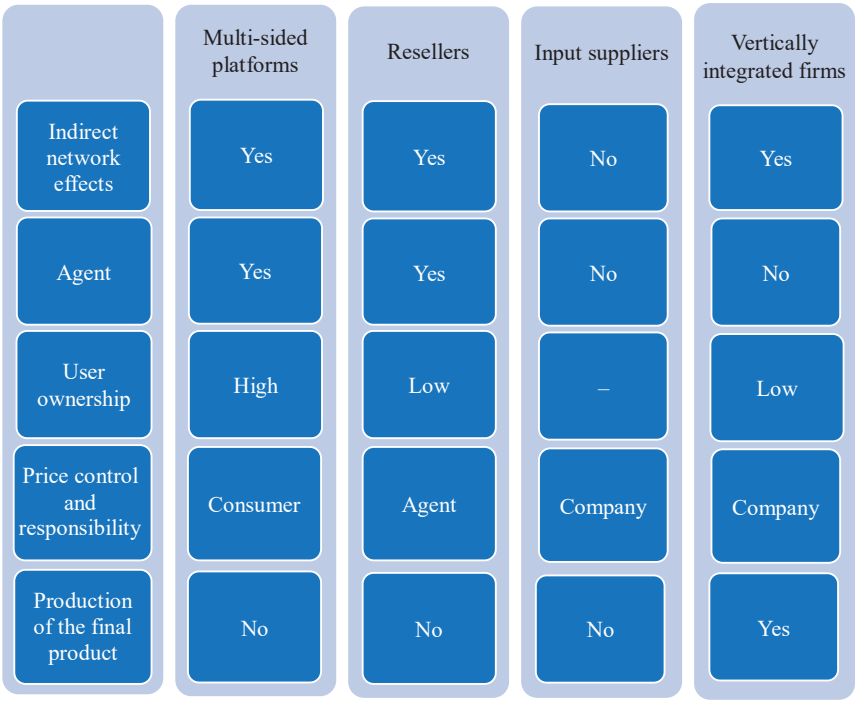


Fig. 5.1 – Characteristics of digital models according to OECD criteria

This has been the case, for example, in the transport and accommodation sectors, as traditional taxi and hotel businesses have been challenged by multi-party platforms such as Uber, Airbnb and Booking.com.

Concept of digital efficiency in business and economy

Digitalization decisions are a strategic business choice. As mentioned above, for economies of scale, many companies are digitizing their own operations, combining various elements from the four listed visa models or using different models for different areas of activity. For example, online stores Alibaba and Amazon operate as intermediaries for market segments where demand fluctuations are expected to be low, but AliExpress and Amazon Marketplace are multilateral platforms serving market segments with more volatile demand. Thus, the risk of low demand remains with the seller, and the multilateral platform

carries no risks. Similarly, the music streaming service that Spotify or Deezer offer users is provided within two different business models: free or "Freemium" (a subscription service that is fully funded by advertising (a multi-party platform)) and a "premium" subscription service (financed by the membership fee (intermediary)). Netflix, on the other hand, started with a pure mediation model, but is now integrated with a content creation model.

The choice between different business models depends on the company's business development strategy, but it is also based on the following ***factors***:

– economies of scale and scope;

– strength of direct and indirect network effects;

– information asymmetry between suppliers, market operators and users;

– advantages of marginal costs in various organizational forms.

There is another approach to evaluating digital effectiveness – ***evaluating the effectiveness of the implementation of digital transformation of customer service*** based on several indicators:

– compliance with the planned deadlines for the implementation of the digital strategy and the introduction of digital tools;

– compliance of real revenue indicators after the implementation of digital transformation of customer service with forecast values;

– the ratio of the company's profit for the established period to the costs of implementing the digital transformation of the client service.

The disadvantage of these indicators is that their values are delayed and do not allow businesses to quickly assess the effectiveness of implementation. Monitoring of marketing metrics will help to promptly evaluate changes and, if necessary, adjust the strategy. Gartner analysts advise choosing from 5 to 9 indicators that most closely match the specifics of your business.

Let's list 10 key metrics, the positive change of which will allow us to draw a conclusion about the systematic improvement of key business indicators because of the digital transformation of customer service (Fig. 5.2). The method

is suitable for any company that wants to receive applications via the Internet.

Conversion Rate (CR)	conversion factor
Customer Acquisition Cost	customer acquisition cost
Average order value (AOV)	average check
Lifetime Value (LTV)	the total profit that the company receives from one customer for the entire time of interaction with him
Customer Retention Rate	the share of regular consumers who make regular repeat purchases
Repeat Purchase Rate (RPR)	frequency of repeat purchases
Churn rate (ChR)	the ratio of customers who refused the services, unsubscribed from the newsletter, do not visit the site
Net Promoter Score (NPS)	consumer loyalty index or the percentage of users ready to recommend a brand, its goods or services to
Return on Advertising Spent	return on investment in advertising, considering each specific channel
Lead-close Rate (LCR)	lead closing rate

Fig. 5.2 – Key marketing metrics

Conversion Rate (CR) – conversion rate. This parameter helps to understand what percentage of people who went to the site later became customers of your business, i.e. bought a product, ordered a service, filled out a lead form. For an online retailer site, the CR value is usually between 1 % and 2 %.

The formation of an omnichannel environment, personalized communication with each user and increasing the relevance of offers due to the digital transformation of customer service allow to achieve an increase in conversion. If, because of the implementation of the digital transformation strategy of the client service intended for the user, the indicator has not changed, you should think about whether you did everything right.

Customer Acquisition Cost (CAC) is the cost of attracting a customer. When calculating the indicator, it is important to consider not only the direct costs of paid promotion channels, but also all additional taxes and fees, the costs of

conducting marketing campaigns, the lost benefit of the company due to the provision of a discount, promotional offer, free trial period, etc. As the audience expands, the cost of attracting a customer increases. The task of any business is to achieve the optimization of CAC.

To recoup acquisition costs, it's important to establish regular sales and focus on retaining existing customers. Active repeat sales, cross sales and stable growth of the average check allow you to reduce CAC. To do this, it is necessary to constantly improve the quality of service, maintain continuous communication with current and potential customers in various channels, and increase their loyalty.

Average order value (AOV) is an average check. This indicator shows how much the company earns from one order. The size of the average check directly affects revenue and is calculated as the ratio of total revenue to the total number of orders for the specified period.

When calculating AOV, it is important to correlate its value with the total amount of spending on advertising and other channels of attracting buyers. For most B2C companies, the cost of first acquisition remains quite high. In certain segments, these costs can be significantly more than the amount of the first purchase. That's why it's so important for businesses to make sure the average check keeps growing.

It is useful to use AOV-based customer segmentation to evaluate marketing effectiveness. Depending on the amount of the average check, divide buyers into 3 groups: "high AOV", "medium AOV" and "low AOV". So you can understand how effective your marketing spend is and adjust your strategy in time. The implementation of digital transformation of customer service will allow the brand to recognize its customer in all communication channels, know about all appeals to the company, predict his behaviour and purchase intentions, and make the right offers. The business gets the opportunity to optimize the costs of attraction and increase the amount of the average check.

Lifetime Value (LTV) is the total profit that the company receives from one customer for the entire time of interaction with him. This indicator is especially popular in e-commerce, because the longer users stay with you and the more money they spend on purchases, the better for business. The LTV indicator allows you to assess how relevant your commercial offer is and how perfect the level of customer service is, as well as to adjust the user retention strategy in a timely manner if necessary.

Often, businesses focus only on making a sale, not caring about the user experience and completely ignoring the issue of customer support after the conversion. The result is disappointed consumers, negative reviews, missed repeat sales. The formation of a single digital profile allows the brand to consider the previous experience of communication with the user, track the purchase history, know about the benefits, make personalized offers, ensuring effective cross-selling and upselling.

Customer Retention Rate (CRR) – the share of regular consumers who regularly make repeated purchases. CRR is calculated as the ratio of the number of regular customers at the end of the reporting period to the number of new ones. How does the quality of customer service affect this indicator?

Evaluating the potential of a retail network, analysts pay attention to the percentage of regular customers. One of the main tasks of the digital transformation of customer service is the automated and complex management of relationships with consumers. Personalization of marketing campaigns, offers and loyalty programs enables businesses to significantly increase CRR. If, because of the digital transformation of customer service, the share of regular customers remained at the previous level, it makes sense to think about adjusting the digitalization strategy of your marketing.

Repeat Purchase Rate (RPR) is the frequency of repeat purchases. Unlike the previous indicator, this metric reflects not only overall satisfaction with customer service, but also the quality of goods or services offered by the company.

It is based on this indicator that marketers plan and launch loyalty programs. Implementation of a single Customer Data Platform and its integration at a single point with all company systems: CRM, ERP, CDP, chatbots, call center, customer support service – allows you to study the preferences of consumers in detail, offer them timely discounts on their favourite products, or select the appropriate replacement if the product is temporarily unavailable or the customer has stopped liking it. To find out if your customers are satisfied, it is enough to divide the number of users who purchased goods or ordered services more than once by the total number of buyers in the reporting period.

Churn rate is the ratio of customers who have abandoned your services, unsubscribed from newsletters and messages, no longer visit the site and mobile applications, who do not visit offline points. For business, this means only one thing: customers are categorically not satisfied with your offer or level of service, and they gradually go to competitors. The formation of segments and cohorts of consumers based on their behavior and purchase history, personalization of content on the website and in marketing communications, provision of convenient service and after-sales service will help to solve the problem.

