

FORMATION OF INFORMATION SOCIETY AND ITS INFLUENCE ON COMPETITIVENESS OF NATIONAL ECONOMIES IN THE CONTEXT OF WORLD ECONOMY GLOBALIZATION

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ABSTRACT

The case of ICT development in the world and in Uzbekistan, the effects of COVID-19 pandemic on the world economy, digital transformation and the degree of the competitiveness of national economy in the world market are studied. The main indicators of world and Uzbek ICT market are discussed. A multifactorial model is created to forecast the volume of communication and information services of Uzbekistan. A forecast for 2021-2025 is constructed and conclusions and recommendations for improving ICT in the economy are provided.

CCS CONCEPTS

• **information and communication technologies**; • **digital economy**; • **Internet**; • **competitiveness**; • **information society**; • **globalization**; • **patterns**; • **COVID-19**; • **trends**; • **e-government**; • **information network**;

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1 INTRODUCTION

Today's trends in development of the world economy are associated with increasing role of information technology and knowledge in the economic life of society. The economy is changing and becoming

more innovative, and the core of these changes is the use of personal computers, high-speed telecommunications and the Internet. The development of information and communication technologies (ICT) sector can increase the competitiveness of economy in the world market, and will contribute to directing the country to a new level of development which is characterized by intensive structural shifts towards high-tech information sector.

2 MATERIALS & METHODS

In the course of the research, a systematic approach was used in the study of economic analysis, the comparative method, and logical thinking. Predictive studies and empirical estimates are based on multivariate econometric analysis.

3 RESULTS & DISCUSSION

World experience shows that the competitiveness of national economy as a whole is associated with the development of information technologies. According to the World Economic Forum, the index of competitiveness of country's economy is highly correlated with the index of the development of its information and communication technologies. The information technologies sector now is one of the fastest growing industries in the world.

In January 2020, Gartner [1] shared its interim results of the development of global ICT market in 2019 and gave a forecast for 2020-2021. According to analysts, its volume amounted to \$3.74 trillion in 2019, which is 0.5% more than a year before. The company noticed that the world is anticipating a recession, but it has not yet begun, so ICT spending will grow also in 2020 – it will increase by 3.4% up to \$3.87 trillion, and in 2021 it may grow by another 3.7% and exceed \$4 trillion.

The corporate software sector is the most rapidly developed and it will continue to grow: in 2019 it increased by 8.5% up to \$456 billion, in subsequent years the growth rate may reach 10.5%. The main reason is the popularity of software services, which are becoming more accessible in clouds.

As per Table 1 below, the largest segment of global ICT market is communication services (\$1.36 trillion in 2019). In second place is held by IT services (\$1.03 trillion). Followed by market drop in

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Table 1: Global ICT Market [1]

	Market size in 2019, \$billion	Growth rate 2019/2018, %	Market size in 2020, \$billion	Growth rate 2020/2019, %	Market size in 2021, \$billion	Growth rate 2021/2020, %
Data centers	205	-2,7%	208	1,9%	212	1,5%
Corporate software	456	8,5%	503	10,5%	556	10,5
Devices	682	-4,3%	688	0,8%	685	0,3%
IT services	1030	3,6%	1081	5,0%	1140	5,5%
Communication services	1364	-1,1%	1384	1,5%	1413	2,1%
Total	3737	0,5%	3864	3,4%	4006	3,7%

2019, Gartner predicted resumed growth of data processing center (DPC) market (-2.7% and 1.9%, respectively) and the devices market (-4.3% and 0.8%, respectively) for this year [1].

According to the forecast, global IT market in 2019 reached \$4.15 trillion, in 2020 it is expected to grow by another 3.6% up to \$4.30 trillion. Some \$2.7 trillion will fall on supply of IT equipment, software, IT, telecommunications and business services for corporate and public sectors. The rest will be spent in the consumer's sector. IDC [2] predicted high demand for development and implementation of applications (about 11.1% annual growth).

The trends in the world economy development associated with ICT, suggest that information society is being formed in social and economic life, which basis is production and consumption of various information resources. The experience of developed countries proves that development of new information and telecommunication technologies has a direct effect not only on raising competitiveness of national economies, but also decisive for effective research and education sector.

Analysis of current research and publications. We studied theoretical foundations and patterns of formation and development of information society. The impact on economic growth and increase of competitiveness of national economy was assessed; the issues were reflected in works of the following foreign and domestic authors, in particular: P.F. Drucker, B. Twiss, J. Schumpeter, I. Perlaki, N. Monchev, V. D. Hartman, R. Fostr, Webster Frank, A. Dinis, Y. Hsu, K. Oppenlander, B. Santo, A. M. Kadyrov, B. B. Abdullaev, I. Abduraimov, S. S. Gulomov, A. N. Aripov, T. K. Iminov, A. A. Pavlov, A. K. Kazantsev, A. A. Akaev, T. N. Belyatskaya, M. S. Maslova, B. N. Panshini etc.

A number of specific studies were carried out within the framework of ICTP-UNDP projects[3]: "Analysis of the State and Prospects of Internet Development in Uzbekistan", "Guide to Intellectual Property Rights for Software in Uzbekistan", "Analysis of the State of the Information Society in Uzbekistan", "State and Development Prospects for Software Export Industry in Uzbekistan" and others.

The main content. In global competition, the inevitable winner is one who has a developed information system.

At the same time, the experience of advanced countries suitable for Uzbekistan is particularly important, as well as successful methods of organizing effective information economy, including issues of commercialization of ICT sphere. The model of some Asian countries [4] shows the process sequence - first is acquisition, absorption and adaptation of foreign information technologies,

that goes in parallel with investments directed to domestic R&D and education, and then followed by emulation, improvement and creation of new information technologies for the world.

