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The imperatives of the formation of an information society

Annotation
The article explores the essence and main components of the process of formation of the information society. The indicators of dissemination of information and communication technologies in the world and individual countries are analyzed. The priorities of the formation of the information society in the conditions of intensification of competition and modern globalization are determined.

Keywords
information society, globalization, ICT, R & D.

1 Introduction

An up-to-date trend in the world's development is the unprecedented dissemination of information and communication technologies (ICTs), which fundamentally changes the technological basis of society. Socio-economic development of countries under such conditions is provided mainly not by resource, but by technological, innovative factors. In view of this, for each country, a study of the processes of dissemination of ICT, the identification of the architecture of the modern world and its positions in it is a very important problem. The key goal should be to identify the main directions of activation of all factors and improve the country's position in the global economic environment. The rapid penetration of ICTs into all spheres of economic and personal life of the population does not leave an alternative and requires from every country persistent steps towards the information society.

Analysis of recent research and publications. In the scientific literature one of the most pressing problems is theoretical and methodological understanding of the essence of the transformational processes taking place in society. Reflection of this emergence of theories of post-industrial society, technotronic society, information society and knowledge society. In the writings of foreign and domestic scholars-economists, D. Bell, Z. Bedzheinsky, V. Inozemtsev, M. Kastesels, F. Makhlup, A. Chukhno and others. At the conceptual level, the issues of the formation of a new type of society are explored. Some issues of the growth of the role of education in the general context of the formation of a new type of society are investigated by F.Althab, L. Antonyuk, A. Asaul, A. Vfleeme, O. Grishnov, O. Kuklin, D. Salmi, B. Santo, L. Tsymbal, etc.

The purpose of the article is to identify trends and scales of ICT dissemination in the modern world in the context of the formation of an information society.

2 Main material

In the conditions of the emergence of post-industrial society, the strengthening of the trends of globalization, the actual problem of economic science and practice is the study of the processes of

development of countries in the new social context. Axiom is the recognition that the breakthrough development of countries is provided not only by the availability of resources, but also by the technologies of their use, including the production of qualitatively new products and services. To escape from the world leaders and to hold the leadership positions are those countries that make significant efforts to develop their intellectual potential and its implementation in the economy.

A knowledge-based society (society of knowledge) is a society oriented in its development to knowledge, in the economy of which the production and use of knowledge become independent areas of activity and play a decisive role in the process of wealth creation (value added or social product). The key indicators that characterize this new role of knowledge are indicators of distribution in the economy and among the population of information and communication technologies (ICTs), as well as indicators of the efficiency of the scientific and technical sphere: the quality of personnel, the number of patents and their share in the balance of payments, etc.

The analysis of the degree of dissemination of information and communication technologies in the economy is one of the most pressing problems of contemporary international economic research. Measuring the role of ICT in social development has been the subject of discussion at the World Summits on the Information Society, held in Geneva (WSIS 2003) and Tunis (WSIS 2005). The Geneva Action Plan was aimed at "an international assessment ... using comparable statistical indicators and research results".

As a result of the first World Summit, the Initiative of the Partnership for Measuring ICT for Development, aimed at improving the collection and quality of ICT data and indicators, especially in developing countries, has been initiated. The Members of the Partnership (International Telecommunication Union (ITU), OECD, UNCTAD, UNESCO, etc.) work together to develop a coherent set of statistical indicators ("core list"). The World Information Society Forum (WSIS 2010), which was held in May 2010, appointed a working group to improve the concept of monitoring the tasks of building an information society based on internationally defined indicators and standards.

MST Member States have signed up to a common vision of an information society in which telecommunications / ICTs will strengthen the interconnected world and boost social, economic and environmentally sustainable growth and development for all. " Thus, the Connect 2020 goals were adopted in the context of broader socio-economic development goals, in particular, 8 poverty reduction targets and core needs agreed upon by the

Table 1 The share of participation of "Samruk-Kazyna" in the capital of some banks in Kazakhstan, %