Special attention should be paid to the analysis of the work of support service specialists. Operators may not be polite enough with customers or unable to solve their problems. The creation of intelligent chatbots and the launch of tools based on artificial intelligence and machine learning will help to minimize the human factor, improve the level of service and reduce the costs of maintaining a call center.

Net Promoter Score (NPS) is an index of consumer loyalty or the percentage of users who are ready to recommend a brand, its goods or services to others. To calculate NPS, brand representatives ask customers one question: “How likely are you to recommend our company/product/service to friends, acquaintances, relatives, and colleagues?” Depending on the answer, the audience

is divided into “supporters” (or promoters), “neutrals” and “critics”. Next, the total number of “critics” is subtracted from the total number of “promoters”, the resulting value is divided by the total number of respondents and multiplied by 100 %. Foreign marketers recommend updating the index at least once a year. It is useful to recalculate NPS once a quarter. And even more so, as a result of the implementation of significant changes in customer service.

Return on Advertising Spent (ROAS) – the return on investment in advertising, considering each specific channel. Regular calculation of ROAS helps the business to evaluate how effectively the costs of advertising are paid off, to correctly allocate the budget and to refuse to invest in unprofitable campaigns. Digital transformation of customer service allows you to optimize advertising costs in each of the channels and significantly improve this metric. For example, custom data analytics integrated with all key channels of brand communication with consumers will help reduce retargeting costs. The advertisement of the product already purchased by the client will be automatically disabled. These budgets can be invested in advertising related products that can provide cross-selling.

Lead-close Rate (LCR) – lead closing rate. It is calculated as the ratio of the number of customers for the reporting period to the total number of leads for the same period. LCR helps to understand how many people were interested in a brand or offer, but ultimately did not decide on the operation. Regular calculation of the metric allows the business to draw conclusions about the effectiveness of advertising as incoming traffic, as well as how faithfully the sales department processes it.

If the strategy of digital transformation of customer service is implemented correctly, the rate of closing leads will begin to grow among the first. If this does not happen, there is a serious reason to think about whether you chose the right strategy, how competently you approached its implementation.

You should always start the process of digital transformation of customer

service with an audit and an objective assessment of the degree of digitalization of a specific business. At the next stage, a target vision is formed and priority areas of digitization are chosen. It is better to focus on those channels and tools, the digital transformation of which will bring the company the maximum economic effect. An alternative option is to focus on "bottlenecks" and optimize them through the implementation of digital transformation of customer service.

Questions for self-control:

1. Define the term "digital efficiency"?
2. How did information and communication technologies change the use of information for business?
3. What is the "infrastructure of the digital economy"?
4. What is digital efficiency in business and economy?
5. What is the digital economy?
6. How did modern advances in ICT enable business development?
7. What business models are used by today's well-known companies?
8. What is e-commerce?
9. How is payment for goods or services made within electronic commerce?
10. What are the types of electronic commerce?

5.2. Value creation and digital business transformation solutions

The process of value creation in the digital economy

Digitization affected the structure of markets, which allowed not only enterprises to develop new products and services, but also brought structural economic changes.

The concept of value creation. A discussion of value creation usually

begins with the value chain. Developed by Michael Porter in the mid-1980s, the value chain is a standard tool in academia and business used to analyse a firm's competitive advantage. Since its publication, M. Porter's "value chain" has undergone several major criticisms, all of which are very relevant in the context of digitalization:

1) *its limited ability to incorporate value created from information flows.* It is obvious that the key feature of the digital economy is the efficient and fast transfer of data and information, which is possible with the help of the Internet. Although Porter saw the Internet as an efficiency-enhancing mechanism, he did not see it as a change in business strategy. Others, however, saw a clear need to adapt M. Porter's value chain given the fact that information has long been considered central to value creation. In response, Rayport and Swiokla (1995) introduced the concept of the virtual value chain, which serves as a useful refinement of M. Porter's value chain;

2) *it was originally developed for use in domestic firms.* The concept of the value chain has been extended to accommodate the possibility that production processes may span multiple jurisdictions, introducing the concept of the global value chain (GVC). GVC describes the need to coordinate the company's activities in different regions. This is especially true in the digital economy, given the ease with which the production processes of a digital business, as well as its final goods or services, can cross borders. Indeed, when it comes to creating value, business is not confined to one geographic location or even to one firm;

3) *its limited application to services.* While value chains are well suited to describe the production processes of physical goods of traditional manufacturers, the concept is less able to describe the business model of service provision. The value chain concept models enterprises where value is created based on the production process, such as in traditional vertically integrated manufacturing enterprises. It also includes intermediaries as their main activity is consistent. Therefore, two concepts should be considered. The value network concept depicts

a business where value will be created by connecting users, suppliers or customers (i.e., forming a network of them) using intermediation. This category covers all types of multilateral platforms. The concept of store value describes a business where value is created by sorting resources, that is, hardware and software, as well as specialized knowledge that can solve customer problems and satisfy his requirements. This includes digital and non-digital services from providers.

Any *classification of value creation processes* will have limitations if applied to the activities of real companies and their areas. However, it helps systematize the large number of enterprises that are heavily dependent on digital technologies by organizing their value creation process along three approaches:

– value chains;

– value creation networks;

– stores of value.

These approaches provide a broader classification of value creation in the age of digitalization (Table 5.1).

Table 5.1 **– Three concepts of value creation**

	Value chain	*Value network*	*Value store*
1	*2*	*3*	*4*
General Description	Purpose: To transform inputs into outputs through discrete but sequential processes (each of which can be defined as a production function). Products can be manufactured by the company itself or purchased. In general, final goods will be standardized	The purpose of a value chain is to broker services to: 1) facilitate two-way interaction between it and its customers; 2) multi-way interaction between its customers (e.g. buyers/sellers, passengers/drivers, etc.). The value creation process can be shaped by direct connections between consumers (for example, phone calls or recommendations from friends) and indirect connections (for example, a commercial bank can determine the possibility of lending to a prominent buyer)	The purpose of the value store is to solve a problem, in particular, to transform an existing state in a more desirable state. The problem is characterized by information asymmetry (that is, the store has more information than its customers). The problem-solving process can be labor-intensive, involving professionals and specialists, or be standardized or highly customized
Primary technology	Continuously connected: a linear process that begins with inputs and receipts and moves to the delivery of the finished product to the end user	Intermediary: used by the company to connect users or customers interested in joining the operation	Intensive: forms of hardware use and knowledge to change specific objects

Continuation of Table 5.1

1	*2*	*3*	*4*
The logic of value creation	Value is created by transferring a product from a company to its customer	Value is created by organizing and facilitating exchanges between related customers	Value is created by solving a customer problem or satisfying a customer demand
Main types of activities	Activities organized sequentially: – inbound logistics; – operations; – outbound logistics; – marketing; – services	Types of activities organized simultaneously (in parallel): – network promotion and contract management; – provision of services; – operation of the infrastructure	Activities organized iteratively (repeatedly): – identification of problems; – choice of approach to finding a solution; – problem solving; – execution; – monitoring/evaluation
Examples of traditional business model	– assembly line for production; – wholesale	– employment agencies that connect employers and job seekers; – banks that unite investors and borrowers	– medical technologies used for diagnosis and treatment of diseases; – professional services (legal, consulting, financial)
Examples of the business model of the digital economy	**Production of goods (vertically integrated firms)** *Tangible goods:* – Unilever, Coca Cola, GE, Siemens, BMW, IKEA, Microsoft (PC, tablets, Xbox), Apple (PC, tablets, iPhone), Huawei (devices), Sony (devices, electronics), Intel, IBM, Cisco, Tsinghua Unigroup (microchips), Xiaomi *Intangible goods and digital content:* – creative content: Disney, Netflix, Sony; – software (one-time purchase of standard package): Microsoft, Adobe, SAP, Dassault Systems, Dropbox, Weiyun, Google Drive. **Trade intermediaries** *Tangible goods:* – Alibaba, Amazon retail, JD.com, Tencent, Walmart. *Intangible goods and digital content:* – creative content: Netflix, Sony (movies/music), Spotify, Deezer, Amazon Audible – software (one-time purchase from standard package): Amazon, Best Buy.	**Multilateral platforms** *E-commerce intermediary* – Material goods: AliExpress, Amazon Marketplace, eBay, Etsy – Intangible goods: Trivago, Booking.com, Hotels.com, Google Play, Apple iTunes store. *Intermediary services:* – Sharing economy: AirBnB; Blablacar, Drivy, Turo, Uber, Didi Chuxing, Ola; Deliveroo, Foodora, TaskRabbit, Upwork; – Social networks: Facebook, LinkedIn, Sina Weibo, Tencent Weibo, Twitter, Nice, Kuaishou, Qzone – Online games and gambling; – Search engines: Google, Bing, Yahoo, Baidu, NetEase; – Email: Gmail, Yahoo, Hotmail, NetEase; – Internet content: Dailymotion, SoundCloud, TripAdvisor reviews, Vimeo, YouTube; – Electronic payments: Transferwise, Alipay, Tenpay, Paypal, Worldpay	**Cloud computing providers / input of computing power to other companies** (X-as-a-Service, potentially fully vertically integrated) **IaaS:** – AWS, Alibaba, Microsoft, IBM, Huawei, Cisco, Intel **PaaS:** – AWS, Alibaba, Microsoft, IBM, SAP *Professional services (vertically integrated firms)* – internet consulting: GE, Siemens – data analysis

Continuation of Table 5.1

1	*2*	*3*	*4*
	Suppliers of materials: – companies that were created to sell reseller products: Intel, Tsinghua Unigroup; – companies that have created applications for supply to application stores		

Creating value in digital business models

Value Network Model: The social network is supported by advertising revenue.