Obviously, rapidly growing countries are increasingly focused on creating innovative ICT products, thus, strengthening the competitive potential in the world market. Some of them, e.g. Korea, Singapore, Taiwan, Malaysia, South Africa, have progressed significantly towards effective informatization of their economies.[5]

In recent years, many countries and international organizations have prioritized tasks on implementation of concepts and programs for transiting to information society. Such concepts have been developed and are being implemented in the USA, United Kingdom, Canada, Finland, France, Japan, Italy, India etc. These documents - various forms, are targeted to a single goal - to enter 'leaders' club' of the world ICT community. The analysis of these concepts reveals and identifies the systemic features of the information society. As a rule, when creating information society concepts, an integrated approach based on a balance of interests of the government, society, business sector and the individual is used.

Transition to information society brings with it fundamentally new changes interrelated in the socio-economic structure, which in turn is driven by development and influence of new and more advanced and productive means of production, all types of man-made information technologies in wide-range field of activity, digital data processing, new industrial network relations and application of new means of production. Up-to-date, we can identify several models of entering the global information society (Table 2).

Modern Uzbekistan is a part of the global economic community, therefore, ongoing integration processes in the international market push industries to enter the information society both on national and international level.

At the current stage of development of the country, positioning in global information space is crucial. By the regions, most of the countries, though with a downward trend, demonstrate domination of telecom services within the sphere. In terms of growth rates, the following "five" is leading, namely: Brazil, China, India, Mexico, Russia. The 50% share of these countries in the world market growth is mainly due to the progressing mobile communications [6]. At the same time, leader countries, where the telecom market has reached saturation threshold, concern about active research in new promising (profitable) areas of development. One of such reserves - broadband access (BBA) in wired and mobile technologies - reveals new horizons for commercializing novel services. The user

Table 2: Models of entering the global information society

No	Model	Description
1	American (liberal)	The model is based on private individual initiative. US corporations hold the leading positions in all segments of global ICT market
2	European	The model is notable for higher government attention to developing basic conditions for dissemination of novel technologies and creation of information society as a basement for socio-economic progress
3	Asian	The model covers newly industrialized Asian economies (Singapore, Malaysia, Korea, Taiwan, Japan). Distinctive features are long-run government programs of ICT development
4	Off-shore type	Common feature for China and India, partially for Ireland, envisaging 'point-based' development of export oriented ICT sector supported by privileged taxation and attracted foreign investment.

Table 3: The main consumer groups determining global demand in IT [8]

No	Group	Description
1	Private and state-owned industrial and service entities	Provide stable demand in integrated management systems to maintain high performance and competitiveness, such as Enterprise Resource Planning Systems – ERP Systems, Customer Relationship Management Systems – CRM Systems, Product Service Management Systems – PSM Systems etc.
2	Research institutes and universities	Main source of demand in applied software for research activities including automation of financial and administrative activities, functioning libraries, infrastructure, data processing etc.
3	Households	Demand in software for PC's, editing of text, graphics, audio and video information

can receive an ever richer package of services in addition to the traditional ones, e.g. a wider variety of audio and video, a growing range of Internet applications etc., all in a suitable and easy form.

This sustainable trend reflect both high production and operation efficiency of equipment, and the priority of intangible component in this sector.

In terms of production of telecom means, the largest positions in the ICT sphere are shared between China, India and the Asia-Pacific countries. Their sales range from 13 to 20 per cent of total revenues. At this, China already controls 11% of the market, only 1% behind Japan [7].

In regard with network equipment, according to Gartner, cloud and mobile technologies will become the key market drivers. The demand for Ethernet switches for data centers will be driven by virtualization and cloud technologies, while proliferation of mobile access hotspots still stimulates massive demand for wireless LAN equipment. Software such as CRM, DBMS (DBMS), data integration and data quality tools will stay in demand.

In recent years price dynamics in leading countries is determined by proximity of demand to saturation threshold for conventional and mobile telephony services and their acceleration along this path in the rest of the world. This pattern is also applicable for the novel technologies market. Thus, the rapid development of broadband access technologies in mobile, stationary, air and wired versions is becoming the main driver of the market both in terms of expanding the range of new services and quick satisfaction of market demand at reasonable prices.

In general, the ICT market has become one of the most dynamic and capacious sectors of the global economy, this in turn led to increased international competition in this area and prompted

countries to increase expenses for R&D and promoting innovations to ensure leadership positions in global ICT industry.

The analysis of specific demand formation global IT market allows to identify three main groups of consumers forming demand for information technology (Table 3):

Expansion of use of IT in public sector along with development of e-services and investment in their infrastructure causes greater use of IT in private sector and catalyzes its diffusion in the corporate sector. Large-scale implementation of the open data concept will build a basement for developing new information services increasing the efficiency and convenience of public access to information systems.

In Uzbekistan in recent years, various aspects of e-government have been developed. Further informatization of key sectors of economy and implementation of government's projects on their transition to the field of modern application of IT stimulate creation of new and development of existing business areas, and that can lead to emerging so called 'breakthrough' technologies within the framework of industry solutions.

To further develop the "Electronic Government" system, a special Government's Order was approved for implementing projects on introduction and development of ICT and in accordance with it a number of works are underway to implement priority projects on e-government, in particular, to create a complex of information systems such as "Entrepreneur", database of individuals and legal entities, National Geographic Information System, etc.

However, along with development of modern ICT and emerging infrastructure, it becomes necessary to quickly involve the population in new technologies. Summarizing the above, we can note that the development strategy of the National Information and Communication System of the Republic of Uzbekistan, being

Table 4: Key indicators of ICT infrastructure in Uzbekistan [9]

Indicator	Unit	2015	2017	2019	Dynamics in 2019 against 2015	
					(+), (-)	%
Gross added value of ICT sector	Trillion Soums	190, 0	267, 7	465, 3	+275, 3	244,9
ICT means per household, incl.:						
TV sets	Units per 100	152	154	160	+8	105,3
Mobile phones	households	234	257	282	+48	120,5
PC's		42	44	47	+5	111,9
TAS-IX Traffic exchange capacity, incl.:	Gbit/s	5 880,0	5 880,0	5 880,0	0,0	100,0
use capacity	Gbit/s	44,6	73,2	122,5	+77,9	274,7
downloads	%	16,0	47,3	62,1	+46,1	388,1
Capacity of trunk networks	Gbit/s	100,0	200,0	400,0	+300,0	400,0
Built-in wide range of Internet network	Thous. ports	722,9	1 039,2	1 878,5	+1 155,6	259,9
Length of optic fiber lines	Thous. km	20,0	24,5	36,6	+16,6	183,0
Number of radio stations connected to mobile communication systems	Thous.units	20 666,1	22 504,5	23 846,7	+3 180,6	115,4
Coverage of radio stations connected to the mobile communication system in relation to population	%	66,0	69,5	71,0	+5,0	107,6
Number of basic stations for mobile communication	Thous.pcs	16,3	20,0	26,4	+10,1	162,0

implemented in all areas of ICT, demonstrates positive trend (Table 4).