Country	**ICT Development Index (place)**		**Indicators of access to ICT**									
			Fixed telephone lines per 100 inhabitants		*Mobile users per 100 inhabitants*		*International Internet (Bit per user)*		*Share of households with computers*		*% of households with the Internet*	
	2009	2015	2009	2015	2009	2015	2009	2015	2009	2015	2009	2015
Sweden	7,85 (1)	8.47(6)	57,8	36.7	118,3	130.4	109 928	421237	87,1	88.3	84,4	91.0
Luxembourg	7,71 (2)	8.34(10)	54,2	51.0	147,1	148.5	9 043 063	7186378	82,8	95.3	80,1	96.8
Korea	7,68 (3)	8.78(1)	44,3	58.1	94,7	118.5	5 975	46764	80,9	77.1	94,3	98.8
Denmark	7,53 (4)	8.77(2)	45,6	29.9	125,7	128.3	94 863	328018	85,5	92.3	81,9	91.7
Netherlands	7,37 (5)	8.36(8)	44,3	41.3	124,8	123.5	149 693	242326	87,7	96.2	86,1	96.0
Iceland	7,23 (6)	8.83(3)	61,6	49.9	108,6	114.0	12 752	725806	91,9	98.5	87,7	96.5
Switzerland	7,19 (7)	8.50(5)	64,1	50.3	118,0	142.0	65 290	275957	80,6	88.4	78,0	84.7
Japan	7,12 (8)	8.28(11)	38,0	50.2	86,7	125.1	7 677	62618	85,9	80.0	79,8	96.5
Norway	7,11 (9)	8.35(9)	39,8	20.0	110,2	113.6	52 722	220937	85,8	96.5	84,0	96.6
United Kingdom	7,07 (10)	8.54(4)	54,2	52.6	126,3	125.8	77 179	374554	78,0	89.9	71,1	91.3
Finland	7,02 (12)	8.11(14)	31,1	9.8	128,8	135.5	51 171	208526	75,8	89.3	72,4	89.9
USA	6,54 (19)	8.06(15)	49,6	37.5	86,8	117.6	21 403	99017	72,5	87.3	62,5	82.2
Russia	4,54 (48)	6.79(42)	31,8	25.7	141,1	160.0	4 712	26845	40,0	72.5	30,0	72.1
Ukraine	3,87 (58)	5.21(76)	28,7	21.6	121,1	144.0	5 477	45743	21,2	59.2	10,3	51.1
China	3,23 (79)	4.80(84)	25,5	16.5	47,9	93.2	2 149	6530	31,8	49.6	18,3	54.2
Hong Kong	7.04(11)	8.40 (7)	58.7	59.2	165.9	228.8	817848	4155651	74.6	80.4	70.9	79.0

United Nations in 2000. As noted earlier, in September 2015, the United Nations has agreed to 17 CSRs that cover an even wider range of issues.

From that time on, for the international community, not only the measurement of the processes of dissemination of ICT is important, but also the social aspects - their impact on sustainable development, inclusion and innovation. Increasing access to ICTs will increase the use of ICTs, which in turn should have a positive impact on the short-term and long-term goals of socio-economic development. Increasing inclusiveness should increase the potential benefits of ICT for all, overcoming the digital divide between developed and developing countries and covering marginal and vulnerable populations. This should be accompanied by efforts to ensure accessibility, relevance to local content and to create opportunities for individuals and communities to take full advantage of potential benefits. It is also important to support the benefits of using ICTs for sustainable development, as growth also brings problems and risks that need to be managed. It is through the innovations and partnerships of the emerging ICT ecosystem that it can effectively adapt to the changing technological and social environment.

Since 2007, the publication Measuring the information society, which analyzes the state of the development of ICTs in most countries of the world, is being analyzed in detail and the index of ICT development (IRI) is calculated based on 11 indicators characterizing access, use and ICT skills. According to "Measuring the information society 2010", at the end of 2009, the world had 4.6 billion mobile users (or 67 per 100 inhabitants) [1], while in 2014 it was already 6.7 billion or 95% of the total population. In developed countries, mobile coverage is more than 100 per cent, in developing countries it is much less than 57 per 100 inhabitants but is growing at a very fast pace: in 2005, only 23 per cent of the population of this group of countries used mobile communications [2].

Internet access is spreading, albeit to a lesser extent. In 2009, 24 percent of the world's population used the Internet (1.7 billion people), including 64 percent in developed countries and 18 percent in developing countries. By 2014, this number is growing rapidly, however, only 6.7 percent of households in the least developed countries have access to the Internet, compared with 46 percent of the world's households and more than 80 percent of households in developed countries.