Business model overview. The social network discussed here is a multifaceted platform that collects user data and provides advertising services. This type of business model serves two purposes. First, on one side of the market, it aims to provide a platform for users to connect with each other and share content. A user participates by referring to other users, where links are formed based on real-world relationships or topical interests that are not necessarily dependent on the relationship between users (such as Facebook, LinkedIn, Tencent Weibo, Twitter, and Qzone). From the user's point of view, social networks work by connecting users on the Internet, generating a news feed with frequently updated content. Users get access to news channels via the Internet or through applications, usually without payment. A traditional equivalent of this business model would be membership based on a social club.

Second, on the other side of the market, the purpose of social media is to allow customers to effectively advertise on the platform to reach their target audience (i.e. users on the other side of the market). Advertising space will be purchased by parties wishing to promote their ideas, brands, products and services, and strengthen their market presence and audience reach. The company's social networks have more diverse options for using advertising space on their platforms, including promoting content that appears from news channels,

as well as promoting trends and some user accounts. Ad placement will be based on attributes such as geography, demographics, interests, keyword content, events, device type. The traditional equivalent of this business can be seen in the placement of more traditional forms of advertising such as television or radio advertising.

The two **goals** typical of operators in multilateral markets are to connect users and to provide advertising services: fulfilment of the first goal provides market research for the second. Users of the social network provide data in the form of geographic and demographic information, voluntary content, and behavioural data when interacting with the network. This data allows the company to learn about its user base. From the company's point of view, its user communities are valuable because they are a means of attracting major commercial customers – advertisers.

Social networks generally receive **revenue** from the sale of advertising space to third parties who want to promote their goods or services to users on the platform.

Social media companies typically protect their **intellectual property rights** through a combination of trademarks, trademarks, domain names, copyrights, trade secrets, and patents. They may also enter into confidentiality and non-disclosure agreements with employees, contractors and other third parties to limit access to, disclosure and use of confidential information and proprietary technology.

Social networks recognize the need to balance ad content with user-generated content so that ad content is well-targeted to maximize user engagement. **User data** and user-generated content form the basis of targeting strategies: the greater the amount of data and user-generated content, and the more sophisticated the data analysis, the greater the potential profit, because the information provided by users is usually contains keywords, which describe the user and his interests. Advertising content is then sent to users with profiles that

companies want to reach.

As described, *the value network consists of three main activities*: network promotion and contract management, service provision and network infrastructure operation.

Network promotion and contract management is a category of activities related to inviting potential customers to the network, selecting customers who are allowed to join, and initiating, managing and terminating contracts governing the provision of services and the collection of fees. The business model of a social network company is to create a social network that then serves as an audience for clients who sell ads on the social network. To best serve their advertising clients, social networks strive to foster a broad and engaged community of users. To this end, they seek to attract influential people to the network, including world leaders, government officials, celebrities, athletes and journalists, as well as media and well-known client brands. Since the social network operates in a two-sided market, it can use price elasticity for different categories of users.

Users connected to users. User-to-user promotion is a key aspect of a social network company's business model: the more users and the more time they spend online (and the more they engage), the more content they create and the more available they are to target with ads. All of these factors are central to increasing the value of the platform's advertising business. In order to encourage users to join their network, social networks offer the use of their platforms to users without financial payments. Also, the barriers to engagement with a social networking website can be low. Although an account is usually required to post content, in some cases it can be opened without any personally identifiable information (such as Twitter), and in other cases users do not even need to have an account to view content on the network. By lowering such barriers, the company aims to encourage users to visit its website or mobile application as often and for as long as possible. However, some social networks require a real identity (for example, Facebook). In these cases, the social network also serves as a means of verifying

the user's identity on other platforms.

Advertisers connected to users. Since the social network's users are spread across the globe, the companies it seeks to work with can also be global.

Operation of the network infrastructure. The functioning of the network infrastructure for the business model consists of:

1) collection of data about the potential target audience for advertising purposes;

2) formation of strategies that can be used to reach the target audience;

3) setting tariffs according to various characteristics of advertising.

Although the social network and traditional television companies are the fact of these measures in general, they go about each in different directions.

The social network company has the advantage of generating its own user data digitally thanks to the community it supports on its platform. The social network collects company-specific user content, as opposed to profile or demographic data, to learn more about user interests. Moreover, user data is available on the social media platform in real-time, as opposed to the reverse data collected through market research.

In terms of setting ad rates according to different ad characteristics, just as other digital firms can differentiate prices using data on product supply and demand, social media companies typically rely on an auction to set prices for their advertising products. This allows them to get the maximum price that businesses are willing to pay for advertising.

The platform is the result of a significant investment in technological resources: computer hardware and software, software engineers, website designers, algorithms, servers, etc. In particular, a social network company must ensure the stability and integrity of its platform, maintaining privacy and sufficient server space to handle large volumes of user traffic.

Digital transformation of the company and its advantages

Digital business transformation is not just another marketing term, but a new

reality that requires businesses to radically revise their business processes and approaches to working with clients. The ability to quickly adapt to changes and optimize one's work, adapting to the client's expectations, are the main challenges brought about by the digitalization of business.

Customer expectations regarding the speed and quality of service provision are growing rapidly. This is especially true of the younger generation of consumers. A high level of service becomes a default requirement. Applying for a loan, activating a service, ordering goods, accessing information about expenses, receiving advice – customers want to perform all these operations here and now with the help of devices that are "at hand". Consumers value their time more and more, they need instant feedback, as well as a clear and convenient interface to meet their needs. Good design of information resources, availability of online chats, individual approach – this is a world to which customers have already gotten used to.

To meet the high expectations of customers, companies must accelerate the digitization of their business processes. To do this, it was enough to automate existing business processes. Companies need to reinvent them. The main goals of digital transformation are to increase the speed of decision-making, increase the variability of processes depending on the needs and characteristics of the client, and reduce the number of employees involved in the process.

Digitization of existing processes is an expensive and often quite futile activity, as all existing problems and shortcomings are automated. It is necessary to shift the center of gravity towards new opportunities that give the company a competitive advantage. For example, instead of automating the work of employees responsible for working with customers, you need to create self-service systems, minimizing the number of intermediaries between the customer and the final service or product.

The creation of digital business processes is associated with fundamental reengineering and revision of existing limitations. At the initial stage of

restructuring, it is necessary to select those areas of the process that are related to the customer experience. For example, how to reduce the time for making a loan decision from several days to a few minutes, how to reduce the number of involved employees from X to zero, etc. Below are some examples:

1. The bank reduced costs by 70 % by implementing an automated mortgage pre-approval system. The duration of the procedure was reduced from several days to a few minutes.

2. The shoe chain implemented an inventory system in its stores, which made it possible to receive information about the availability of shoe sizes online, which reduced the waiting time of customers and the loading of sellers several times.

3. The insurance company has fully automated the decision-making process for simple operations that take most of the time of the customer service staff. As a result, the number of involved back-office employees was radically reduced.

Another advantage of digitalization of business processes is the possibility of collecting information about the customer experience and automatic adaptation of individual process scenarios in accordance with consumer expectations. The current level of technology development makes it possible to accurately predict customer needs and the most relevant methods and channels of communication.

The human factor, outdated IT systems, lack of knowledge, customer habits are the main obstacles on the way to digital transformation. It is possible to single out the factors of a less complicated, costly and risky transition of the company to new business processes (Fig. 5.3).

Management support. Digital transformation must be supported and promoted by the company's top management. This is a necessary condition for the successful implementation of the planned changes. The main task of management is to "sell" innovations to employees and show how they will affect each of them. New processes may cause job losses for some employees. This fact does not need to be hidden and announced in advance so that the planned changes do not become the subject of rumours and gossip.

Fig. 5.3 – Factors of transition to new business processes

Availability of a competence center. To implement changes at the operational level, it is necessary to create a cross-functional team consisting of employees of departments responsible for certain aspects of the process. Often, a separate competence center is formed for this purpose, consisting of employees of various profiles – client experience designers and designers, marketers, IT representatives, etc. It is important that the members of this team are open to new ideas, have the necessary skills and are not afraid to experiment. Such a center can function on a regular basis, broadcasting best practices within the company.

Organizational transformation. Traditionally, new business processes are implemented within the existing organizational structure by employees who have long been working within existing processes. There are big risks involved in this approach, and here's why:

– *any innovations require time for training and adaptation.* As mentioned above, this always causes some repulsion among employees. Fear for one's job, reluctance to change established practices, unwillingness to learn, fear of the new – these are traditional attributes of any internal corporate changes;

– *when switching to new processes*, more effort will be required from employees. It is necessary to maintain operational efficiency and simultaneously

switch to new work rules. In essence, employees must “change shoes” on the go without changing the speed of movement. It can also create a negative background and cause hidden sabotage or open discontent.

Therefore, in some cases, it is more correct to create a new organizational unit or group within an existing unit to work on new digitalized processes. When transitioning to the updated processes, employees of the “old” organizational units will transfer to the new division. This approach allows you to go through the transformation faster and with less financial and energy effort.

