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MARKET OF INFORMATION AND COMMUNICATION TECHNOLOGIES AND PLACE OF UKRAINE IN IT

The meaning of "information and communication technologies (ICT)", "market of information and communication technologies" were clarified in the article. Components and priority areas for capital investment in the ICT market were determined. The relativity of relationship between the placement of supercomputers in the countries and their level of innovation was revealed. The tendencies of world ICT market development were defined. The place of Ukraine in the world ICT market was established.
Keywords: information and communication technologies (ICT), market, supercomputer, e-commerce, network readiness, e-government.

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РИНОК ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНИХ ТЕХНОЛОГІЙ ТА МІСЦЕ В НЬОМУ УКРАЇНИ

У статті уточнено зміст понять "інформаційно-комунікаційні технології" (ІКТ), "ринок інформаційно-комунікаційних технологій". Визначено складові та пріоритетні сфери вкладання капіталу на ринку ІКТ. Розкрито відносність взаємозв'язку між розміщенням в країнах суперкомп'ютерів та рівнем їх інноваційності. Визначено тенденції розвитку світового ринку ІКТ. Встановлено місце України в світовому ринку ІКТ.
Ключові слова: інформаційно-комунікаційні технології, ринок, суперкомп'ютер, електронна комерція, мережева готовність, електронний уряд.

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РЫНОК ИНФОРМАЦИОННО-КОММУНИКАЦИОННЫХ ТЕХНОЛОГИЙ И МЕСТО В НЕМ УКРАИНЫ

В статье уточнено содержание понятия **"**информационно-коммуникационные технологии**", "рынок** информационно-коммуникационных технологий**"**. Определены составляющие и приоритетные сферы вложения капитала на рынке ИКТ. Раскрыта относительность взаимосвязи между размещением в странах суперкомпьютеров и уровнем их инновационности. Определены тенденции развития мирового рынка ИКТ. Установлено место Украины в мировом рынке ИКТ.
Ключевые слова: информационно-коммуникационные технологии, рынок, суперкомпьютер, электронная коммерция, сетьевая готовность, электронное правительство.

Formulation of the problem. Market of information and communication technologies in the world economy has undergone rapid development in the last decade, affecting the pace of scientific and technical progress and carrying out favourable impact on productivity improvement of national economies. However, in recent years ICT market slowed down its development caused by decrease in the growth rate in production volumes of IT products, return of available capital, productivity insufficiency of all production factors due to implemented information technologies. It requires study of the ways to address such situation.

Also the study of the impact on ICT market development of countries with market economy has significant interest, which innovation area had begun to form recently. In particular, it applies to the study of the ICT market of Ukraine.

The set of assigned tasks which need immediate resolution and allow, thanks to the received information about situation on ICT market, more effectively influence the market situation, indicate undeniable actuality of issues that have being studied.

Analysis of studies and publications. Research of the essence of concept, structure, tendencies and development prospects of ICT market was made by a number of native scientists, particularly such as S. Voytko [1] O. Volot [2], V. Geiets [6], D. Glukhova [3], A. Danylenko [6], L. Danylchuk [4], M. Kademiia [7], A. Kovalenko [8], I. Kryvovyazyuk [9-11], K. Ladychenko [12], E. Libanova [6], L. Fedulova [15], N. Fominyh [16], S. Yaremko [17]. Significant attention to this particular issue was also paid by foreign researchers [18-23].

Previously unsolved aspects of the problem. Despite the importance of conducted research in the works of represented scientists, the essence of concepts "ICT" and "market of information and communication technologies" is revealed incompletely. The components of ICT market and priority areas for investment capital need clarification considering present tendencies that have developed on the world ICT market. Also, relationship between the placement of supercomputers in the countries and their innovative activity is less highlighted in the economic literature. Additional attention should be given to Ukraine's place in the global ICT market.

The purpose of research is to determine development tendencies of world and native ICT markets and their impact on economic processes in order to develop further directions of market dynamics development.

Main results of research. Modern society is undergoing rapid fundamental changes in all areas of activity that primarily concern new ways of creation, storage, transfer and use of information. Informatization of society and computerization of all areas of human activity have become leading trends of world development. ICT are increasingly getting into different areas of life, science, education, production, which requires appropriate knowledge and skills of their use. [4, p. 123].

Currently, there is no clear interpretation of the term "information and communication technologies" (Fig. 1).

