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TÍTULO: Desarrollo de tecnologías digitales en Rusia.

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RESUMEN: Con el fin de intensificar la implementación de las tecnologías de la información y la comunicación en Rusia en los últimos años, se han adoptado los actos jurídicos pertinentes, que implican la implementación de medidas relevantes y su financiación. Al mismo tiempo, el aparato terminológico, las metas, los objetivos, y en parte, el mecanismo organizativo no están lo suficientemente dirigidos para mejorar la eficiencia de la economía rusa. En este sentido, el documento discute los principales componentes problemáticos que deben enfocarse para un crecimiento activo, tanto el sector de la información de la economía como el componente de información de toda la economía. En particular, es necesario prestar atención a la capacitación del personal, la especialización de áreas científicas, los costos de I + D.

PALABRAS CLAVES: Tecnologías de información y comunicación, recursos de economía digital, tecnologías digitales en agricultura, costos de investigación y desarrollo para tecnologías de información y comunicación.

TITLE: Digital technologies development in Russia.

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ABSTRACT: In order to intensify the implementation of information and communication technologies in Russia in recent years, relevant legal acts have been adopted, which involve the implementation of relevant measures and their financing. At the same time, the terminological apparatus, goals, objectives and partly the organizational mechanism are not sufficiently targeted to improve the efficiency of the Russian economy. In this regard, the paper discusses the main, problematic components that need to be focused on for active growth, both the information sector of the economy and the information component of the entire economy. In particular, it is necessary to pay attention to personnel training, specialization of scientific areas, R&D.

KEY WORDS. Information and communication technologies, digital economy resources, digital technologies in agriculture, research and development costs for information and communication technologies.

INTRODUCTION.

The modern economy is developing with the use of new technologies, among which the most important place is occupied by information and communication technologies. In the Russian Federation, the term “Digital economy” is synonymous with the use of such technologies. It involves the use of advances in information and communication technologies in various sectors of the economy (Ashmarov, 2018; Minakova, 2017; Gnatyuk & Pekert, 2018; Olkhovskiy, 2018; Narkevich & Narkevich, 2018; Novikov, 2017). Unfortunately, issues related to the development of the digital economy in certain sectors of the economy are not reflected in the legal regulation, there are no tools of the digital economy, and the conceptual apparatus suffers (Schwarzkopf, 2018; Moiseenko, 2017; Kobets, 2017; Vernigor, 2017).

DEVELOPMENT.

Methods and materials.

Comparative, economic and mathematical, economic and statistical and other research methods were used. Federal laws, decrees of the President of the Russian Federation, resolutions of the Government of the Russian Federation, published works of research institutions of the RAS, statistical materials at the federal and regional levels were used as materials.

Research results.

In terms of the digital economy development at the federal level, the following legal acts were adopted:

1. Strategy of scientific and technological development of the Russian Federation (approved by presidential decree of December 1, 2016. №642).
2. The decree of the President of the Russian Federation from 21.07.2016, No. 350 “On measures on realization of state scientific and technical policy in agriculture development”.

3. Federal scientific and technical program for the development of agriculture for 2017-2025 (approved by the Government of the Russian Federation on August 25, 2017, №996).
4. The decree of the President of the Russian Federation from 07.05.2018, No. 204 “On the national goals and strategic objectives development of the Russian Federation for the period up to 2024”.
5. Program “Digital economy” (approved by Order of the Chairman of the RF Government No. 1632-p 28.07.2017).

Paradoxically, none of the above normative documents give a clear definition of the category of “Digital economy”. There is a situation when a fashionable term is pulled out of any context, the appropriate regulatory framework is adopted, funding is allocated, organizational measures are implemented, but what this term means no one knows clearly. Accordingly, there is no single terminology base associated with this category. Thus, without knowing the essence of the term, it is impossible to speak the same language.

The absence of a methodology for statistical observation regarding the digital economy is also natural. It cannot be a priori, because of the lack of terminology. In periodicals, the digital economy is often understood as literally everything related to information technology. And how true is that? After all, the term “Economy” from ancient Greek οἶκος “house, farm; managing” + νόμος “nome, territory of management; rule, law”; literally “the rules of the household”) is economic activity of society and the totality of relations in the system of production, distribution, exchange and consumption

In our case, it turns out that the digital economy is economic activity using information technology. Information technology in this case will be an instrument of the economy. It is fair to note, that for example, in agriculture, production is impossible without living organisms, so the economy in

agricultural production is biological, and besides, also digital. There are many such analogies. Let us turn to the program “Digital economy”. It sets 3 main goals:

1. Creation of the digital economy ecosystem of the Russian Federation, in which data in digital form is a key factor of production in all spheres of social and economic activity and in which effective interaction, including cross-border, of business, scientific and educational community, state and citizens is ensured;

2. Creation of necessary and sufficient conditions of institutional and infrastructural character, removal of existing obstacles and restrictions for creation and (or) development of high-tech businesses and prevention of emergence of new obstacles and restrictions, both in traditional branches of economy, and in new branches and high-tech markets;

3. Improving competitiveness in the global market, as individual sectors of the economy of the Russian Federation, and the economy as a whole.

For all three goals, the “Digital economy” is only a factor or mechanism for achieving the goal. Unfortunately, other factors and mechanisms are not taken into account in this program. The second and third goals can generally be achieved with minimal use of information technology. Important factors here are: human resources, purchasing power of the population, state support for exports, etc.