Evolutionary integration with legacy systems. The digital transformation of business processes affects many legacy systems (inherited mechanisms of the company’s activity), which cannot be eliminated at once. Attempts to integrate old systems into new processes threaten long projects with vague payback periods. After a few years, it may become clear that what was done is no longer relevant. To reduce such risks, it is important to move in very small steps. The duration of individual initiatives should not exceed 6 months. Sometimes it makes sense to use simple temporary solutions to transition to “new rails”, in parallel creating integration interfaces between new services and old systems, or completely replacing the latter.

Attracting and stimulating customers. Customer habits change slowly, which slows down the introduction of new service technologies. For example, a significant proportion of passengers at railway stations stand in line at the ticket office, although there are terminals for self-purchase of tickets installed nearby. The development of new models of consumer behavior is an integral element of digital transformation. It is important to identify the key reasons that prevent consumers from using new services and develop measures to attract such customers. Training, demonstration of benefits along with stimulation allows to achieve results. It is important that the first experience of interaction with the new rules is successful and emotionally positive. Below are some examples of how this can work:

– bank employees help office visitors to make payments through the terminal;

– the client receives a bonus for completing the application online;

– the company offers special conditions for making a purchase through the mobile application.

Flexible model of business process management. The classical theory of optimization and reengineering of business processes in new realities is complemented by flexible approaches. The description of business processes, separated from the business processes themselves, is a thing of the past. Such a description quickly becomes outdated, maintaining its relevance requires serious labor costs.

The best way to have an up-to-date version of business processes is to use the company's business process management tools. Another characteristic feature of the new approach is the shortening of the process optimization cycle. The use of A/B testing, control groups and other tools to evaluate the changes made allow you to quickly check and implement changes in processes with minimal risks of obtaining negative results.

Types of digital business transformation and its stages

Digital business transformation can be represented by various digital business solutions.

CREATION OF A B2B PORTAL. A B2B portal is an online platform within which agreements between companies (for example, a manufacturer and a wholesaler, between a wholesaler and a retailer) are implemented. Partners from different levels of the distribution chain can be connected to the portal:

– distributors;

– dealers;

– independent wholesalers;

– retailers.

Wholesale sales, registration and preliminary processing of orders, exchange

of documents and reference information are carried out on the portal. The supplier can reduce the time for interaction with the buyer, relieve the sales and support departments. The customer can find the necessary products and all information about them in an interactive catalogue with filters and sorting, instantly receive information without the need to call the supplier.

In turn, **creating a B2B site** will help you quickly find your own audience of regular customers and, thus, get a reliable source of permanent income (Fig. 5.4).

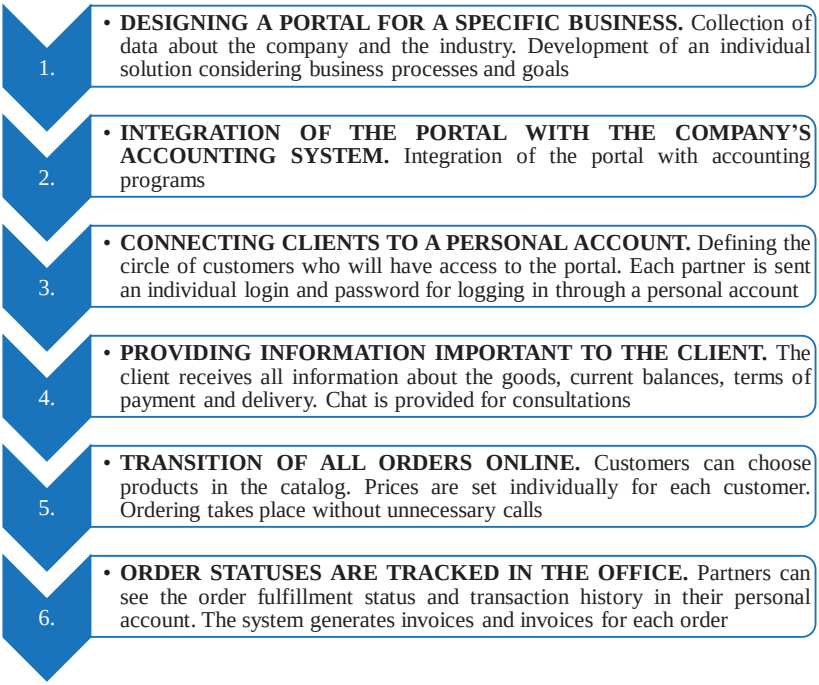


Fig. 5.4 – The sequence of creating B2B digital portals

Usually, the development of a B2B portal takes into account the specifics of a specific business niche, to which the activities of its owner are directed. Therefore, it is necessary to consider the most popular types of such sites in order to draw up the most accurate **business plan for a B2B portal** (Fig. *5.5–5.6*)**:**

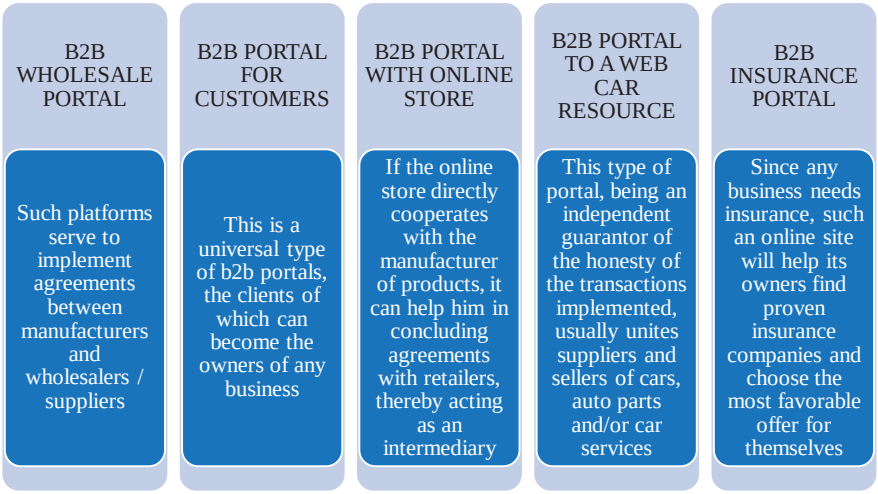


Fig. 5.5 – Types of B2B digital portals

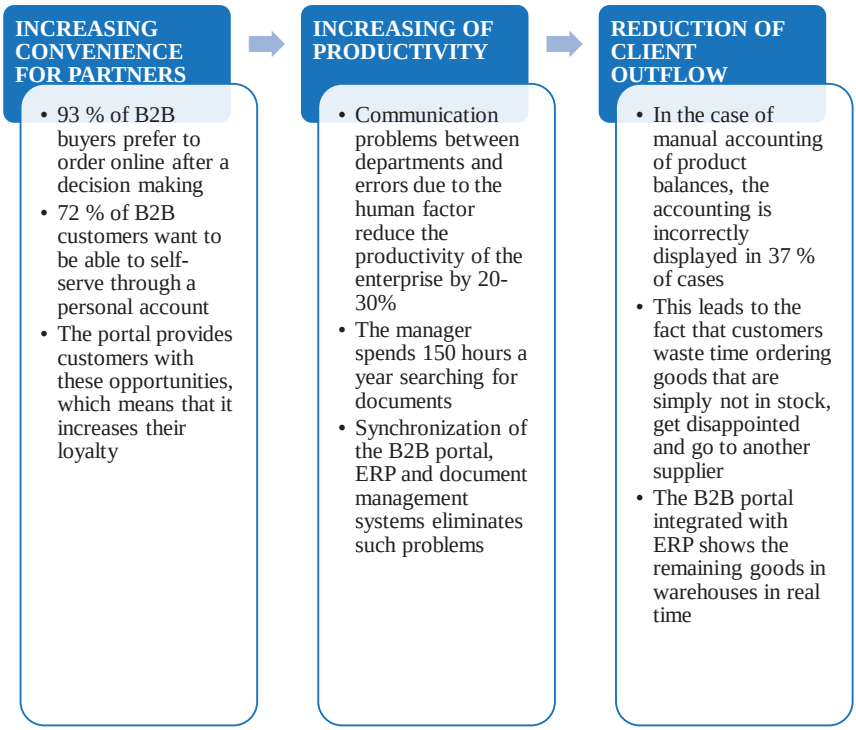


Fig. 5.6 – Advantages of creating a B2B portal

DEVELOPMENT OF CRM SYSTEM. The CRM system is a program for streamlining work with clients. CRM stores data about current and potential customers from various sources and optimizes processes in sales, marketing and customer service departments.

CRM stores the history of interactions with each customer and helps managers make timely offers and provide personalized service (*Fig. 5.7–5.8*).