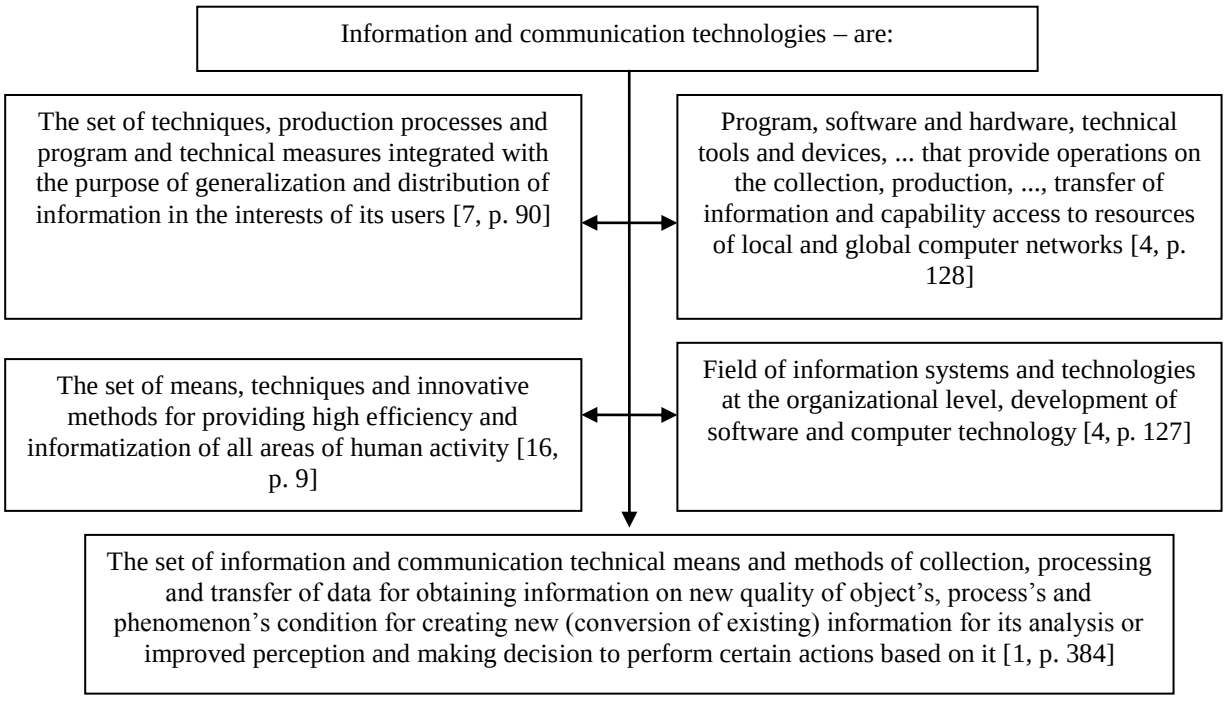

Fig. 1. The concept of "information and communication technologies", *author's elaboration*

At the same time, analysis of existing definitions of this concept allows to specify its essence according to the existing conditions of ICT market development:

Information and communication technologies – a set of methods and means of information and technical nature that ensure representation of new information to consumer, meant for its distribution and generalization for his interests on a global or local levels of its storage through special program and technical processes, devices and tools.

ICT Market – economic space where interaction exists between the participants on the exchange, purchase and sale of ICT, the price of which formed under influence of their supply and demand dynamics.

The national goal of Ukraine in the field of ICT should ensure the development of an efficient economy, production and export of products with high degree of processing, improving level of citizens education, implementation of state administration based on ICT.

ICT market structure includes: all types of computers, telecommunication and related equipment; R & D carried out with their help; all types of software; technical maintenance of all types of computer, telecommunication and related equipment; all kinds of telecommunication and teleinformation services, including transfer of voice, video and other types of information; technical maintenance, management and collection of plans for all telecommunication and teleinformation services; all on-line and off-line mass media services, including publication of books, magazines, newspapers etc.; launch and support of web sites, portals and etc.; all types of online and offline advertising [15, p. 253].

Presence of basic and intelligent market sectors is typical for field of telecommunications and information technologies. In particular, area of hardware for telecommunications is basic for IT and area of TC services, telecommunications equipment are basic for telecommunications. IT services, program software and services that are implicitly related to communication, belong to intelligent sectors of information and communication technologies. Intermediary services not directly related to production (creation) hardware and software – namely, the sale of licenses to use program software, reengineering of software products and business consulting also belong to information technologies [1, p. 386].

According to data of Statista [24], field of ICT in the world is characterized by global income growth during the last decade (Fig. 2).

