

DOI: 10.55643/ser.3.49.2023.491

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DEVELOPMENT OF THE WORLD MARKET OF INFORMATION AND COMMUNICATION TECHNOLOGIES

ABSTRACT

This article examines the development of information and communication technologies (ICT), which consist of information and communication tools for the collection, processing and transmission of data. The peculiarities and structure of the ICT market are studied, as well as the current trends in the development of the industry are analyzed. The article also presents the amount of ICT spending in the world and strategic technological trends. The author analyzed the change in the structure of international production, the trends of ICT management and the results of the analysis of the ICT market in different countries of the world. The market of information and communication technologies of Ukraine is analyzed from the point of view of its development, taking into account macroeconomic indicators and market interaction. Recommendations are given for the further development of the ICT market in Ukraine, taking into account the strategic directions of the development of the information society.

Keywords: market, information and communication technologies, equipment, software, information security, policy, company

JEL Classification: O311

INTRODUCTION

In modern society, the volume of new information products and technologies is constantly increasing, and the possibility of operational information transfer is increasing, which leads to the transformation of the information and communication technologies (ICT) market. The growing demand for information resources and services expands the possibilities of countries for the development of the field of ICT in the international environment. Research of the market of information and communication technologies makes it possible to predict the development of this market and increase the efficiency of its use. This market is an important component of international economic relations and accounts for 6.5% of world GDP, employing about 100 million people. [1, p. 261]. The development of ICT and the Internet over the past 25 years has contributed to the transition to a new technological era, the Fourth Industrial Revolution, which provides digitization of data and automation of operational processes at enterprises of all forms of ownership, in all organizations and institutions, both in the private and in the public sector of the economy. Against the background of the global modernization of the ICT market, the Ukrainian market is still at the stage of forming information needs related to the automation of key sectors of society, such as public administration, business, education, health care, culture and security. Due to the consequences of the political and economic crisis, as well as the conflict in the east of the country, which turned into a full-scale war, the introduction of ICT into the business processes of enterprises is rather slow, and only partial or sectoral automation is taking place. Against the background of the global modernization of the ICT market, the Ukrainian market is still at the stage of forming information needs related to the automation of key sectors of society, such as public administration, business, education, health care, culture and security. Due to the consequences of the political and economic crisis, as well as the conflict in the east of the country, which turned into a full-scale war, the introduction of ICT into the business processes of enterprises is rather slow, and only partial or sectoral automation is taking place. Against the background of the global modernization of the

Received: 23/05/2023

Accepted: 17/08/2023

Published: 18/09/2023

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ICT market, the Ukrainian market is still at the stage of forming information needs related to the automation of key sectors of society, such as public administration, business, education, health care, culture and security. Due to the consequences of the political and economic crisis, as well as the conflict in the east of the country, which turned into a full-scale war, the introduction of ICT into the business processes of enterprises is rather slow, and only partial or sectoral automation is taking place.

LITERATURE REVIEW

Scientists such as A. Keshelava, V. Budanov, K. I. Tarasova engaged in active market analysis, outlined the industry's internal competitive advantages on the market and identified strategic directions for development. V.P. Aleksandrova, Yu.M. Bazhal, and M.S. Danko highlight the conceptual principles of the behaviour of subjects of the global ICT market, the specificity of the process of digitalization in developed countries. S. F Wamba, A. Gunasekaran, S. Akter, made a significant contribution to the research of innovative activity at the enterprise and state level, identified the main stages of ICT development, the formation of the industry at the international level and its impact on the economic society. E. Rudykh, S. Velitskyi, V. Kudryashova, and S. Morozova investigate modern trends and directions of development. International organizations such as the European Information Technology Supervisory Commission (EITO), the United Nations Conference on Trade and Development (UNCTAD), the McKinsey Global Institute, the International Telecommunication Union (ITU), the International Monetary Fund (IMF) contribute to the development of the ICT market, establish the main regulators of trends and dynamics, monitor trends and ways of development. All authors, despite the diversity of approaches and conclusions, express the idea that the ICT market is fast developing and turning into a powerful source of competitiveness national economy.

AIMS AND OBJECTIVES

The purpose of the article is a study of the world market of information and communication technologies, establishing the main factors, trends and prospects for their further development. The main objectives of the article are:

- to perform a system-structural analysis of the current state of development of information and communication technologies in the world and in Ukraine;
- to investigate the activities of the leading IT companies of Ukraine as the main ICT sector, based on financial and operational indicators;
- develop a set of measures to improve the development of information and communication technologies in Ukraine.