Table 1 provides data on access to ICTs by countries that rank first in the ICT development index and some other countries. Characteristically, the availability of fixed telephone lines has a steady decline in all countries; in the leading countries it is from 20 to 58 per 100 population, whereas in Ukraine - 21.6, Russia - 25.7, China - 16.5. As for mobile users, Ukraine is at the level of advanced countries (144.0 persons per 100 people with mobile phones), in which from 114.0 (Iceland) to 148.5 (Luxembourg) persons use mobile communication. Ukraine lags behind households by computers (59.2 versus 77-98.5 in the lead

Table 2 Indicators of the use of ICT in the economy [2]

Country	ICT Development Index (place)		Indicators of ICT use					
			Internet users per 100 inhabitants		*Fixed-line users per 100 inhabitants*		*Mobile Internet users per 100 inhabitants*	
	2008	2015	2008	2015	2008	2015	2008	2015
Sweden	7,85 (1)	8.47(6)	87,8	90.6	41,2	36.1	35,5	122.1
Luxembourg	7,71 (2)	8.34(10)	80,5	97.3	29,8	36.5	82,6	83.3
Korea	7,68 (3)	8.78(1)	76,5	89.9	32,1	40.2	70,7	109.7
Denmark	7,53 (4)	8.77(2)	83,9	96.3	37,1	42.5	27,3	116.8
Netherlands	7,37 (5)	8.36(8)	86,5	93.1	35,1	41.7	25,0	70.5
Iceland	7,23 (6)	8.83(3)	90,6	98.2	32,9	37.0	0,0	93.4
Switzerland	7,19 (7)	8.50(5)	77,0	88.0	34,2	44.8	28,3	97.6
Japan	7,12 (8)	8.28(11)	75,4	93.3	23,7	30.5	75,5	126.4
Norway	7,11 (9)	8.35(9)	82,6	96.8	33,3	38.9	20,9	92.8
United Kingdom	7,07 (10)	8.54(4)	76,2	92.0	28,2	37.7	33,9	87.8
Finland	7,02 (12)	8.11(14)	82,6	92.7	30,5	31.7	24,3	144.1
USA	6,54 (19)	8.06(15)	74,0	74.6	23,5	31.5	26,3	109.2
Russia	4,54 (48)	6.79(42)	32,0	73.4	6,6	18.8	0,6	71.3
Ukraine	3,87 (58)	5.21(76)	10,6	49.3	3,5	11.8	1,8	8.1
China	3,23 (79)	4.80(84)	22,3	50.3	6,2	18.6	0,0	56.0
Hong Kong	7.04(11)	8.40 (7)	67.0	84.9	28.1	31.9	42.8	107.0

countries) and Internet access (51.1 vs. 82.2- 98.8).

In the period from 2008 to 2015, Ukraine significantly improved its position on indicators of ICT use. Thus, the number of Internet users in Ukraine increased significantly from 10.6 to 49.4 per 100 population, but it is much less than advanced countries: in Japan, 93.3, Iceland - 98.2, Norway - 96.8, Finland - 92.7, Great Britain - 92.0 (see Table 2). Another big gap is the use of broadband and mobile Internet. In Ukraine, only 11.8 per 100 population use the large-scale Internet (compared to 31.5 - 44.8 in the lead countries) and 8.1 persons - mobile Internet (compared with 70.5 - 144.1 in developed countries). On the whole, we can conclude that, with regard to access and use of ICT, Ukraine is approaching the advanced countries of the world, but is significantly behind the indicators of higher-quality services provided by the possibilities of modern information and communication technologies.

Along with indicators of the use of ICTs in the economy, the characteristics of human resources that need to apply these modern technologies are important. In international comparative analysis, indicators that characterize the proportion of people with higher education, the increase of student contingents, and the share of graduates in the field of science and engineering specialties are widespread; scientific degrees in specialties in exact sciences and others.

Over the 14 years from 2000 to 2014, the student contingent globally increased more than doubled - by 208.5% and reached almost 208 million (Table 3). The growth of the number of students is observed in all countries, but to a greater extent - in Asia (284%), South America (222.5%) and Africa (213.7%). The smallest dynamics is observed in developed countries in the educational industry - in Europe by 120.5% and in North America by 151.5%. Accordingly, the share of different regions in the global market of educational services varies. If in 2000 European countries occupied more than a quarter of its (25.6%) and North American 17.7%, in 2014, these two regions together represent 27.7% of the contingent of students in the world.

The world leader in the growth rate of students is China, which has increased the number of its students by almost 7 times from 1999 to 2015 - by 681%, Brazil by 329%, Mexico by 186%, and India by 322%. The growth of the student contingent in Ukraine was at an average world level, but since 2008, as in other post-socialist countries, the student contingent has started to decline. Developed countries generally show a slight growth rate of students, which is explained firstly by a steady socio-economic situation, and secondly, by a demographic factor, a reduction in the cohort of the young population. The increase in the number of students in these countries is provided mainly by increasing the inflow of foreign citizens.