During the reported period, the share of ICT in gross added value increased from 190.0 trillion Soums (2015) to 465.3 trillion Soums (2019), or 2.4 times, the number of broadband Internet access and the length of fiber-optic connections increased respectively by 1.8 and 2.5 times.

Today ICT holds an important place in the development of the country. The activities on widespread introduction and development of ICT carried out by the leadership of Uzbekistan in previous years is already bearing fruit.

Turning to economic indicators, 2019 can be characterized as positive. The overall services provided in the ICT sector reached 10.9 trillion Soums, or increased by 105.4 percent. The services in the field of communications and informatization increased to 176 million dollars, or 130 percent [10].

The volume of computer and software services in 2019 increased by 119 percent and amounted to 1.078 billion Soums (against drafted 920 million Soums);

Exports of software products and services grew to \$ 15.8 million, or 158 percent (against drafted \$ 10 million);

The size of wages in the field of ICT also increased significantly. At present, the average salary in this sector is 4 million Soums (average salary in the country is 2.3 million Soums);

The number of enterprises with foreign capital is also consistently growing: by the end of 2019, their number amounted to 269 entities (increased by 73 entities).

In 2019, the ICT Ministry implemented 9 large projects totaling \$ 177.5 million included in the Investment Program. Moreover, the plan was overfulfilled by 102 percent (against drafted \$ 174.02 million). In particular they are:

- Based on direct foreign investments - \$ 97.14 million worth projects (against drafted \$ 94.5 million, 103 percent growth);
- Based on foreign loans secured by the government - \$ 53.38 million worth projects (against drafted \$ 43.56 million, 123 percent growth);
- At the expense of enterprises' own funds - \$ 26.93 million worth projects (against drafted \$ 35.96 million, fulfilled by 75 percent).

Also, a number of works were done in important areas of ICT in 2019. By registering websites in the national segment of the Internet under the "UZ" domain, useful services for consumers were provided including online training and education for young people and online public services. A good job was also done in the field of online payment via e-services, for example, 299.3 million transactions worth 6.5 trillion Soums were carried out through online payment systems in 2019.

A new version of the Unified Interactive Portal of Public Services was developed for contactless forms of communication between the population or entrepreneurs and government agencies. Today, 209 types of electronic governmental services are provided through this Portal, 21.5 million applications have been received (Fig. 1).

This, in turn, significantly reduce the costs and time of the population.

The unified portal of interactive government services (the Unified portal) is a single access point to electronic government services provided by government agencies, some of them on a paid basis. The provision of electronic government services through the Unified portal is aimed at:

- providing opportunities for applicants to implement interaction with government agencies within the framework of e-government;

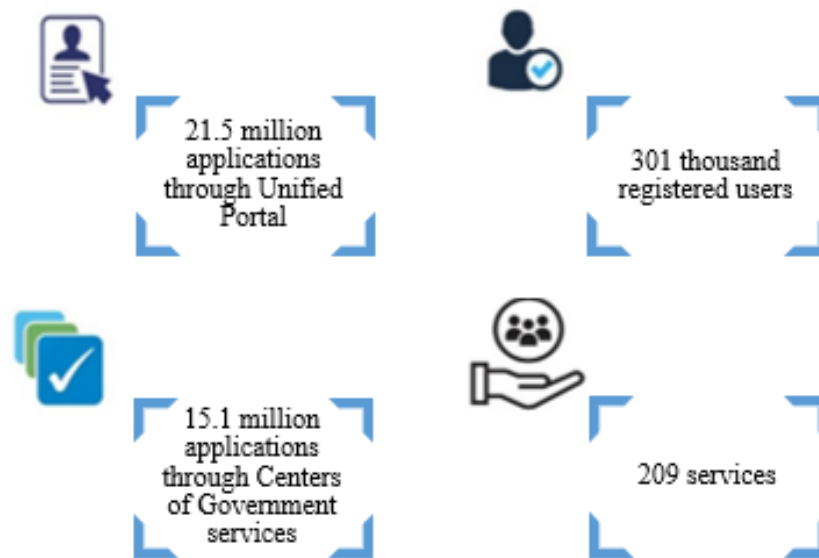


Figure 1: Number of state interactive services [11]

- introduction of the “single window” principle in the public administration system while implementing relations with applicants;
- improving the quality of public services by creating transparent and publicly available mechanisms, reducing time frame and centralized control over the execution of procedures;
- reducing the expenses of the population, business entities and government agencies when implementing government services.

The Unified portal is designed to develop conditions and expand the user's capabilities in obtaining electronic public services based on the use of IT.

Over 4.4 thousand state bodies and organizations and over 30 thousand users are currently connected to the Unified Interdepartmental Electronic System of Executive Discipline.

In order to establish and accelerate work on processing application from entrepreneurs, including foreign investors, to ensure an open and direct dialogue with them, to practically and effectively exercise their rights and to resolve other problems, a Virtual Reception of the Prime Minister www.project.gov.uz has been launched. Currently, 34.7 thousand requests have been received through the portal, out of which 33.6 thousand have been executed.

The electoral process management system ‘saylov.gov.uz’ has also been introduced. In cooperation with the relevant ministries and departments, a Unified Electronic Voters Database was formed comprising information on over 20.5 million voters and then integrated into the Information System for managing election processes.

The need to implement a unified state policy in the information sphere can be explained by the nature of the information space, which is an extremely multidimensional and at the same time a single phenomenon.