METHODS

In the work, general scientific research methods were used for the purpose of research, analysis and forecasting of the ICT market, which include: dialectical method of cognition and logical and formal-logical methods to establish logical chains, methods of comparison, and correlation. Systematization grouping and graphic analysis were used for the generalization of information and its graphic display, which allows for comprehensive analysis.

RESULTS

In today's world reality, questions about the state and future prospects of the development of the informatization of society are often discussed, and large-scale scientific studies of the results of the implementation of information technologies in the life, business and economy of various countries are carried out.

Information and communication technologies include a set of technical means and methods of collecting, processing and transmitting information for the purpose of obtaining new knowledge about objects, processes and phenomena. The main purpose of these technologies is to create or transform information for further analysis or improved human perception, as well as to make decisions on the basis of certain actions.

From the history of the development of the information technology market, it follows that earlier this market showed significant growth, but recently the pace has decreased, and experts predict that this trend will continue for some time. Compared to the period before 2015, when the market was growing steadily, 2015 - 2022 are characterized by a reduction in investments in non-financial assets and the instability of the global economic situation.

The world market of information technologies includes several main segments:

- IT services;
- software;
- computer Engineering;
- communication equipment;
- trends of the global IT market.

The growing demand and application of ICT in various spheres of life lead to a dynamic growth of market volumes. According to a study conducted by the International Telecommunication Union (ITU), by 2020, more than half of the world's population had access to the Internet, and the number of connected devices exceeded USD 25 billion (Table 1).

Table 1. Number of devices connected to the Internet. (Source: <https://www.statista.com/statistics/1101442/iot-number-of-connected-devices-worldwide/>)

Year	The number of connected devices (in billions)
2010	0.8
2013	2.1
2015	3.6
2022	16.4

ICT plays an important role in increasing the efficiency of business processes and the competitiveness of companies. The introduction of modern information systems and technologies allows for the automation of a large number of tasks, reducing time and financial costs. For example, the implementation of customer relationship management systems (CRM) or electronic commerce systems (e-commerce) allows to increase sales efficiency and improve customer service. In addition, ICT contributes to the expansion of market boundaries and increased competition. Thanks to the possibilities of electronic commerce, companies gain access to new markets and customers on an international scale. This increases consumer choice and stimulates competition between companies, which in turn promotes innovation and improves the quality of goods and services.

Digital transformation covers a wide range of sectors of the economy, including manufacturing, finance, trade, healthcare and many others. The use of ICT makes it possible to automate processes, increase the efficiency and quality of products, and improve communications and interaction between market participants. As a result of the digital transformation of economic sectors, there is an increase in productivity, a reduction in costs and the creation of new opportunities for business. The introduction of ICT contributes to the stimulation of innovation, as it provides new opportunities for the development and implementation of new products and services. More effective use of information technologies contributes to the acceleration of economic growth and the creation of jobs in the field of high technologies.

The relationship between the ICT market and international trade is also becoming increasingly significant. The development of e-commerce and digital platforms opens up new opportunities for global businesses, providing them with access to new markets and customers around the world. However, along with the positive aspects, the ICT market also faces challenges in the field of data security, digital privacy and cyber security. The continued growth and development of ICT requires effective risk management and the development of appropriate policies and regulatory frameworks. Analysis of current ICT trends includes the study of the latest developments and innovations in the field of artificial intelligence, big data, the Internet of Things, cloud computing, cyber security and other technologies. These technological breakthroughs have the potential to transform business processes, improve productivity, optimize resources and create new opportunities.

The practical foundations of ICT include the study of specific applications and implementations of ICT in various industries and spheres of activity. This may include the development and implementation of software, database management systems, creation of information systems, development of web applications and other aspects of practical use of ICT [14]. In the field of health care, for example, ICT enables the development of electronic medical records, telemedicine, patient monitoring systems and other solutions that contribute to increasing the availability and quality of medical care. In the field of education, ICT opens up new opportunities for distance learning, e-learning, interactive learning materials and personalized education. They allow teachers and students to access educational resources and modern teaching methods. In the business environment, ICT plays a key role in automating business processes, increasing work efficiency, reducing costs, and improving communication both within the company and with customers and partners. They also provide the ability to analyze data, forecast trends, and make informed decisions based on information. ICT also permeates the urban

environment, creating the concept of a "smart city". With the help of ICT, transport and energy management systems are implemented in cities, infrastructure is improved, efficient use of resources is ensured, and the quality of life of citizens increases [16].