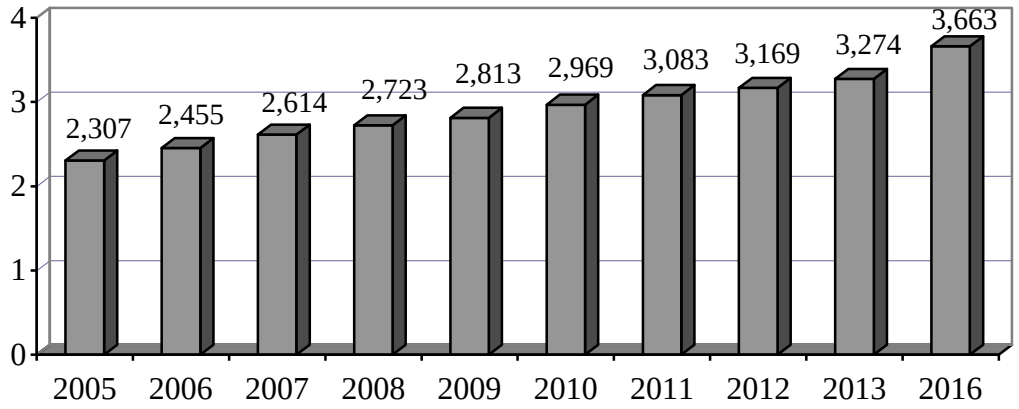

Fig. 2. Dynamics of ICT market's income in the world in 2005-2016, trillion euros [24]

Sector of cell phone and Internet service is the priority area for capital investment in ICT market because it is in great demand in all regions of the world. If developed countries are paying special attention to innovations in the field of ICT and more than any other group

of countries are using them in everyday life in business environment as well as sphere of households, then CIS countries are leaders in the use of mobile cellular communication.

If considering active implementation of ICT by business environment then small and medium-sized private enterprises are the first that actively use these technologies in their activities. Creation and rapid development of such phenomena as e-business (business carried through electronic networks), in particular, e-commerce (electronic trade, electronic commerce) is a modern trend [12]. The total volume of retail trade e-commerce totalled 1.336 billion USD in 2014 and 1.671 billion USD in 2015 [24]. Volumes of e-commerce will increase in the future because the share of Internet users in the world has been steadily increasing, which 2014 accounted for 49.6% in 2014 and 51.5% in 2015.

The presence of supercomputers with ultra-high power and speed in the country is one of the indicators in the field of ICT. Yet another list of Top500 was announced in November 2015, which was headed for five years by supercomputer Tianhe-2 (China) with productivity of 33,86 PFLOPS. Titan Cray XK7 (USA) with 17,59 PFLOPS is a less productive system. IBM BlueGene / Q Sequoia system (USA) with productivity of 17.17 PFLOPS remains on the third position. Fujitsu K computer (Japan) with productivity of 10,51 PFLOPS is the fourth. The fifth position presented by supercomputer IBM BlueGene/Q Mira (USA), which has productivity of 8,59 PFLOPS. The top ten fastest computers in the world has a number of newcomers: supercomputer Trinity (USA) which occupies the sixth position and supercomputer Hazel-Hen (Germany) that is the eighth. These both systems were enacted during 2015, as well as the system Shaheen II, located in Saudi Arabia (ninth position). All other systems in the top ten are "long-lived" and are there since 2013 or earlier [25].

Analysis of division by country is presented below: USA – the leader of the list (installed 199 supercomputers out of 500 (39,8 %)). Then goes China with 109 units (21,8 %), Japan – 37 (7,4 %), Germany – 33 (6,6 %), UK – 18 (3,6 %), France – 18 (3,6 %), India – 11 (2,2 %), South Korea – 10 (2 %), Russia – 7 (1,4 %), Saudi Arabia – 6 (1,2 %), others – 52 (10,4 %). 155 supercomputers (31 %) were built on HP processors, 69 (13,8 %) – Cray Inc., 49 units (9,8 %) – Sugon, 45 (9 %) – ABM, 31 (6,2 %) – SGI, 25 (5 %) – Lenovo etc. [25].

While comparing these data with indicators of the Global Innovation Index [23], the first ten countries are – Switzerland, the UK, Sweden, the Netherlands, the USA, Finland, Singapore, Ireland, Luxembourg, Denmark, Hong Kong, Germany, Iceland, South Korea, New Zealand, then only the relative relationship between the presence or absence of supercomputers in the country and its level of innovation can be noticed.

Considering the data of world statistics [24] on the dynamics of the ICT market the following trends of its development should be allocated:

– high growth rates of ICT sector, which over the past 10 years annually were up to 2,8–6,5% per year, but there is a negative trend of growth rates slowing in the end of researched period;

– sector of using services of cellular communications network and Internet network is the most progressively growing segment of ICT;

– share of Internet users during 2005–2015 increased from 18 to 51.5 for every 100 inhabitants of the globe;

– growth rate of e-commerce is gradually slowing down. More and more transactions realized through Internet network;

– Internet transactions are concentrated in several areas of business operations, but the most dynamic one by the size of goods' purchase and sale is a B2C e-commerce segment;

– increase in demand for ICT qualifications.