In the information era the executive bodies of state act strictly within the granted authority, but in the conditions of the information society the situation changes, since the management of a complex social phenomenon urges interdepartmental cooperation, endowing certain supra-departmental or interdepartmental bodies with power to develop electronic government and supervise over the executive authorities’ the observance of the rights of individuals to access information and to receive public services in electronic form.

In Uzbekistan, since January 1, 2014, all budgetary organizations of the country carry out accounting and reporting within a unified system “UzASBO”, which automated the whole accounting cycle. Implementation of the pilot system of electronic court proceedings “E-SUD” is also effectively functioning and reducing the number of steps from 56 to 25 required for processing documents submitted to the courts. The high development rates of the national segment of the Internet should be noted separately. For the third quarter of 2020, the number of domains in the “UZ” zone is more than 83 thousand, which the growth rate amounted to over 118% (Fig. 2.) as compared to the same period of the previous year. Since the beginning of 2020, more than 386.9 million visits were made to domestic websites. This figure is twice as high as last year.

Almost all educational institutions of the country are connected to the educational network Ziyonet (ziyonet.uz), which formed up a single educational space for interaction. The new version of Ziyonet network launched in 2020 is rapidly gaining popularity; the network is implemented within the State Program of Youth Policy in Uzbekistan (Ziyonet portal has been operating since 2005).

The Ziyonet library has already collected more than 112 thousand information and educational resources, including academic materials, textbooks, dissertations, scientific articles etc. The interactive section on learning foreign languages includes more than 4

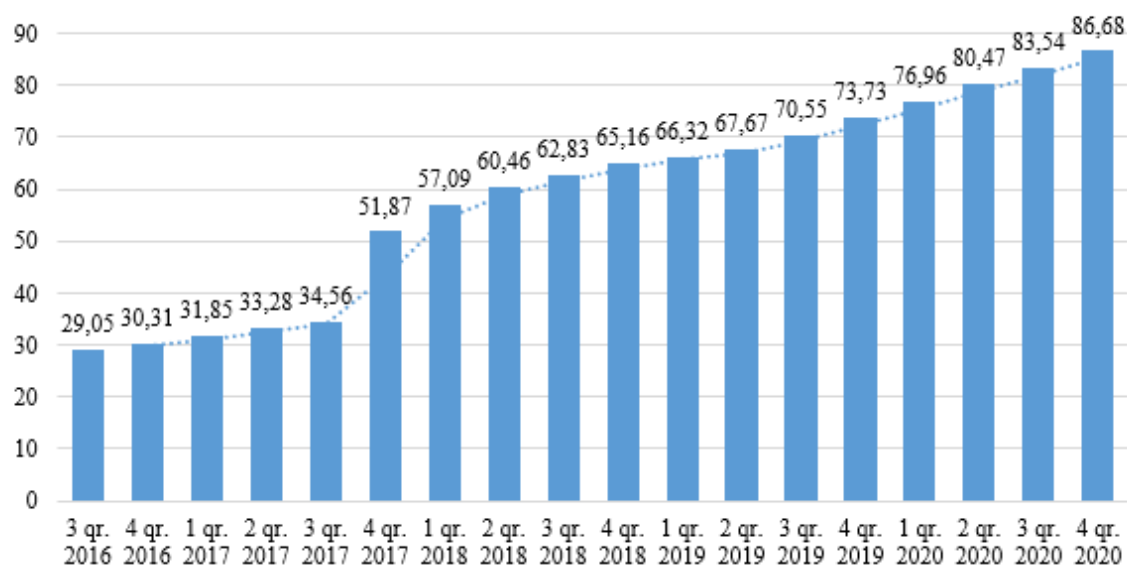


Figure 2: Number of active domains [12]

Table 5: Main indicators of Internet services in Uzbekistan [9]

Indicators	Unit	2015	2016	2017	2018	2019	Dynamics in 2019 against 2015	
							(+), (-)	%
Number of people connected to the Internet	Thous. people	8339,1	9626,8	11168,0	13321,7	16386,2	+8047,1	196,5
Users of the Internet against total population	%	25,8	29,1	33,2	39,1	46,9	+21,1	181,8
Bandwidth of the international network (Internet speed)	Gbit/s	40,0	80,0	120,0	1200,0	1200,0	+1160,0	30 times
Capacity used by the Internet	Gbit/s	26,4	55,0	94,0	439,0	750,0	+723,6	28 times
Cost of Internet connection per 1 Mbit/s	Thous. Souns	438,1	294,4	245,0	84,9	56,0	-382,1	12,8
Share of enterprises connected to the Internet	%	21,6	25,9	27,2	27,5	26,2	+4,6	121,3

thousand educational materials and 400 information resources for learning English [13].

An important role in creating digital economy and industries is played by the development of the Internet (Table 5) and the introduction of modern information systems and software for management and production processes.

In 2015-2019, the number of people connected to the Internet increased from 8339.1 thousand to 16386.2 thousand, or increase by 196.5%. The traffic speed increased from 40 Gbps to 1200.0 Gbps, while the cost of connecting to the Internet decreased from 438.1 thousand to 56.0 thousand Souns.

A special attention is paid also to the development of domestic software market. Within the implementation of measures to further incentives for domestic software developers, the National Register of Software Developers has been founded which includes 69 domestic companies; information on 1,600 domestic software products is posted in 'software.uz', the domestic catalog of software developers [14].

The strategic task of Uzbekistan is to enter the global information society as a full-fledged participant. Based on this task, a national program for the development of ICT for the short and medium term is being formed and implemented. Currently, programs are

being implemented aimed at the development of infrastructure, introduction of ICT in the activities of state and local government agencies, and the development of the national segment of the Internet.

Adopted Comprehensive Program for Development of the National Information and Communication System of Uzbekistan for 2013-2020 and Target Program for Development of Information and Communication Technologies for 2015-2019, provide:

- creation of a multi-service data transmission network with a capacity of 40 Gbps for regional centers and 10 Gbps regional centers;
- expansion of NGN networks by 550 thousand numbers and installation of IMS (IP Multimedia Subsystem) platform for 450 thousand users;
- expansion of broadband access networks by 1 million ports and laying of 12.1 thousand km of fiber-optic lines.