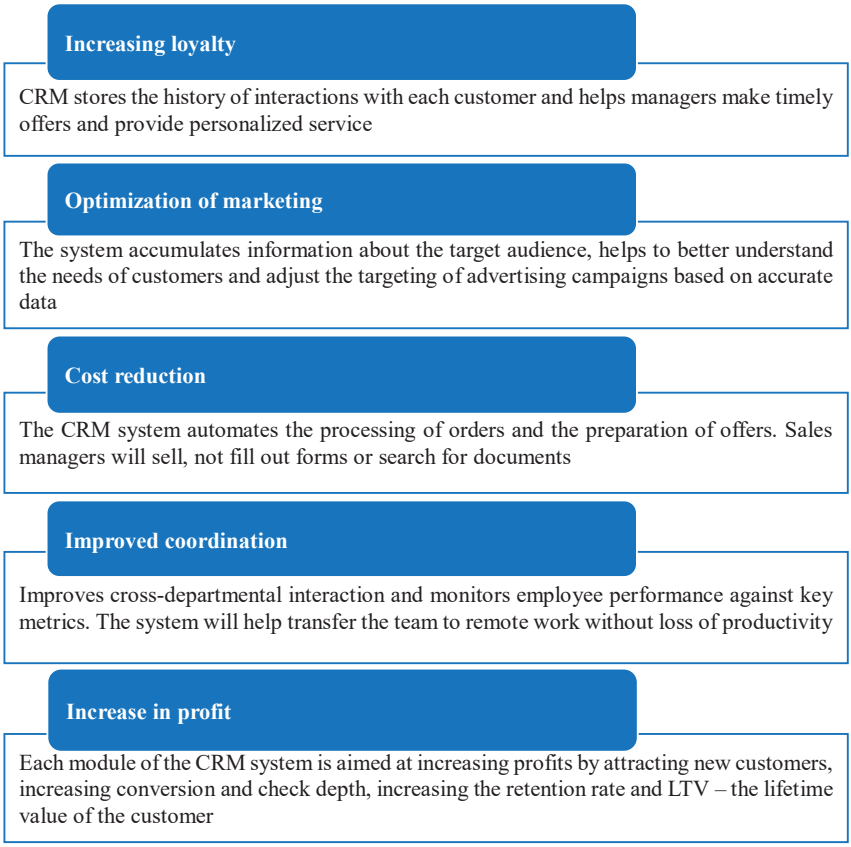


Fig. 5.7 – Tasks solved by CRM

The choice of such a system depends on the specifics of the specific business – its turnover, security requirements and the need to implement unique functions. But the general rule is as follows: for small businesses, it is better to choose ready-made box solutions; for medium and large businesses – to develop

their own system for automation.

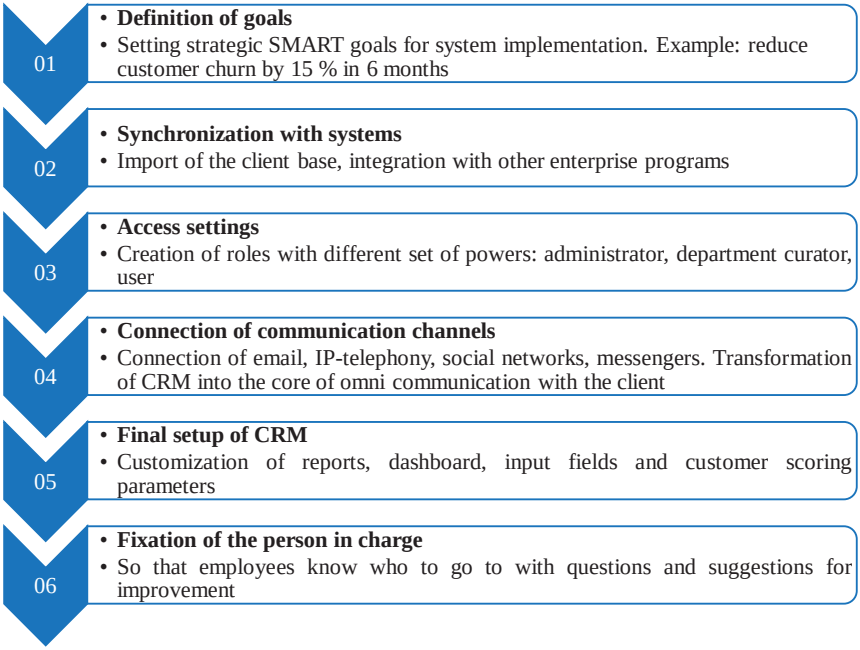


Fig. 5.8 – Stages of CRM system implementation

Such advice is due to the fact that with the development of business there are more and more complex processes that are difficult to translate into template solutions.

Standard CRM solutions cannot be fully adapted to all business processes. Often, after the implementation of the system, it is necessary to manually maintain Excel, coordinate actions or upload documents to the system. As a result, CRM only complicates the work (*Fig. 5.9*).

DEVELOPMENT OF E-COMMERCE PROJECTS. E-commerce covers a number of different types of businesses and corporations and is becoming one of the most important aspects of the Internet. Today, online trade accounts for more than 5 % of the world trade volume.

Templates

Standard CRM solutions cannot be fully adapted to all business processes. Often, after the implementation of the system, it is necessary to manually maintain Excel, coordinate actions or upload documents to the system. As a result, CRM only complicates the work

Redundancy

You pay for a standard set of tools whether you need them or not. The individual system will have only the necessary functions. So, they will be easier, faster and more convenient

The problematic of the developments

Big providers of SaaS systems will not specifically complete functional modules for you, whether it is automatic payroll calculation or the formation of sales plans

Dependence on the provider

You are completely dependent on the CRM provider and do not get full control over the software and accumulated databases

Integration

Ready-made solutions can be integrated with other programs. But for this service you have to pay separately and the list of applications for synchronization is limited

Security

It is easier for attackers to find and use vulnerabilities in standard CRM systems

Monthly payments

Most CRM providers provide their software on a subscription basis. You will have to pay for it every month. Moreover, the tariff increases with the growth of the client base and the number of system users

Support

Consultation, debugging and support takes place remotely and is often not included in the tariff. A custom contractor allocates specialists for personal training of your employees

Hidden payments

CRM vendors do not always announce a complete list of paid services on their sites. Read user agreements carefully to avoid surprises such as storage overage charges

Fig. 5.9 – The main disadvantages of ready-made solutions

Owners of large, medium and small businesses are involved in the process of e-commerce and understand that the development of trading platforms and

complex online stores takes the first place in business scaling. Creating marketplaces helps businesses sell products to their customers around the world. Websites break the barrier of business geographic location and offer a wide range of audiences and therefore the opportunity to increase sales.

Creating an online store according to an individual scheme is not an easy task, so it should be entrusted to experienced developers who have experience in this field. Below we will talk about the features of its creation and the stages of work. The process of developing e-commerce projects (*Fig. 5.10*):

1. COMPLEX ONLINE STORE

Helping to implement the project, if the functionality of the store goes beyond the scope of ready-made CRM systems

2. DROPSHIPPING PLATFORM

Connecting service for suppliers and sellers. Selling goods around the world in a few clicks

3. CASH-BACK SERVICE

Refund of part of the funds from purchases

4. MARKETPLACE

Aggregator of millions of products from various sellers

5. NOTICE BOARD

A platform that enables individuals to sell and buy goods

6. TENDER SITE

A platform for bidding and public procurement

7. AUCTION

A platform that provides comprehensive interaction between sellers and buyers with the possibility of adjusting the price of the product depending on the level of demand for it

8. ONLINE CATALOG

Online showcase of your business with detailed information about the company and the possibility to place an order

9. PERSONAL OFFICE

Interaction with customers or partners through the website. Purchase history, current prices, feedback and much more

Fig. 5.10 – Sequence of e-commerce projects development

CREATION OF A SITE WITH A PERSONAL CABINET. A personal account is an element of the site interface that makes the experience more personalized for the user. Due to the availability of this option, users get access to the functionality specific to their own accounts (for example, to personal data, a discount program, payment cards, etc.).

Table 5.2 **– Types of personal offices**

For clients of e-Commerce projects	For business, it gives an opportunity to directly interact with customers, allows you to accelerate scaling due to the automation of the purchase-delivery process. For the client, it increases the level of convenience of cooperation, which will result in increased loyalty and repeat orders
For service companies	The most important component in the digitalization of interaction with customers. Enables the client to track statuses, communicate with the support service, participate in marketing activities
For interaction with dealers and representatives	The office is aimed at automating work and speeding up the interaction process. Online ordering, current prices and balances. Document management. Exchange leads. Marketing materials
For interaction with b2b customers	Document flow. Order history. Personal loyalty program. Support. Ability to integrate with your own accounting system
For the public sector	To provide citizens with access to public information, as well as organization of interaction with authorities
For patients of medical facilities and veterinary clinics	Appointment. Medical card. Test results. Payment for services. Doctor's call
For consumers of communal services	Apply for connection, consumption reporting. Details for payment. Balance. Document flow. Statistics on price changes
For the educational sector	Cabinet for online educational programs. Companies for the organization of language training, private schools
For buyers of cars and special equipment	View offered cars. Order additional inspections. Track purchase status

Creating a personal account is necessary for sites:

1. **Online store**. A personal account is a mandatory element necessary for the functionality of such sites. In particular, thanks to the personal account, users will be able to reserve products in the basket, apply discounts "linked" to their personal account, speed up the purchase process by pre-filling their data for the order, view previous purchases, as well as monitor the status of the current order.

2. **Internet portal.** The majority of users will enter from mobile devices. Therefore, it is worth focusing your attention on displaying the site in them:

– mobile version design;

– mobile first layout;

– thorough testing, on all kinds of devices/browsers (we use special software for these purposes).

3. **Company website.** Company websites often have several access options – for ordinary users, for company employees and for administrators. To distinguish access rights between these groups of visitors, personal accounts are created.