Ukraine is one of the countries with a market economy (since 2004), which seeks to actively use innovation and develop field of ICT, which is one of the priority and important

areas of the economy. It forms innovation part in socio-economic development of the country, demonstrating sustainable growth dynamics for decades.

According to data of the World Economic Forum, Ukraine's rankings by the indexes concerning ICT were compared with the aggregate number of countries in 2015 [23; 24]:

– ICT Development Index (IDI) – 79 position out of 167 countries (2014 – 73 out of 166 countries);

– WEF Global Competitiveness Index – 79 out of 140 countries (2014 – 76 out of 144 countries);

– WEF Technological Readiness Index – 85 out of 144 countries (2014 – 94 out of 148 countries);

– WEF Networked Readiness Index – 71 out of 143 countries (2014 – 81 out of 148 countries);

– UN Global E-Government Development Index – 85 position out of 144 countries (2014 – 87 out of 193 countries).

In 2015 the share of IT sector in GDP was 1.61 %, while in 2014 – 1.54 %, 2013 – 1.22 % [14].

According to data of the National Commission for State Regulation in the field of Communication and informatization of Ukraine, 86,377 economic entities of different ownership functioned there in 2014. The total number of IT specialists in Ukraine at the beginning of 2015 was more than 298 thousand persons [5, p. 5].

Field of ICT in Ukraine – is [5; 14]:

– 13 % of the average number of employees at the enterprises of the service sector are workers of enterprises engaged in the ICT field;

– 3523 economic entities engaged in IT;

– 2973 operators that have licenses for certain kind of activity in the telecommunications sector;

– 148 higher education institutions carry out training personnel for ICT;

– 2,892 economic entities providing services of access to the Internet;

– 46,967 persons that form total licensed number of students for the IT sector;

– 57.1 % of regular Internet users;

– 39.3 % of households with wideband Internet access (common European share is 65 %);

– 20 % – share of Ukrainian households that have access to cable TV services;

– almost full coverage of the country's territory by movable (mobile) connection, which penetration level according to telecommunication operators is 142,4 % out of Ukraine's population.

In 2014 IT-market in Ukraine decreased by 43 % to 2.92 billion USD. The volume of Ukrainian IT-market at the end of 2015 was 1.61 billion USD (including phones and smartphones), having decreased by 42 % compared to 2014. Market was the most developed in 2008, when its volume reached 5.1 billion USD. Current market volumes match the volume of 2005. According to data of IDC, equipment segment decreased by 43 % and amounted 643 million USD, software segment by 50 % up to 106 million USD and IT-services by 38 % up to 112 million USD. The only segment that demonstrated growth – market of public clouds. In the last year it increased by 10 % and totalled 9 million USD. According to forecasts of IDC, in 2016 IT market in Ukraine may rise by 5–10 % [13].

Despite the dynamic development, a lot of has yet to be done to bring information and communication market of Ukraine to a competitive level corresponding to world requirements.

Conclusions. Consequently, global market of information and communication technologies intended to become powerful platform for growth of investors income, who are willing to invest in software business products. Thus, ICT should be presented as a product

that not only provides consumer with new information aimed at its distribution on a global or local levels, but also the one that provides obtaining additional income in the future.

In Ukraine mostly formed preconditions for the development of ICT sector, that covers formation of market principles of development; proper education of producers and users; appropriate level of population's income that form solvent demand; developed infrastructure; level of prices and profits that provide extended reproduction and stable interest of a wide range of investors; competitive market environment that is regulated by the state, which encourages the development of STP and especially the sectors of information technology, telecommunications and related services. However, according to data of the analytical observation, the structure of IT sector of Ukraine currently lags significantly behind the world standards and in most cases represented by software products and Internet services.

That is why the number of priority tasks in the ICT field of Ukraine should include: development of a system of measures promoting development of ICT market; implementation of mechanisms of state-private partnership in ICT field; increase in the investment attractiveness of ICT sector; provision of the development of Ukraine's ICT market infrastructure and its integration into the global information networks.

Further research towards the development of ICT market should be focused on the search for the ways of improving the performance of the national economy by boosting production and implementation of new IT goods and services and by improving the competitiveness of existing ones. Increased attention should be paid to mechanism of stimulating the development of fundamentally new technical ideas and organizing efficient production of high-tech products based on information technologies.

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