Demand for products and services that are not the first necessity has decreased, which has led to a decrease in the need for IT infrastructure for the enterprises that produce these products and services. Due to the spread of COVID-19 and the introduction of the lockdown, automotive companies, for example, have become less important than companies that produce information and communication equipment and consumer electronics. With the transition of remote work to education, chip manufacturers have focused on cooperation with companies that produce computers, smartphones, televisions, game consoles, and other gadgets that have become necessary.

One of the key aspects of ICT globalization is the development of international communication networks such as the Internet. Global communication networks provide the possibility of fast and efficient exchange of information between different countries and regions. This contributes to the development of global communication and the creation of new forms of interaction and cooperation between people and organizations at the international level.

One of the significant consequences is the development of the digital economy. The digital economy encompasses a variety of sectors, including e-commerce, digital platforms, online services and other forms of digital business. Globalization of ICT contributes to the development and expansion of these sectors, creating new opportunities for entrepreneurship and innovation, as well as increasing the productivity and efficiency of business processes.

Modern enterprises cannot exist without the support of information technologies, which have a great impact on the activities of small and medium-sized businesses and are important for the growth of the country's economy. Information has become an irreplaceable resource, a valuable product and a key factor in progress and development. Information technology, in particular the Internet, has a significant impact on the activities of small and medium-sized enterprises, and this is important for their survival and growth, as well as for the national economy as a whole. The success of small and medium-sized businesses in an increasingly competitive and global environment largely depends on their ability to access information as a resource and use new technologies.

Today, every enterprise is faced with the issue of innovative development. Using this type of development leads to high competitiveness and sustainable growth. However, in recent years, a negative trend has been observed: a decrease in the number of innovative processes. Therefore, an important task is the development of effective methods and measures to improve innovative activity as a whole.

In the period of Industries 2.0 and 3.0, the first information technologies and the initial digital business were introduced, which significantly changed the way people live. Examples include the advent of the telegraph, the first payment card, and time synchronization. Previously, competitive advantage in business could be achieved by improving product quality, personnel qualification and production modernization. However, modern manufacturing has become increasingly commoditized as advanced technologies are transformed into affordable "raw" components for more advanced enterprises.

One of the simplest and most common innovative technologies are electronic document management (EDM) systems, which allow you to effectively solve all tasks related to working with documents. They include document registration and entry, search, sharing, reporting, archiving and document access rights management. The use of information technologies, in particular SED, is mostly required by small and medium-sized businesses from their large customers or suppliers [18]. This increases the dependence of small and medium-sized enterprises on these consumers or suppliers. In today's world, many enterprises install terminals of any size to ensure communication with their customers. However, this may limit the room for manoeuvre for the customers themselves.

ICT have a diverse impact on organizations. Companies and SMEs gain competitive advantage through innovation and the ability to extract value from information as a resource. The use of information technologies allows the creation of new business models and market settings, including by outsourcing business processes, which allows small and medium-sized enterprises to gain access to new markets and sources of competitive advantages. The business, which is based on modern information and communication technologies, is efficient and competitive, ready for the processes of European integration and entry into international markets. Businesses that experience greater cost-effectiveness, i.e., the benefits of adopting new communication technologies that exceed the costs, are likely to be the first to adopt these technologies.

In Ukraine, the market of information and communication technologies is considered a set of economic, legal and information relations related to the purchase and sale of information goods and services. This market is the only mechanism operating on the basis of general laws of social production and ensures full economic independence and responsibility of manufacturers of scientific and technical products. It promotes freedom of entrepreneurship, independent buying and

selling of information resources, products and services, means of information production, labour, money and securities. [4 pp. 46–51]. The ICT market sells software packages and hardware that help customers manage information. Individuals and legal entities are consumers because they need to use information technologies to process large amounts of accumulated information and reduce dependence on paper documentation.

In accordance with the Law of Ukraine "On the Basic Principles of the Development of the Information Society in Ukraine for 2007-2015", tasks, development goals, and directions of the national ICT market development policy were established, and the organizational and legal foundations of the development of the information society in Ukraine were presented [7].