Questions for self-control:

1. How does the value creation process take place in the digital economy?
2. What is the digital transformation of the company?
3. What are the advantages of the company's digital transformation?
4. What are the types of digital business transformation?
5. What is the sequence of stages of digital business transformation?

5.3. Digital performance management based COBIT 2019

Combining business and IT as an integral part of the enterprise

In many proto-models, business and economics were considered separately from IT. Boards of directors and middle management could delegate, ignore or avoid decisions related to information and technology. In most sectors and industries, such an attitude is currently "ill-advised". In the light of digital transformation, information and technologies (hereafter referred to as IT) have become essential for the support, stability and growth of enterprises. According to SOVIT-2019, IT and business are two puzzles that successfully complement the full picture of the company's activity – it is IT that enables the successful presentation of data and information, and efficient business certifies success.

Three *main roles of IT in business and economy* are defined:

– ***support*** – to provide support to basic corporate services and stabilize operations, in order to obtain an effect;

– ***improvement*** – provision of business and partnership, consolidation of management information and integration of orientation process, for efficiency;

– ***innovativeness*** – to provide inter-enterprise solutions, enable business growth, flexibility and business analytics, for the sake of transformation.

Impact of digital efficiency on business and economy (Fig. 5.11):

– the creation of the values of interested parties – stakeholders (that is, the realization of benefits at the optimal cost of resources while optimizing risk) is often due to a high degree of digitization in new business models, efficient processes, successful innovations, etc.

– modern organizations (i.e. digitized enterprises) increasingly depend on IT for survival and growth.

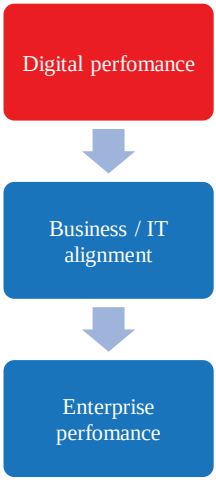


Fig. 5.11 – The impact of digital efficiency on business and the economy (according to COBIT-2019)

Leverage digital efficiencies and benefits EGIT

Leverage is a factor that acts with a small change and gives a significant

change in the resulting indicator ("leverage effect").

Digital Efficiency Leverage:

– the digital efficiency of the enterprise depends on the management and management of information and technologies at the enterprise;

– given the centrality of IT to enterprise risk management and value creation, over the past three decades there has been a particular focus on enterprise information and technology management – Enterprise Governance of Information and Technology (EGIT).

Management of information and technologies at the enterprise (EGIT) according to SOVIT-2019 (Fig. 5.12):

1) EGIT is an *integral part* of corporate governance;

2) EGIT is *complex* and multifaceted;

3) there is *no perfect way* to design, implement and maintain the effectiveness of EGIT in an organization;

4) EGIT consists of *management and managerial activities*.

Fig. 5.12 – Context EGIT

Advantages of effective EGIT:

1. Realization of benefits – provides value creation for the enterprise through IT.

2. Risk optimization – entails addressing the business risk associated with the use, ownership, operation, involvement, impact and adoption of IT in the enterprise.

3. Resource optimization – ensures that appropriate capabilities are available and sufficient to execute the strategic plan, and that sufficient, appropriate and effective resources are provided.

EGIT framework

IT needs quality management. The framework for EGIT is the COUNCIL (Fig. 5.13):

– frameworks have been developed and presented over the years to *assist* in the process of understanding, designing and implementing EGIT;

– COBIT 2019 builds on and combines more than 25 years of development in this field, not only incorporating new ideas from science, but also operationalizing these ideas as practice;

– from its inception in the IT audit community, COBIT has evolved into a broader and more comprehensive IT governance and management system and continues to be established as a generally accepted framework for *IT governance*.

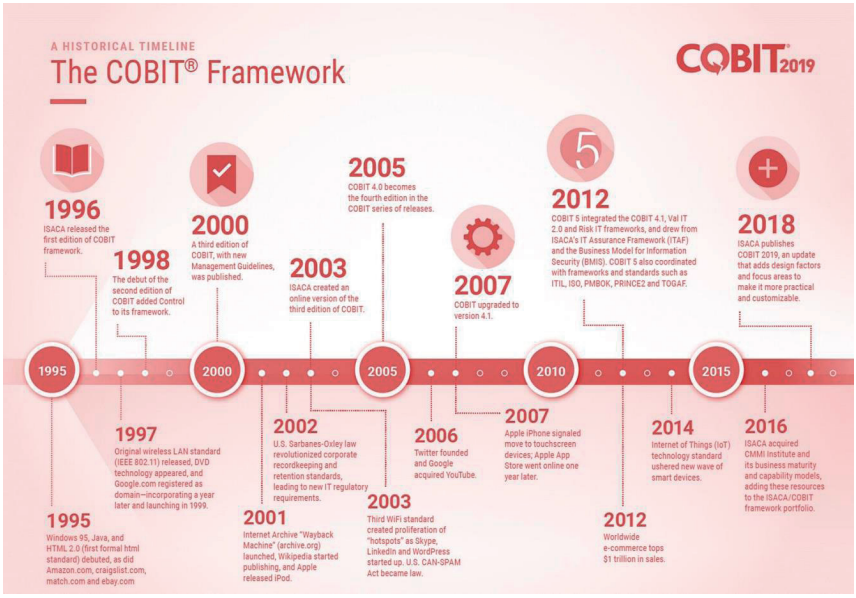


Fig. 5.13 – COBIT framework

What is COVIT-2019:

– COBIT is the framework for GEIT aimed at the entire enterprise;

– COBIT defines components for building and maintaining a management system;

– COBIT defines constructive factors that must be considered by the enterprise in order to build the best management system.

Management of digital technologies in the company and its benefits

With the advent of the concept of the digital economy, the digital transformation of business and the development of IT technologies and communications have become of key importance in companies to ensure their growth and stability. Previously, as a rule, the highest management staff and top management ignored the need for management decisions in the field of IT implementation, which is still the case in certain sectors of the economy. Creating value for a company's stakeholders through IT implementation is typically characteristic of new and more innovative business models.

Based on the central importance of IT for risk management and value creation by modern companies, interest in enterprise governance of information and technology (EGIT) has grown significantly in recent decades.

EGIT is an integral part of corporate governance, which consists in ensuring the implementation of processes, structures and mechanisms of such connections in the organization that enable both business owners and IT personnel to fulfil their functions of aligning the business through the implementation of IT and creating business value through investment in business IT technology (Fig. 5.14).

Fig. 5.14 – The content of information and technology management in the company

Information and technology management in a company is complex and multifaceted and must consider individual characteristics and needs, as well as the means and culture of their company's value creation to build a customized IT management system.

EGIT is focused on obtaining value from the digital transformation of

business and reducing its risks, which are the result of digital transformation. In general, three main results of the successful adoption of EGIT can be considered (Fig. 5.15):

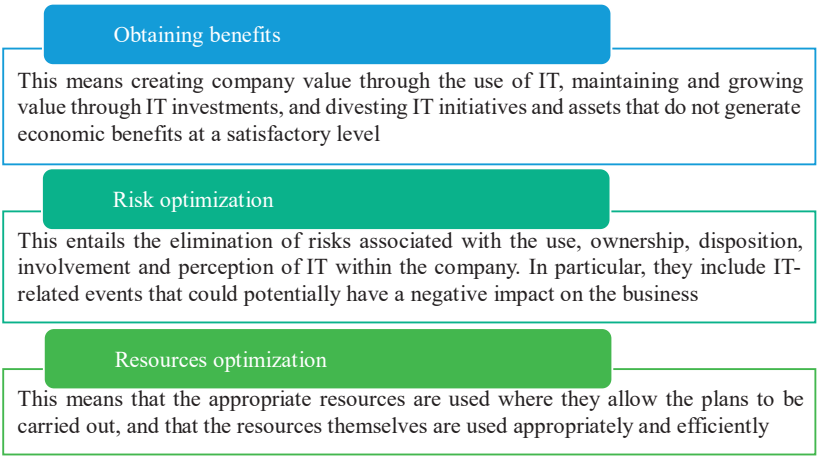


Fig. 5.15 – Benefits of information and technology management in the company

Companies that do not develop and implement information and technology management systems are less able to adapt their business to digital transformation strategies. Such companies are less likely to achieve their strategic development goals and will not create adequate value as a result of digital transformation.

Concept and structure of COVIT 2019

To better understand, design and implement information and technology management systems, best practices have been developed and disseminated over the years. As a result, the COBIT 2019 methodology was developed to support the implementation of such management systems in practice.

Since its inception, COBIT has been developed into a broader and comprehensive concept of information and technology management.

COBIT is a concept for enterprise-wide information and technology management, meaning that company information and technology are used and processed to achieve company-wide goals, not limited to the IT department.

When implementing the COBIT concept, a distinction should be made

between governance and management, which include different types of management activities, require different organizational structures, and serve different goals (Fig. 5.16).