One of the problems of the industry is the lack of qualified personnel. There is a shortage of qualified programmers. In most universities, programming is an applied discipline, and universities teach programmers for a specific industries: transport, mechanical engineering, etc. At the same time, professional information is sometimes too excessive, but teaching programming skills is not sufficient. So, IT companies are suffering shortage of skilled personnel and unsatisfactory level of education.

When solving the problem of qualified personnel, it is necessary to actively engage public-private partnerships. If companies are interested in educated professionals in IT, then they should act as systemic participants of this process.

Special attention should also be paid to increasing the number of graduates in IT-related professions included in the base of specialists working in the industry. According to experience of many companies, when employing for positions of software and architecture development, the university graduates in IT sphere practically have no advantages over graduates in physics, mathematics or engineering.

Today IT sphere is actively progressing and demand for professionals in this field is still growing. That is why Uzbekistan attaches particular importance to the issue of training personnel in IT field.

One of the main priorities of JSC "Uzbekiston pochta" (Uzbek Post Service) is upgrading postal network and development and introduction of new ICT based services.

Automated information system for accounting pensions has been integrated with information system "Pension" owned by off-budget Pension Fund under the Ministry of Finance of Uzbekistan, and with the automated information system for receiving payments and billing attached to JSC "Uzbekenergo". The exchange of electronic data between the automated information systems is organized in online mode.

The main directions of state policy for improving IT education will include:

- professional development and raising qualification of teachers of educational organizations in accordance with modern standards;
- expansion of the practice of student apprentices at IT companies and giving such companies incentives to open relevant departments at the universities;

- development of IT faculties at universities with high educational level;
- opening additional training programs for basic professional level at the regional professional educational institutions;
- development of centers for professional retraining of specialists in IT-related areas as well as centers for advanced training for young IT specialists;
- introduction of disciplines providing IT skills within educational programs for technical and engineering professions;
- expansion of the volume of IT education at comprehensive educational institutions;
- increase of the number of comprehensive educational institutions providing in-depth IT education;
- better training of highly qualified personnel (primarily post-graduates and doctoral students), required for developing the most promising and critical technologies in IT.

When practical solving systemic issues of ICT development in the context of national economy in the long-run prospective, there are two basic principles that should be followed:

- concentration of resources for financing R&D in key areas of ICT meaning expanded reproduction of basic and applied knowledge increasing quality of "human capital" which possibly can be one of the main competitive advantages of Uzbekistan in this area;
- creation of the information infrastructure ensuring transformation of knowledge into a market product using mechanism of public-private partnership. This assumes the part of scientific research and creation of information infrastructure should be accomplished with government's participation, while commercialization part is done mainly by the business. We can highlight the following trends in the development of global ICT market:
- firstly, the trend of recent years has been intensively focused on moving the ICT production from developed to developing countries [15]. They have become catalysts for development of ICT production where significant investment is channeled. This is explained by the fact that such products are produced in most developing countries with the same high quality, but with lower costs, and this enhances competitiveness of their products in the world market. Developing countries are competing for the right to locate production facilities of transnational companies (TNC), offering the most favorable conditions for business.

At the same time, developed countries compete with each other for the highest ranks in the field of R&D. They concentrate most of scientific developments and test the production of the most advanced, sophisticated and expensive industrial ICT products. Today USA, Japan, EU countries represent the centers of global research laboratories and industrial testing grounds. At the beginning of the 21st century, the share of R&D expenditures in ICT in the United States of the total R&D expenditures was 34%, in Japan - 35% and in the EU - 15-18%. It should be noted that in developing countries significant positive changes also can be observed. In particular, R&D expenditures in China and India are growing at a higher rate, which has made them in certain areas of ICT to move from "catching up" to "leading" category [16].

- second, the total international trade in ICT-related products sector reached \$ 2.1 trillion in 2017. This is primarily due to the growing demand for electronic components of IoT devices - all kinds of sensors and smart machines connected to the network [17].

The turnover in the field of ICT products amounted to 13.4 percent of the total international trade. This is less than in 2000 when there was a 'market boom' for Internet companies, however it is the highest figure in the last two years.

Electronic components are the most requested product in this category. Their annual sales are increasing by 8 percent. More and more products in the world include digital technologies, and the main growth comes from IoT devices, which demand has grown at an unprecedented rate since 2015.

China is still in first place in the top ten exporters of ICT products, while South Korea is the second. However, all the countries of this list, except the United States, have shown impressive growth rates. Overall, these countries account for 86 percent of all ICT-related product export [18].

Meanwhile, the United States ranks first among the top ten importers followed by China. Countries of the top ten, except Mexico, also demonstrated significant growth. The highest growth rates of imports of ICT-related products are observed in the CIS countries (29 percent). In the least developed countries, by contrast, this figure dropped by one third.

In general, developing countries are importing more electronics because it is there that the final product is assembled from imported components. Another trend is that these countries demonstrate higher demand in communication devices, e.g. mobile phones, rather than computers, while in developed countries all categories of electronic products are purchased equally;

-third, the world trade in ICT services is dynamically growing. Here, we can note that while international organizations have adopted a single classification standard for trading ICT products, which simplified comparison of indicators, in the case of ICT services the situation is different. So far, generally accepted classification of services has not yet developed and various methods are used to compare indicators. The study of this problem allows us to argue that both narrow and broad definition are used when evaluating trade of ICT services. In particular, the OECD has adopted a narrow definition where ICT services are subdivided into communication, computer and information services.

G. Vickery noted that such subdivision of ICT services by the OECD is standard and based on the statistics of balance of payments of the International Monetary Fund (IMF). In contrast, UNCTAD, in its analytical materials, uses a broad definition of ICT services [19]. In particular, UNCTAD notes that the IMF's statistics of balance of payments have a number of limitations, therefore, the OECD definition underestimates total contribution in the trade of ICT services. Experts of the World Bank also pointed to the limited statistics of the balance of payments. They noted that the data of global trade in ICT services are not adequate and accurate enough [20]. In this connection, UNCTAD proposes a broader interpretation of ICT services defining them as IT services and services including ICT.