In the conditions of the war in Ukraine, information technology became, one might say, the only branch of the economy that continues to actively develop, create new jobs, launch new projects and attract investments. Despite the fact that the full-scale war affects all spheres of the economy, the IT sphere continues to support Ukraine and, perhaps, will become one of the main factors of development in the future. The IT sphere in Ukraine not only actively contributes to the development of the economy, but also plays an important role in supporting the military forces. Today's Ukraine is waging the first digital war, where not only machine guns and tanks are assets on the battlefield, but also data and technology that are crucial. Innovative developments of Ukrainian IT specialists help save the lives of the military and bring us closer to victory.

During the first ten months of 2022, the information and communication technology (ICT) industry in Ukraine was marked by growth, which led to an income of USD 6 billion in export revenue to the country's economy. This is 10% more than in the corresponding period of 2021. The share of exports of IT services in GDP increased by 51% to 5.4%, and exports of services increased by 24% to 47%, which is roughly equal to half of the total volume of exports. [10].

Ukraine has a developed IT infrastructure, which includes IT parks, technology parks, innovation centres and other technological classes. The presence of such infrastructure creates favourable conditions for placing investment projects in the field of ICT. According to the Ukrainian Software Association (UAP) and IT-Ukraine IT Association, the country employs about 200,000 IT specialists, which is one of the largest figures in Central and Eastern Europe.

One of the main indicators of the investment attractiveness of the ICT industry is the amount of foreign direct investment (FDI). In recent years, there has been a constant increase in this indicator. According to data from the National Bank of Ukraine, in 2022 the volume of FDI in the ICT sector was USD 621 million, which is a significant increase compared to previous years (Figure 1).

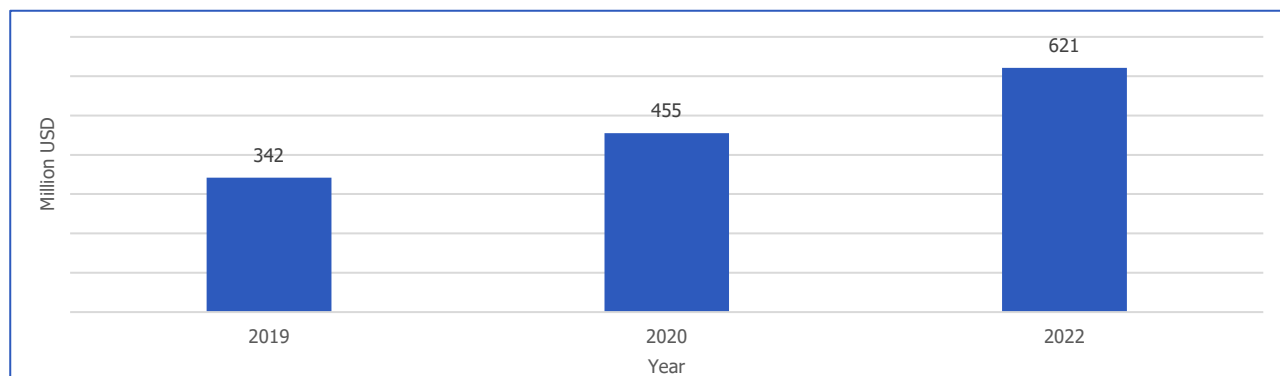


Figure 1. The volume of FDI, USD million. (Source: [17])

This growth in the volume of FDI indicates the growing interest of foreign investors in the Ukrainian ICT industry. Such an increase in investment may be associated with changes in legislation and state support aimed at the development of the industry. The Ukrainian state also actively supports the development of the ICT industry by adopting relevant legislation and creating special programs and funds to support innovative projects. For example, the "Action" program promotes the development of the startup ecosystem and provides financial and infrastructure support for innovative projects. In general, the investment attractiveness of the ICT sector of Ukraine is confirmed by the growth of foreign direct investments, the presence of a developed IT infrastructure and highly qualified personnel. State support is an important factor contributing to the further development of the industry and attracting investments.

The main goals of Ukraine's digital development are the following: acceleration of economic growth and attractiveness of investments; transformation of economic sectors into competitive and efficient ones; technological and digital modernization of industry and the creation of high-tech industries; ensuring the availability of benefits and opportunities of the digital

world for all citizens; development of human potential, promotion of digital industries and development of digital entrepreneurship [16].