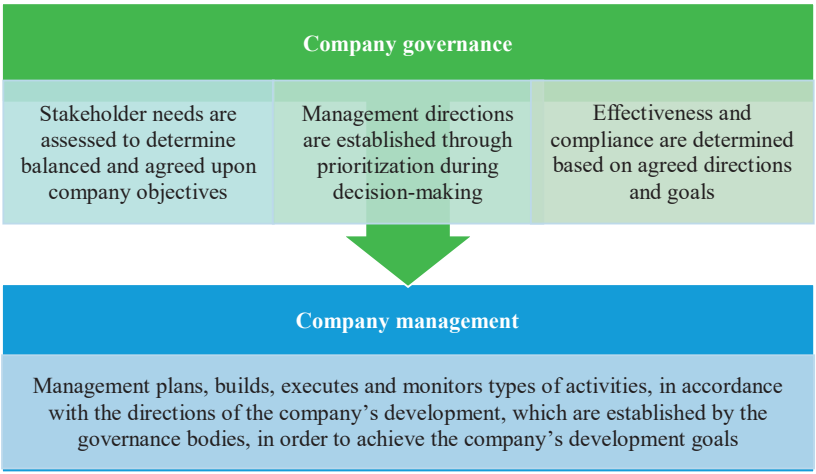


Fig. 5.16 – The connection between the company's management system and the management system

The COBIT concept defines tools for building a stable management system (Fig. 5.17):

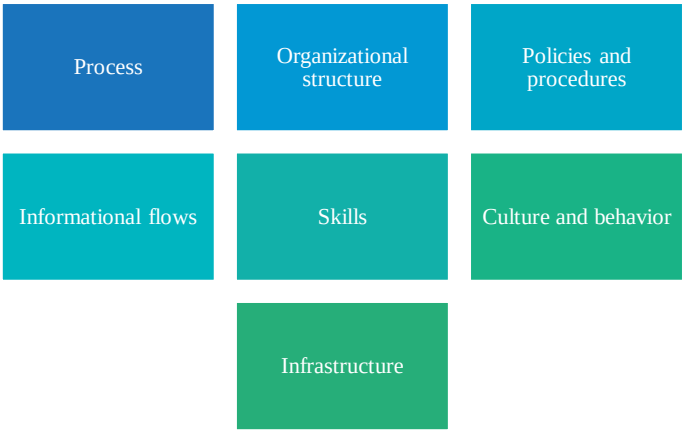


Fig. 5.17 – Components of the information and technology management system in the company

At the same time, the COBIT also suggests factors that should be taken into account when developing and designing an information and technology management system in a company.

For a better understanding of the essence of the COBIT concept, the distinguishing features of this concept should be pointed out:

– COBIT is not a complete description of the entire IT environment of the company;

– COBIT is not a concept of organization of business processes;

– COBIT is not a technical framework for managing all technologies;

– COBIT does not make any decisions related to IT, but it says which decisions should be made, how and by whom.

Stakeholders of digital efficiency management

Stakeholders of digital efficiency management can be conditionally divided into two groups (Fig. 5.18):

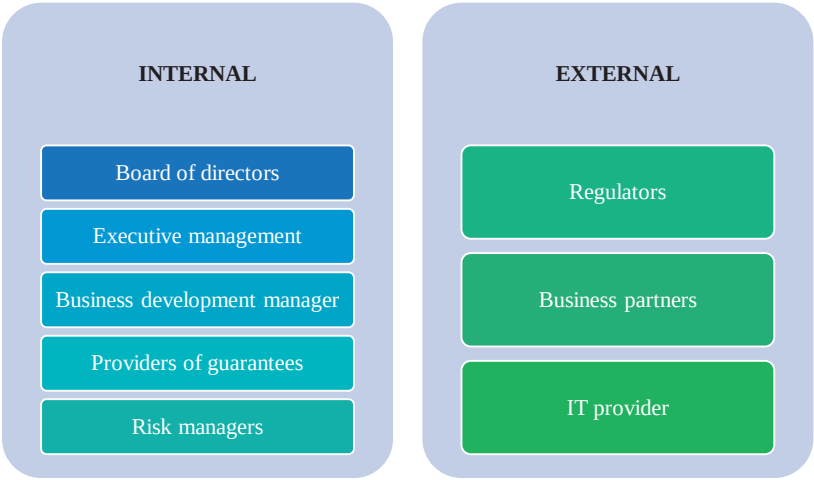


Fig. 5.18 – Stakeholders of the company's information and technology management system

The benefits of implementing the COBIT concept for various stakeholder groups are detailed in Table 5.3.

***Table 5.3* – Stakeholder benefits of the company's information and technology management system from implementation COBIT**

Stakeholder Benefits from the implementation of COBIT	*Stakeholder Benefits from the implementation of COBIT*
Internal stakeholders	
Board of Directors	Provides insight into how to derive value from the use of IT and explains the board's respective responsibilities.
Executive Management	Provides recommendations on how to organize and monitor the effectiveness of IT use throughout the company.
Business Development Manager	Helps to understand how to make the IT decisions that the company needs and how best to use new technology to realize new opportunities for the company.
Providers of guarantees	Provides recommendations on how to better build and structure the IT department, manage IT efficiency, effectively carry out IT operations, control IT costs, bring IT strategy closer to business priorities.
Risk Managers	Helps ensure identification and management of any IT-related risks.
External stakeholders	
Regulators	Helps to ensure that the company complies with applicable rules and regulations and has the right local management system in place to support such compliance
Business Partners	Helps ensure that the company's transactions with business partners are secure, reliable and compliant with rules and regulations
IT Provider	Helps ensure that the company's dealings with IT suppliers are secure, reliable and compliant with rules and regulations

A certain level of experience and a thorough understanding of the internal and external environment of the company's functioning is mandatory to obtain the appropriate benefits from the implementation of the COBIT concept. This allows users to adapt (customize) the basic principles of COBIT to the individual characteristics and goals of the company, considering the context of its activity.

The target audience for the implementation of COBIT in this case are those responsible persons who are involved in the entire life cycle of search and decision-making.

Questions for self-control:

1. How is the management of digital technologies in the company?
2. What are the advantages of managing digital technologies in the

company?

3. Name the main elements of the structure of the COBIT 2019?

4. Who are the stakeholders of the digital technology management system in the company?

5. What are the benefits of the company's information and technology management system stakeholders from the implementation of COBIT?

References:

1. Blake, M. (2019), 7 Examples Of How Digital Transformation Impacted Business Performance // Forbes, [Online], available at : https://www.forbes.com/sites/ blakemorgan/2019/07/21/7-examples-of-how-digital-transformation-impacted-business-performance/?sh=13d5b5ca51bb.

2. Calvino, F. and Criscuolo C. (2019), Business dynamics and digitalisation, OECD Science, Technology and Industry Policy Papers, No. 62, OECD Publishing, Paris, [Online], available at : https://doi.org/10.1787/6e0b011a-en.

3. COBIT Case Studies, [Online], available at : https://www.isaca.org/resources/cobit/cobit-case-studies.

4. COBIT 2019 Design Guide: Designing an Information and Technology Governance Solution, Information Systems Audit and Control Association, Isaca, Information Systems Audit and Control Association, 2018, ISBN 1604207612.

5. COBIT 2019 Framework: Introduction and Methodology. ISACA, 2018, [Online], available at : https://community.mis.temple.edu/ mis5203sec003spring2020/files/2019/01/COBIT-2019-Framework-Introduction-and-Methodology_res_eng_1118.pdf.

6. Digital performance management: From the front line to the bottom line (2020), [Online], available at : https://www.mckinsey.com/business-functions/operations/our-insights/digital-performance-management-from-the-front-line-to-the-bottom-line#.

7. Information Systems Audit and Control Association (2012), Ur., COBIT

5: a business framework for the governance and management of enterprise IT: an ISACA® framework. Rolling Meadows, Ill: ISACA.

8. Gerl, A., von der Heyde, M., Groß, R., Seck, R. & Watkowski, L., (2021), Applying COBIT 2019 to IT Governance in Higher Education. In: Reussner, R. H., Koziolek, A. & Heinrich, R. (Hrsg.), INFORMATIK 2020. Gesellschaft für Informatik, Bonn. (S. 517–530), [Online], available at : https://doi.org/10.18420/inf2020_47.

9. Hardy, G. (2006), Using IT governance and COBIT to deliver value with IT and respond to legal, regulatory and compliance challenges. Information Security Technical Report, let. 11, št. 1, str. 55–61, 2006, [Online], available at : https://doi.org/10.1016/j.istr.2005.12.004.

10. How digital transformation is revolutionizing economics (2020), [Online], available at : https://drivinginnovation.ie.edu/how-digital-transformation-is-revolutionizing-economics/.

11. OECD (2018), Digitalisation, business models and value creation, in Tax Challenges Arising from Digitalisation – Interim Report 2018: Inclusive Framework on BEPS, OECD Publishing, Paris, [Online], available at : https://doi.org/10.1787/9789264293083-4-en.

12. OECD (2019), Digitalisation and productivity: A story of complementarities, in OECD Economic Outlook, Volume 2019 Issue 1, OECD Publishing, Paris, [Online], available at : https://doi.org/10.1787/5713bd7d-en.

13. OECD (2014), Information and communication technology and its impact on the economy, in Addressing the Tax Challenges of the Digital Economy, OECD Publishing, Paris, [Online], available at : https://doi.org/10.1787/9789264218789-6-en.

14. OECD (2014), The digital economy, new business models and key features, in Addressing the Tax Challenges of the Digital Economy, OECD Publishing, Paris, [Online], available at : https://doi.org/ 10.1787/9789264218789-7-en.

15. Nachrowi, E., Nurhadryani, Y., & Sukoco, H. (2020), Evaluation of Governance and Management of Information Technology Services Using Cobit 2019 and ITIL 4. Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi), 4(4), pp. 764–774.