One of the main reasons for the broad definition of ICT services is the convergence of technologies. For example, today it is difficult

to distinguish computer, commercial, telecommunications and software services. In our opinion, a broad definition of ICT services is more preferable; it makes possible to more accurately identify the contribution and role of these services in the whole global trade of services. Therefore, we use broad definition as a basis when considering trade of ICT services.

As compared to 2017, China has significantly strengthened its position in the top five leader countries exporting ICT-related services: 169% export growth rate made it possible to beat Germany (108% in 2017) and the USA (101%). Russian export dynamics (113%) corresponds to the world's average (114%).

The size of the global market for IT and business services jumped by 5% in 2019[22]. Without currency exchange rate fluctuations, the growth was 2.4%.

The market of IT and business services has been growing for past two years - 4% in 2017, 4.3% in 2018. Despite slowdown in global GDP growth to 3%, the dynamics of the market in 2019 is increasing.

The reasons for such a rapid development of the world's ICT services trade are as follows:

- this sector of the economy provides high-tech services, produces higher added value and plays a key role in the information economy;
- in the context of the international division of labor, the role of ICT infrastructure is dramatically important, it pushes the quality and wider range of services offered;
- many of the services provided are integral part of production activities at the enterprises; now, thanks to ICT, these services can be offered in form of outsourcing and offshoring.

Offshoring ICT services is becoming a new direction towards diversification of economies of developing countries [23]. In the long term, according to forecasts by McKinsey & Company, further stable growth is expected and by 2020 this market will reach \$ 440 billion (Fig. 4).

The growth of offshore ICT services in the global economy will be determined by the following factors:

- rapid development of the Internet and ICT infrastructure;
- consequences of the global financial and economic crisis resulted in greater transfer of some of TNCs functions to developing countries in order to minimize production costs;
- problems of workforce aging in most developed countries;
- increasing innovation potential and scientific and technical resources of developing countries. As per World Bank experts, the demand for ICT services is on very high level and only a small part of them is satisfied, while the "supplier" side acts as a limiting factor [25];
- global ICT market is shifting from developed to developing economies. As developing countries demonstrate increasing demand in these products, the expanded size of the global ICT market seems to be a natural process. These countries lag significantly behind the developed countries in access to technologies and knowledge, and their government policies are aimed at supporting the ICTs. For instance, this can be proved by the structure of expenditures for ICT in developing countries, that in contrast to developed countries, focuses

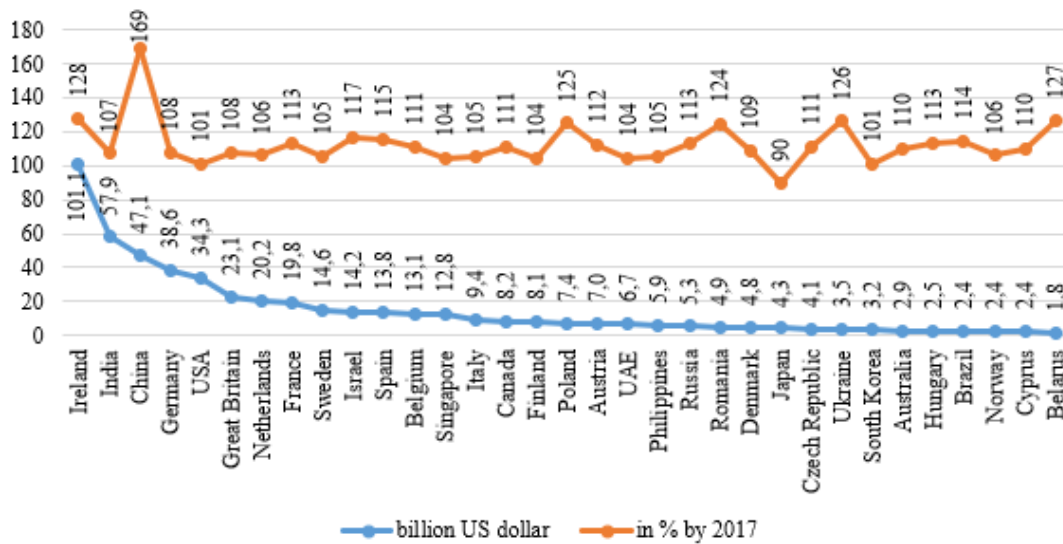


Figure 3: Export of ICT related services by countries: 2018 (at actual prices) [21]

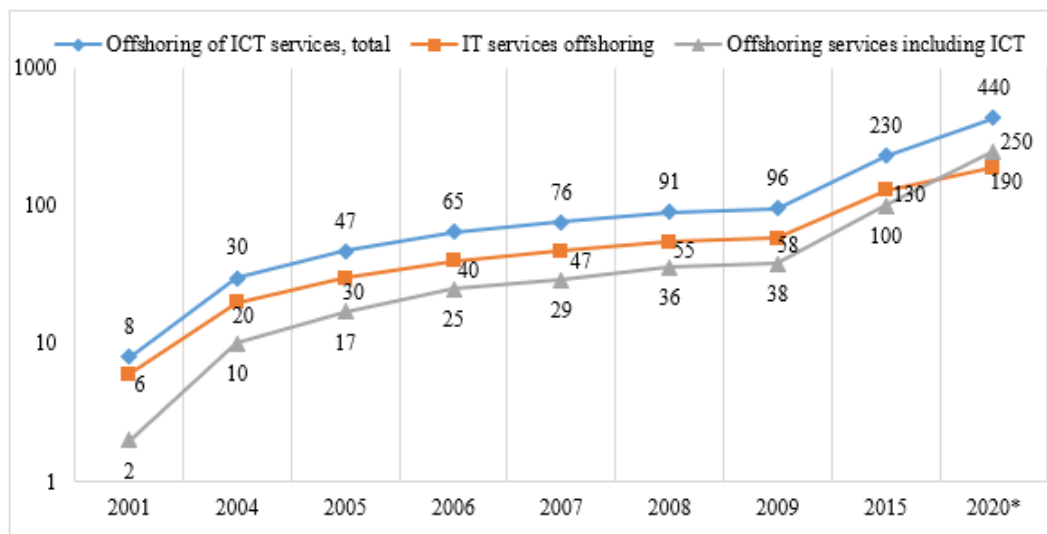


Figure 4: World market of offshore ICT services in 2001-2020, in US\$ billion [24]

more on equipment than services, meaning the stage of building ICT infrastructure;

- intensive integration of universities, academic institutions and the private sector towards collaborative R&D, especially in ICT. In Western literature this process is called "open innovation" [26]. The driver motivation for developing open innovation in ICT sector is the ever-shortening life cycle of the technology. Companies are seeking for external partners to enter novelties market as quickly as possible.