An effective regulatory policy is an important condition for the positive development of information and communication technologies (ICT). Acceleration of the spread of ICT is based on steps taken within the framework of macroeconomic policy, including the following main directions: establishment and improvement of the regulatory and legal framework, the inclusion of a set of measures for the development of ICT in national target programs; expansion and improvement of the information infrastructure to ensure wide access and reduce the cost of Internet services; ensuring information security; support of research and intelligence activities in the field of ICT; promotion of investments in the production and dissemination of ICT in the public, private sector and among the population; training of qualified specialists in the field of ICT.

Awareness and implementation of these directions help to create a favourable environment for the development of ICT, ensure the wide availability of digital technologies, promote economic growth and stimulate innovation in this area. In order to achieve a proper strategy for the development of a new digital society and sustainable socio-economic growth, it is necessary to take into account promising and long-term trends in the development of civilization. Special attention should be paid to the role and needs of the person in this process.

DISCUSSION

In the modern economy, the high-tech market plays an important role in the growth of the world economy and individual countries. It shows several trends, including an increase in demand for IT services and the transformation of hardware and software in addition to these services. Also, more and more companies are switching to a global model of providing IT services, where developers and operating companies can be located far from the client, and interaction takes place using communication channels. In addition, cost reduction in the ICT market is achieved by attracting IT specialists from developing countries to countries with a high level of economic development.

Although the regulatory and legal framework for the development of the ICT market is not ideal, the market is still developing. Both official and unofficial sources of information were analyzed to assess the state of this market. However, during the analysis, it turned out that the obtained results were not the same and were characterized by the criteria of "inconsistency" and "contradiction".

In essence, the scientific tenets, conclusive insights, and pragmatic recommendations arising from the conducted study are poised to function as instrumental tools. These tools have the potential to augment and optimize domestic market development through the strategic integration and utilization of cutting-edge Information and Communication Technologies (ICT). As Ukraine embarks on a trajectory of technological evolution, guided by insights from comprehensive research, the stage is set for the nation to harness its inherent potential and emerge as a formidable player in the global arena of information technologies.

CONCLUSIONS

In the contemporary landscape of the global economy, the high-tech market assumes a pivotal and transformative role in propelling both the world economy as a whole and the individual economies of nations. Within this dynamic arena, several notable trends are discernible, each contributing to the overarching narrative of technological evolution and its impact on various sectors. One of these discernible trends is the escalating demand for IT services, which underscores the growing significance of technology in our daily lives and across industries. This heightened demand is further complemented by a profound metamorphosis of hardware and software components, intricately interwoven with the provision of IT services.

Simultaneously, a consequential paradigm shift is underway in the realm of service delivery models, with an increasing number of companies transitioning towards a globalized approach. This paradigmatic transformation is redefining the conventional notions of proximity and geographic limitations between service providers and their clients. Developers and operational entities are no longer confined by geographical proximity to their clientele; instead, they are dispersed across diverse locations, engaging in seamless communication through various channels.

An intriguing facet of this globalized service provision is the integration of communication technologies, which play a pivotal role in bridging the geographical divide. This is particularly pertinent in today's interconnected world, where businesses seek to optimize efficiency and accessibility while transcending the confines of physical boundaries. Moreover, the reduction of costs within the expansive Information and Communication Technology (ICT) market is being effectively realized through

a strategic talent acquisition strategy. This entails the recruitment of proficient IT specialists from developing countries, subsequently leveraging their expertise in countries characterized by advanced economic development.

Undeniably, the implementation of information technology carries profound implications for the enhancement of diverse business domains. Supply channels, e-commerce platforms, logistical networks, and other critical sectors are all poised to benefit significantly from the integration of advanced technologies. Projections and forecasts indicate the staggering potential of the global IT market, suggesting a financial yield spanning a colossal range from USD 14 trillion to USD 33 trillion by the year 2025. These estimations underscore the undeniable importance of digital technologies in catalyzing economic growth and technological advancement.

A concurrent phenomenon within the contemporary business landscape involves the installation of communication terminals by a myriad of enterprises, spanning various sizes and industries. While these terminals serve as conduits for engaging with customers, there is an implicit caveat. The adoption of such terminals, while enhancing communication, might inadvertently curtail the inherent flexibility and agility that customers might expect in their interactions with businesses. Thus, a paradoxical relationship emerges, wherein businesses endeavour to foster communication while inadvertently introducing constraints that could impact the overall client experience.