16. What is digital transformation? (2021) HP Process, [Online], available at : https://www.hpe.com/us/en/what-is/digital-transformation.html.

17. Зайцева, О.О., Болотинюк, І.М. (2015), Електронний бізнес. Навч. посібн. Івано-Франківськ: Лілея-НВ, [Online], available at : http://nmc-pto.lg.ua/images/ Посібники/elektronnyi_biznes.pdf.

18. Закон України «Про електронну комерцію», [Online], available at : https://zakon.rada.gov.ua/laws/show/675-19#Text.

19. Ляпін, Д.В. (2016), Тест малого підприємництва (М-тест). Посібн. з використання. К.: Центр комерційного права. С. 63.

20. Тардаскіна, Т.М., Стрельчук, Є.М., Терешко, Ю.В. (2011), Електронна комерція: Навч. посібн. Одеса: ОНАЗ ім.О.С. Попова. 244 с.

21. Успішна цифрова трансформація починається з культури (2021), DTEK, [Online], available at : https://dtek.com/media-center/news/uspeshnaya-tsifrovaya-transformatsiya-nachinaetsya-s-kultury/.

22. Федишин, І.Б. (2016), Електронний бізнес та електронна комерція (опорний конспект лекцій для студентів напряму «Менеджмент» усіх форм навчання). Тернопіль, ТНТУ імені Івана Пулюя. 97 с.

23. Шалева, О.І. (2011), Електронна комерція. Навч. посіб. К.: Центр учбової літератури. 216 с.

24. Як цифрова трансформація допоможе розвитку вашої організації? (2020) Terrasoft, [Online], available at : https://www.terrasoft.ua/page/digital-transformation.

UDC 339.138:004.75

Darya LEGEZA, Doctor in Economics, Professor
Tetiana KULISH, PhD in Economics, Associate Professor
Yana SOKIL, PhD in Economics, Associate Professor
Oleh SOKIL, Doctor in Economics, Professor
Dmytro Motornyi Tavria State Agrotechnological University,
66, Zhukovsky str, Zaporizhzhia, 69600, Ukraine

Chapter 6
MOBILE APPLICATIONS AS MEANS OF INTERACTIVE CONNECTION WITH THE COMMUNITY

Content

6.1. Modern transformations of digital marketing and the role of mobile applications

New digital methods of processing and using information become the main source of increasing the effectiveness and efficiency of marketing activities. In the conditions of information-concentrated society, the Internet and modern capabilities of mobile devices are changing the forms and methods of marketing activity. They have been becoming an impetus for the emergence of a new form of marketing activity called digital marketing.

The term “digital marketing” have been used from 1990s. In 1993, marketers have used an interactive banner for the first time. With the development of mobile devices and the possibilities of using Internet technologies, digital marketing is launching new momentum.

Digital marketing is marketing that provides interaction with customers and business partners using digital information and communication technologies and electronic devices. In a broader sense, it is the implementation of marketing activities using digital information and communication technologies.

Digital marketing is the usage of all possible forms of digital channels to promote a company and its products. Television, radio, Internet, social media, mobile devices are all digital marketing tools. Digital marketing is closely intertwined with Internet marketing, but it has already developed a number of techniques that allow you to reach your target audience even in an offline environment. It solves the following tasks:

1) brand image support;

2) support for bringing a new brand or product to the market;

3) increasing recognition;

4) sales promotion.

Digital marketing uses the following basic tools, each with a set of terms.

1. ***Mobile marketing*** – marketing activity using mobile devices.

2. ***SEO*** (English search engines optimization) – site optimization in search engines, promotion of the site to the first page of search engine results for key queries.

3. ***SMM*** (social media marketing) – social media marketing, media advertising in the form of static or animated pictures placed on website pages for the purpose of product promotion.

4. ***SMO*** (social media optimization) – optimization for social networks, advertising in social networks: blogs, forums, online diaries.

5. ***Big Data technology*** – research of large data sets.

6. ***Marketing of games*** – promotion of games, including the process from creating a game to selling the game and making profit from the game.

7. ***SEM*** (English search engine marketing) – marketing activity in search engines aimed at increasing website traffic.

8. ***Remarketing*** – retargeting, repeated display of previously viewed Internet advertising.

9. ***E-mail marketing*** – text messages of an advertising nature sent by e-mail.

10. ***Web analytics*** – analytics in the field of digital marketing.

11. ***Google AdWords contextual advertising.***

12. ***RTB*** (English real time bidding) – bidding in real time.

Such tools attract new customers and provide services to existing customers that help develop customer relationships through CRM systems. Customer Relationship Management (CRM) is the usage of digital communication technologies to increase sales to existing customers and encourage continued use of online services through methods such as databases, personalized web messages, customer service, chat bots, email and marketing in social networks. However, if you want to be successful in digital marketing, it is necessary to integrate traditional media with such tools as print, television, direct mail, and PR. They are part of multi-channel marketing communications in mobile devices.

The ranking of the frequency of use of digital marketing tools is as follows:

1. The first place takes SEO (site optimization in search engines). About 90 % of enterprises use the method.

2. The second place take SMM (social media marketing) and SMO (optimization for social networks. About 65 % of enterprises use the method.

3. The third place take mobile applications (they increase every month by 2–3 %).

4. The fourth place is contextual advertising. About 60 % of enterprises use the method.

5. The fifth place takes SEM (search marketing). About 60% of enterprises

use the method.

The first place of search optimization is explained by the fact that 70–90 % of consumers, depending on the type of market (B2C, B2B), start their search for a product from search engines. This is the basis of the paradigm and concept of digital marketing, which is manifested in the philosophy: “Cooperate with those who want it”. This approach is a priori the most effective. When a user turns to a search engine, his request is recorded, and thus the needs of consumers are determined. Further, with the help of other digital marketing tools, he is offered alternative options for meeting demand.

The second place of marketing activity in social networks is due to the popularity of social networks and a high level of trust in the recommendations of acquaintances and friends. Social networks are an artificial platform for realizing the biosocial propensity of people to communicate. This is facilitated by unlimited interactive communications, direct participation of users in the generation and relaying of media content, a high degree of involvement in the communication process, maximum feedback speed, and user personalization. Meanwhile, in addition to social networks, there are other types of social media that also allow influencing the position of consumers: Internet forums, blogs, photo and video hosting, virtual worlds, communities for the production of joint content, joint projects, geosocial services, event communication communities, dating sites, social aggregators. That is why the methods of SMM and SMO are so important, which allow you to form and consolidate a positive image of the company among the network community. Optimization of social networks occurs due to the organization of media sites and attracting the target audience to them, placement of advertising or PR content in places of concentration of the target audience, creation and management of blogs, cooperation with bloggers, creation or sponsorship of additional software products, holding contests.

An additional tool for social networks is viral marketing, which is effective under the condition of harmonizing the content of commercial information and

the form of its illustration. Mobile marketing is not yet among the leaders of digital marketing, but it is rapidly gaining momentum and its share in the total volume of advertising should be expected to increase in the near future. The increasing potential of mobile devices, the growing number of GPS devices and various mobile applications will lead to a restructuring of digital marketing in favor of mobile marketing. Mobile marketing is 2–5 times more effective than internet marketing.

The creation of mobile applications strengthens the presence of the product in the digital network and involves understanding the target audience, the portrait of the client and proactively developing digital solutions to solve the company's problems. Before creating concepts and features of mobile applications, companies should answer the following questions:

1. Is the offer limited by issues of reach, understanding, trust or loyalty?
2. Are there problematic issues with important customer touch points?
3. If there are gaps in brand perception, how can digital marketing tools close or bridge them?

Taking this into account, the effective operation of the company is achieved by the synergy of the actions of Internet marketers and employees of other departments, in particular the marketing department. The strategy for the development and operation of mobile applications should not operate in a reactive mode. Digital marketing is involved during the planning and design phase of mobile software, and its application should not be delayed. For example, Starbucks reinforces its offline value proposition with an app that lets you take advantage of quick checkout, tip, earn stars, find stores, choose personalized offers, and more. Such a strategy is aimed at obtaining a sustainable advantage in the future, which is supported by the application of innovations and an aggressive brand strategy.

Digital mobile transformation is the introduction of modern technologies into the enterprise's business processes with the help of mobile software products.

This approach involves not only the installation of modern equipment or software, but also fundamental changes in management approaches, corporate culture, and external communications. As a result, the productivity of each employee and the level of customer satisfaction increase, and the company gains the reputation of a progressive and modern organization.

Digitization of processes is relevant not only at the level of individual enterprises: entire industries choose this path of development as the only opportunity to meet the rapidly changing conditions of the surrounding world. Thanks to this, the digital transformation of industry, retail trade, the public sector and other areas is already changing the life of every person and every company today.

The use of digital media, data and technology to support marketing activities has given rise to a wide range of terms proposed by practitioners and academics alike (digital marketing, Internet marketing, electronic marketing and web marketing). Digital marketing is the evolution of internet marketing.

The digital economy is a global network of economic and social activity that is accessible through platforms such as the Internet, mobile and sensor networks. Since the digital economy is, on the one hand, a derivative of the electronic economy, and on the other, the next stage of development, the identification of fundamental differences in marketing in the conditions of the digital economy is unresolved.

The new phenomena that give the digital economy independence and specificity are:

– mobile technologies;

– cloud technologies;

– business analytics based on digital technologies;

– social media.

Mobile technologies significantly change business models, as various actions with information can be carried out remotely. Smartphones are a