In the framework of open innovation, currently the following cooperation forms are widespread: consortium of few companies in order to share costs and risks, and enter new markets with jointly developed technologies; involvement of the scientific and academic community in corporate research; long term partnerships based on agreements or contracts with universities and academic institutions for running joint laboratories; commercialization of ideas of independent researchers or start-ups etc [27].

Such collaboration more and more bears an international character due to the growth of internationalization of activities and

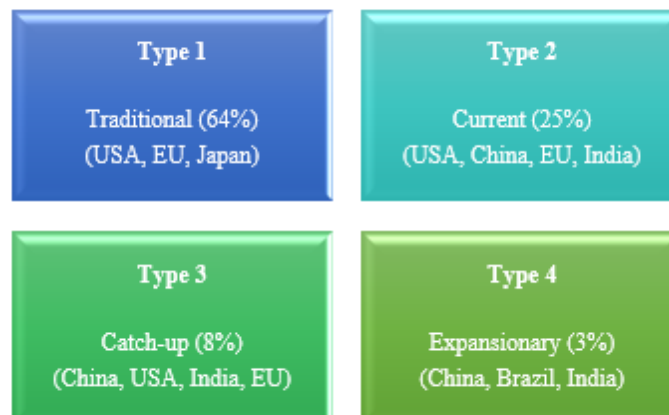


Figure 5: Classification of types of R&D internationalization [28]

development of global innovation networks. As a result, R&D in ICT sector becomes more mobile and are concentrated more and more outside the developed economies. All participants take benefits from this process. Corporations from developed countries can reduce their costs due to lower labor costs and favorable fiscal policies of host countries, while the latter, along with other advantages, gain access to global knowledge.

In recent years, there is a progressive trend can be observed when companies from developing countries setup their R&D centers, both in developed and in developing countries (Fig. 5).

Note: The share based on a survey of 776 R&D centers of transnational companies.

In the first case, this movement to the West is more costly, since competitive advantages are weak due to lower remuneration, but in the long run it seems to be rather promising. These companies have the opportunity to be closer to the local market and technologies and scientific discoveries. In the second case, these are investments in the direction “from developing to developing”. One of the key arguments in favor of this path is that developing countries are strengthening their positions in promising growing markets. Among developing countries, China and India are key players in three areas (type 2-4).

The ICT is one of the most innovation intensive sector as R&D expenditures there exceed those of all other sectors of the world’s economy.

Analysis of the global economy sectors revealed that in comparison with other industrial goods and services, the ICT products and services are more resistant to the crisis. Within the sector itself, the crisis affected to a greater extent income and employment of manufacturers of ICT equipment, and to a lesser extent, providers of ICT services. Post-crisis projection of further development of ICT sector is considered favorable.

Thus, it can be stated that recently there has been an accent shifted in the world industry and trade towards developing countries. All this leads to a higher interest in development of the sector not only in developed but in developing countries as well.

Nowadays in a global scene unprecedented measures are being taken to combat pandemic of coronavirus infection, including restrictions of people’s traffic and suspension of businesses. This caused a sharp decline in production and consumption rates in the largest economies, disruption of global production chains and trade links, falling commodity prices and deteriorating global financial markets.

Being a part of global system, the economy of Uzbekistan is also suffering above factors, and this pushes to adoption of effective proactive measures for negative impact mitigation. Special attention should be focused on supporting and ensuring sustainability of such fast developing sectors of the country’s economy as tourism, transport, pharmaceutical and textile industries.

The global pandemic has made analysts to revise their forecasts for development of ICT market. In May 2020, Gartner’s analysts revised the data for 2019 and according to their estimation, announced that as compared to 2019, global IT expenditures will decline by 8% down to \$3.4 trillion in 2020. That means the industry will practically bounce back to the level of 2016 (\$3.414 trillion) [29].

The squeeze is anticipated for all segments of the industry, except for cloud services - the demand for them will grow due to the massive turn of employees to distant work. In whole, companies will focus on technologies and services that help to survive in a new reality. The challenges of digital transformation and business growth will fade and relegate to the background.

The largest drop (-15.5%) is expected in the segment of IT devices, also, the negative impact will be observed in segments of IT solutions for data centers (-9.7%) and IT services (-7.7%). The enterprise software segment, previously predicted to grow by 10.5%, will decline by 6.9% in accordance with an updated forecast.

By early April 2020, the COVID-19 pandemic was in full swing hitting all markets and countries. The impact of the spread of the infection also affected companies and government agencies undertaking digital transformation.

Table 6: Initial input data [31]

Year	ICT services volume, billion Soums	Investment in fix assets (ICT), billion Soums	Number of Internet users, million people	Number of mobile communication subscribers, million people
	Y	X1	X2	X3
2011	2515,0	773,7	6,9	23,2
2012	3046,0	671,4	8,8	19,4
2013	3503,9	760,5	9,8	20,3
2014	4195,1	760,7	10,0	19,6
2015	5181,5	985,3	10,2	20,1
2016	6306,8	1 098,5	12,1	20,6
2017	8196,7	1 926,1	14,7	21,4
2018	10332,6	1 607,9	20,0	22,8
2019	10891,7	2 679,0	22,0	23,6
2020	12634,4	3 174,6	22,5	25,4

However, since the world actively use IT, the pandemic should contribute to accelerated digital transformation in a whole. For instance, educational institutions are introducing tools for distant learning and exams; companies are installing software for remote work and staff interaction; medical institutions are minimize patient visits to doctors' offices; stores are massively launching contactless delivery services.