This dynamic extends to the domain of small and medium-sized enterprises (SMEs), which find themselves navigating a delicate balance between dependence and autonomy. The installation of communication terminals positions SMEs in a state of reliance on their customer base or suppliers. While this could potentially enhance business-customer interactions, it also introduces a degree of vulnerability, as these enterprises become intricately interwoven with the actions and decisions of their patrons and partners.

Enterprises that anchor their operations on modern information and communication technologies are demonstrably poised for success. These entities exhibit traits of profitability, competitiveness, and integration into broader regional and global frameworks. An interesting corollary emerges, wherein businesses that are more cost-effective, efficiently navigating the balance between benefits and associated costs, tend to be early adopters of innovative communication technologies.

Delving deeper into the realm of information technology, particularly its subset of Information and Communication Technology (ICT), the multifaceted impact on organizations becomes palpable. Corporations, as well as various entities within the transportation sector such as railroads, seize a distinct competitive advantage by harnessing the potential of innovation and strategically extracting value from the information at their disposal. This synergy of technological integration empowers organizations to reimagine their business models, creating novel configurations within markets and embracing the outsourcing of specific business processes.

Within the context of Ukraine, a nation grappling with the forces of transformation and innovation, the ICT market presents an intriguing landscape. Current observations reveal an illusion of vigorous growth within the Ukrainian ICT market, which is still positioned at an early developmental stage. This growth narrative is primarily orchestrated by the efforts of smaller enterprises, despite their constrained resource potential. Fascinating trend surfaces, where the demand for ICT services among these enterprises is on a steady ascent, catalyzed by strategic outsourcing agreements inked with international counterparts.

The investment appeal of Ukraine's ICT sector resonates strongly with both investors and the governing bodies, a sentiment substantiated by a confluence of factors. Central among these is the country's robust IT infrastructure, encompassing enclaves such as IT parks, technology hubs, and innovation centres. This infrastructure serves as a testament to Ukraine's commitment to fostering technological progress and creates an environment conducive to hosting innovative investment endeavours within the ICT domain.

Another pivotal determinant of Ukraine's ICT potential is the abundance of highly skilled professionals populating the country's workforce. An impressive talent pool of approximately 200,000 IT specialists is a distinctive feature within the landscape of Central and Eastern Europe. This expansive reservoir of expertise serves as a wellspring of high-quality resources, pivotal for driving and sustaining ambitious investment projects within the dynamic realm of information technology.

Ukraine, replete with untapped potential, stands at a precipice, poised to exert a substantial influence within the global information technology landscape. This pivotal role necessitates a strategic and concerted approach, wherein Ukraine continues to undertake measures to rectify existing shortcomings. Addressing bureaucratic impediments that have historically hindered IT development, coupled with the formulation of progressive reforms and legislative frameworks, emerges as a critical mandate. Simultaneously, an intensified focus on bolstering infrastructural support stands as a tangible strategy to elevate the nation's allure and investment appeal on the global stage.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

Conceptualization: Lyudmila Khomutenko

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Methodology: Lyudmila Khomutenko

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Validation: Lyudmila Khomutenko

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РОЗВИТОК СВІТОВОГО РИНКУ ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНИХ ТЕХНОЛОГІЙ

У цій статті розглянуто розвиток інформаційно-комунікаційних технологій (ІКТ), які складаються з інформаційних та комунікаційних засобів для збирання, оброблення й передачі даних. Досліджені особливості та структура ринку ІКТ, а також проаналізовано сучасні тенденції розвитку галузі. У статті також представлено обсяг витрат на ІКТ у світі й стратегічні технологічні тренди. Автори проаналізували зміну структури міжнародного виробництва, тенденції управління ІКТ та результати аналізу ринку ІКТ в різних країнах світу. Ринок інформаційно-комунікаційних технологій України проаналізовано з точки зору його розвитку з урахуванням макроекономічних показників та ринкової взаємодії. Надано рекомендації щодо подальшого розвитку ринку ІКТ в Україні з урахуванням стратегічних напрямів розвитку інформаційного суспільства.

Ключові слова: ринок, інформаційно-комунікаційні технології, обладнання, програмне забезпечення, інформаційна безпека, політика, компанія

JEL Класифікація: 0311