The general tendency of the development of many countries of the world is to increase the

Table 3 The number of students in the world and in the regions, 2000-2014 [3]

	2000		2005		2010		2014		2014/2000
	thousand people	%	thousand people	%	thousand people	%	thousand people	%	%
The whole world	99739.2	100	139292.6	100	181531.1	100	207516.4	100	208.5
Africa	6087.8	6.1	8610.7	6.2	11452.8	6.3	13011.0	6.3	213.7
Asia	41136.5	41.2	62611.7	45.0	91201.4	50.2	116832.6	56.3	284.0
Europe	25514.3	25.6	32081.8	23.0	33688.3	18.6	30740.9	14.8	120.5
North America	17700.8	17.7	22881.1	16.4	27278.9	15.0	26811.9	12.9	151.5
South America	8255.4	8.3	11812.7	8.5	16335.8	9.0	18372.3	8.9	222.5
Oceania	1044.3	1.0	1294.6	0.9	1574.0	0.9	1747.8	0.8	167.4

average level of education of the population. The age of students grows and the number of years of general secondary education required to enter the labor market and effective employment. For this purpose, the presence of not only 8-9 years of general education, but also complete general secondary education and specialized vocational training, is an indispensable condition. It is assumed that more or less universal education in the near future will be 2 years of study in college.

Another interesting indicator is the rate of gross coverage of higher education, calculated as the share of the population aged 5 years after the completion of general secondary education, which studies in higher education institutions. According to UNESCO, Ukraine is in the first ten countries of the world for this indicator and in 2014 took the 7th place. Among the world leaders - Spain, Belarus, Finland, the USA and others (Table 4).

The growth in the need for higher education is manifested not only in the increase in student contingents, but also in the growth of the general educational level of the population. On average, in OECD countries, less than a third of the population

TABLE 4 Gross Higher Education Coverage [4]

No.	Country	2014	2010	2000	1990
1	Spain	89.1	78.7	57.8	35.6
2	Belarus	88.9	79.4	54.6	48.8
3	Finland	88.7	94.1	82.4	44.5
4	USA	86.7	94.2	68.1	70.8
5	Chile	86.6	69.7	37.1	-
6	Slovenia	82.9	88.3	55.2	22.8
7	Ukraine	82.3	81.9	48.7	48.7
8	Denmark	81.5	73.6	57.2	34.1
9	New Zealand	80.9	82.5	66.2	39.4
10	Austria	80.0	68.7	56.6	32.6
12	Russia	78.7	76.5	55.8	55.0
20	Latvia	67.0	70.4	49.5	33.6
33	Great Britain	56.5	59.1	58.5	26.5
	Korea	95.3	99.7	78.4	36.9
	Greece	110.2	102.7	51.5	24.9
	Australia	86.6	80.9	67.0	35.1

(29%) have only elementary and part-time secondary education, and 31% have higher education. In the countries, the proportion of people with higher education has the following meanings: in Canada 51%, the United States 42%, Japan 45%, Korea 40%, United Kingdom 38%, New Zealand 41%, and Israel 46%. The proportion of people with higher education increases with age, so that 38% of young people aged 25-34 years old and 23% of the population aged 55-64 are in higher education, which can be observed accordng to Table 5.

In most countries, the proportion of people with higher education already exceeds the 50 per cent limit and is approaching its upper threshold. This means that in these countries (including Ukraine), higher education has already acquired not only a mass but also an almost universal character. Those countries in which the coverage of the population aged 18 to 25 years of higher education is low is precisely the highest rates of student contingent growth (as a rule, these are many populated countries in Southeast Asia and Latin America).

In this context, the criterion proposed by M.Trou concerning massization of higher education is quite interesting. So, in his opinion, if higher education is received from 15 to 40% of a certain age group, then it can be considered mass [Tsit. by: 6]. According to Table 4, we can observe that in the vast majority of countries this share is already much greater than the

TABLE 5 The share of the population with higher education, 2015 [5]

Country	Age groups		
	25-64 years	*25-34 years*	*55-64 years*
Australia	43	48	34
Canada	55	59	46
Finland	43	41	36
Japan	50	60	38
Korea	45	69	18
Latvia	32	40	25
New Zealand	34	39	27
Norway	43	48	33
Poland	28	43	14
Portugal	23	33	13
Sweden	40	46	30
Turkey	18	28	10
United Kingdom	43	49	35
USA	45	47	41
OECD average	35	42	26
EU - 22	32	40	23
Brazil	14	16	11
The Russian Federation	54	58	50

50 per cent limit and approaches its upper threshold. This means that in these countries (including Ukraine), higher education has already acquired not only a mass but also an almost universal character. Those countries in which the coverage of the population aged 18 to 25 years of higher education is low is precisely the highest rates of student contingent growth (as a rule, these are many populated countries in Southeast Asia and Latin America).