IDC interviewed a number of CEOs from 10 different industries and received some interesting results. One of them is that business even more appreciated projects on digital transformation and IT literacy for all employees. The pandemic has contributed to improved remote work opportunities, as well as marketing and business projects over the Internet.

Due to virus outbreak, companies are becoming more digital remotely interacting with their customers. To manage personal data in IT sector, large companies have to introduce special systems for managing information about users of their corporate systems. Previously, there was a shortage of specialists in this area, but currently, in conditions of the pandemic, the situation worsened.

The pandemic may push to divide management process in companies between different specialists. For example, one can program connectors for security systems, set up internal workflows, write scripts and deploy them. The other one may work with user data, describe business processes, register documentation and promote ideas of massive account management.

Digital identity management often is not included in digital transformation strategies of the company, however this process is important because companies, when conducting business on the Internet, should verify that personal electronic account corresponds real data. This can improve quality of service and protects business from the fraud.

As per our survey, the coronavirus outbreak resulted in a "significant slowdown" in IT equipment sales in the first quarter of 2020, while the crisis in healthcare system continues to negatively affect corporate IT spending over the year.

Experts say that with the most pessimistic scenario, the size of IT market in 2020 may grow by 1.3% against 4.3% expected initially.

At the same time, the forecast may likely be worse depending on duration and intensity of the pandemic [30].

In order to predict the volume of ICT services (Y), the following factors of investment in fixed assets (X1), number of Internet users (X2) and number of mobile subscribers (X3) were used (Table 6).

After calculations, a multiple regression equation is obtained: $Y = -151.469 + 0.9256 * X1 + 500.9059 * X2 - 63.1636 * X3$.

Possible economic interpretation of the model's indicators:

- increase in investment in fixed assets (ICT) by 1 unit leads to increase in the volume of ICT services by 0.926 units in average;
- increase in the number of Internet users by 1 unit leads to increase in volume of ICT services by 500,906 units in average;
- increase in the number of mobile subscribers by 1 unit leads to decrease in volume of ICT services by 63,164 units in average.

Using the maximum coefficient $\beta_2 = 0.8$ (β_2 is a vector in number of Internet users), we can conclude that the number of Internet users as a factor has the greatest influence on volume of ICT services (Fig. 6).

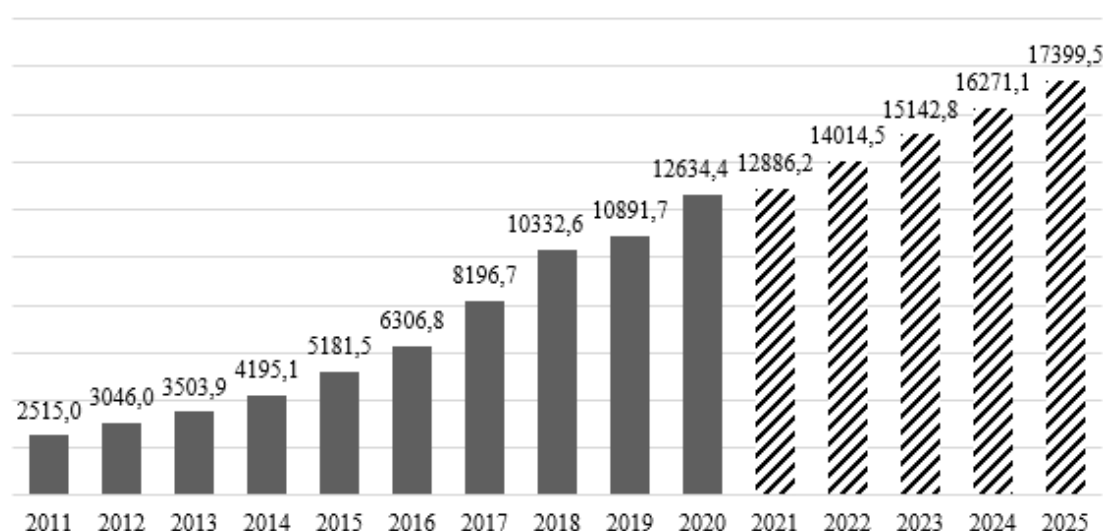
The statistical significance of the equation was checked using the coefficient of determination and Fisher's test. It was found that in the given situation, 97.38% of total variability of the volume of ICT services can be explained by the changes in factors X1 (investments in fixed assets (ICT)) and X2 (number of Internet users).

4 CONCLUSIONS

Conclusion and prospects for further research in this direction. Thus, the identification of prerequisites and features of various foreign models for entering global information society is necessary for drafting programs for development of ICT sector and its institutional environment that can help Uzbekistan to enter into global information society and identify potential partners and competitors. From our view, the emphasis should be put on segments of ICT industry where domestic companies have competitive advantages in the local market, as well as on segments of the global ICT market with potentials of further growth.

Table 7: Matrix for correlation of development indicators

Indicator		ICT services volume Y	Investment in fix assets (ICT) X1	Number of Internet users X2	Number of mobile communication subscribers X3
ICT services volume	Y	1			
Investment in fix assets (ICT)	X1	0,9375239	1		
Number of Internet users	X2	0,9838239	0,9241690	1	
Number of mobile communication subscribers	X3	0,7366212	0,8148952	0,7335932	1

**Figure 6: Prospective forecast of the ICT services volume**

The main objective is to use country's potentials in R&D for effective implementation of national priorities in technological development, while simultaneously transforming the ICT sector into a sector producing "knowledge economy". The following aspects of the issue need to be investigated for further prospective research:

- conceptual approach to the strategy of integrating country's ICT into the global world market;
- determined directions towards improvement of institutional framework for creating favorable conditions for developing innovative information type of economy;
- social factors (youth participation, education, etc.) for developing ICT sphere and opportunities for its effective use;
- strategies for incentives for transition to the information society model in post-crisis development of the national economy.

The theoretical outcomes to be obtained in the course of these studies will expand scientific and methodological approach to forming the information society, creating new conditions and sources

for raising country's competitiveness, as well as the mechanism of adaptation to the challenges caused by globalization of the world economic system.

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