The lagging behind of the European countries from the USA by many economic and social parameters, including the number of students and scholars, is a subject of constant attention and concern of the European Union. The process of creating the European Research Area (ERA) was launched on the basis of the creation of network consortia of the Sixth European Union Research and Development Framework Program. In general, EU Framework Programs (all of them seven) were identified as the main form of scientific and technical cooperation between European countries. This European Union's attention to the research sector affirms that the proper condition of research and the appropriate level of financing is the key factor in achieving successful socio-economic and innovation development. Depending on the proportion of GDP allocated to the financing of science, determine the role and function that performs science in society.

The global architecture of world leadership is characterized by constant and rapid changes in modern conditions, as world leaders are increasingly coming out of the country not only due to the availability of resource prerequisites. At the core of the high values of the indicators and dynamics of the development of countries such as Germany, Japan, South Korea, Singapore, Taiwan, Iceland, Finland, etc., there are significant investments in research and development, the implementation of their results in products and services produced, as well as in qualitative changes in the spheres of life.

In general, it is considered that the financing of scientific developments in the country should be at least 2% of GNP. On average, about 2% of world GDP is spent in the world, although these financial resources are expended extremely unevenly. The highest level of financing for research is observed in North America, which covers about 35% of global spending. The second place is located in the countries of Asia, which spend about 30% of the global level and in third place in the EU with a rate of 25%. Leading countries are countries that generally account for more than 3 percent of GNP for research funding: Israel (4.11%), Korea (4.11%), Japan (3.59%), Finland (3.17%), Sweden (3.16%), Austria (3.07 %).

New and emerging outsiders are emerging as they grow their research potential. In particular, Slovenia and Estonia have rapidly increased funding for science. China is also showing a high dynamics, increasing by more than double this figure for 15 years. In general, the average R & D financing rate in the EU28 is 1.95% of GDP, in the OECD countries - 2.38% (Table 6).

According to Table 6, it can be noted that the difference in financing levels is significant: the highest level of financing in Israel (4.11% of GDP), the European countries in Finland (3.17%), the lowest - in Greece (0.84%) and Latvia (0 , 68%). Regarding the general dynamics of changes in R & D financing in the EU, it should be noted the tendency to increase funding in all countries, however - at different rates.

TABLE 6 R & D spending on EU-27 countries and outsiders countries,% of GDP [7]

Country	2000	2010	2012	2014
Israel	3,93	3.93	4.13	4.11
Finland	3.25	3.73	3.42	3.17
Germany	2.39	2.82	2.867	2.90
Sweden	-	3.41	3.28	3.16
Denmark	-	2.94	3.00	3.05
Germany	2.39	2.71	2.87	2.90
USA	2.62	2.74	2.70	-
Austria	1.89	2.74	2.93	3.07
South Korea	2.18	3.47	4.03	4.11
Slovenia	1.36	2.06	2.38	2.39
Estonia	0.60	1.58	2.11	1.44
France	2.08	2.18	2.23	2.26
Japan	3.00	3.25	3.34	3.59
Poland	0.64	0.72	0.88	0.94
France	2.08	2.26	2.213	2.26
EU28	1.68	1.91	1.92	1.95
OECD	2.14	2.30	2.34	2.38
China	0.90	1.73	1.93	2.05
The Russian Federation	1.05	1.13	1.13	1.19

In the strategy of development "Europe 2020" it is declared not only equalization of financing of research and development in the EU countries, but also achievement of the level of 3% of GDP. However, the presence of significant differences in the volumes and levels of funding by country still questions the ability to achieve these goals.

3 Conclusions

The formation of a knowledge economy is characterized by an unprecedented spread of information and communication technologies. An urgent problem of contemporary world science is the analysis and evaluation of trends in the dissemination and use of ICTs in the world and in individual countries. The analysis allowed to reveal the following trends: in the countries of the world the consumption of fixed telephones is decreasing, the number of mobile and Internet users, including broadband and mobile Internet, is growing rapidly. Ukraine is among the countries around the world in terms of population coverage of the Internet and mobile communications, but lags behind the indicators of higher-quality services. Indicators of young people's coverage of higher education are high enough, which indicates a significant intellectual potential of our country. The importance of continuous monitoring of the processes of dissemination of modern technologies in the economy, identifying the most acute problems and identifying key areas for enhancing the use of ICTs has been proved. This problem leaves much scope for further analysis both in terms of identifying quantitative parameters and in the context of in-depth study of factors and mechanisms for achieving leadership positions in the country.

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