If we analyze the first goal, it is absolutely not clear how to create an ecosystem of the digital economy? Ecosystem, or ecological system (from ancient Greek. οἶκος - house, seat and σύστημα - system) is biological system (biogeocenosis), consisting of community of living organisms (biocenosis), their habitat (biotope), communication systems that exchange matter and energy between them.

In the second goal, the main factor is not information technology, but the possibility of obtaining cheap financial resources, taxation, contributing to the development of small and medium-sized businesses. Sometimes for the development of small and medium-sized businesses, it is sufficient not to interfere with its own development, not to strangle it with all sorts of reports, which are rather clarifying in nature. In the future, the collected reporting data is not used anywhere, and the methodology of data collection on small forms of management is questionable.

As for the third goal, the main thing here is the price and quality. For example, after the introduction of a number of sanctions, Russian agricultural products became competitive in the domestic market. And after the depreciation of the national currency in 2 times the competitiveness only increased. What is the role of information technology? Rather, it is a data collection tool for subsequent analytical processing. In practice, we can talk about new software, new technologies of collecting and processing information, the use of robotics, automation of production etc. In fact, it is the innovation with which the sphere of production, distribution, exchange and consumption operate more effectively.

Of course, digital technologies, as well as biotechnologies and other types of technologies, should be developed by allocating appropriate funding, and most importantly, it is necessary to encourage businesses that use the technologies of tomorrow, because the Russian Federation is not in the first positions in the digital technologies development.

According to the development index of computer information and communication technologies (ICT), Russia in 2017 was on the 45th place in the world. The value of the index was 7.07, and two years earlier, our country ranked 44th place in the world with the index - 6.91 (table 1).

Table 1. World ICT ranking in 2015 and 2017.

2015			2017		
Ranking	Country	Index	Ranking	Country	Index
1	South Korea	8,93	1	Iceland	8,98
2	Denmark	8,88	2	South Korea	8,85
3	Iceland	8,86	3	Switzerland	8,74
4	Great Britain	8,75	4	Denmark	8,71
5	Sweden	8,67	5	Great Britain	8,65
6	Luxembourg	8,59	6	Hong Kong	8,61
7	Switzerland	8,56	7	The Netherlands	8,49
8	The Netherlands	8,53	8	Norway	8,47
9	Hong Kong	8,52	9	Luxembourg	8,47
10	Norway	8,49	10	Japan	8,43
44	Russia	6,91	45	Russia	7,07

This suggests, that despite the measures taken, information and communication technologies in the world (with a rating of up to 44 places) are developing more effectively than in Russia. Paradoxically, the ten countries did not include such developed countries as the United States, Germany, France, and Canada.

The index is a combined indicator of the world countries achievements in terms of information and communication technologies. It is calculated according to the methodology of the International Telecommunication Union, a specialized unit of the UN, which determines the world standards in the field of ICT. The index was developed in 2007 on the basis of 11 indicators used by the International Telecommunication Union in its estimates of ICT development (table 2).

Table 2 – Indicators for ICT assessing.

№	Indicator	Value, %	Share in ICT index, %
Access to ICT			
1	Number of fixed-line telephone contracts per 100 population	20	40
2	Number of mobile telephone contracts per 100 population	20	
3	Bandwidth of international Internet channels (bps) per Internet user	20	
4	Percentage of households with a computer	20	
5	Proportion of households with Internet access	20	
Use of ICT			
6	Percentage of people using the Internet	33	40
7	Number of fixed broadband contracts per 100 population	33	
8	The number of subscriptions with broadband connection per 100 population	33	
ICT skills			
9	Average duration of education, years (since 2016, before that there was adult literacy rate)	33	20
10	Secondary education population coverage	33	
11	Higher education population coverage	33	

The index combines these indicators into a single criterion that is designed to compare the world countries achievements in ICT development and can be used as a tool for comparative analysis at the global, regional and national levels. These indicators relate to access to ICT, use of ICT, and skills, i.e. practical knowledge of these technologies by the population of the countries covered by the study (Ashmarov, 2018).

Despite the fact that the funding of the priority direction "Information and communication systems" is increasing every year, the Russian Federation in the world ranking does not approach the leading positions. Domestic expenditures on ICT in 2017 amounted to 81.4 billion rubles, of which 61.4% are funds of budgets of all levels (table 3).

Table 3 – Internal costs for research and development in the priority area of "Information and telecommunication systems" by funding sources (Abdrakhmanova, 2019).

Indicators	Years			
	2010	2014	2016	2017
Total, billion rubles	38128,8	70631,5	77932,0	81390,7
Total, %	100,0	100,0	100,0	100,0
Budgets of all levels	62,9	64,9	61,7	61,4
Including federal budget	62,9	64,0	61,1	60,6
Own funds	no	9,3	16,2	15,6
Funds of public sector organizations	no	8,4	9,6	8,9
Funds of business sector organizations	no	15,3	10,2	11,7
Other sources	no	2,1	2,3	2,4
Internal costs for research and development in the priority direction "Information and telecommunication systems" to the total amount of internal costs for research and development.	7,3	8,3	8,3	8,0

Over the last 3 years the amount of internal costs in this area increased from 70.6 to 81.4 billion rubles or 15.3%. The inflation rate for the same period was 32.17%.

Thus, we can state the fact of reduction of the share of internal costs for financing the direction "Information and communication systems", which does not contribute to the development of Russia

as a digital power. In addition, the lack of incentives for the implementation of internal costs in the field of information technology does not motivate business entities to finance this kind of innovation.

A significant problem of inconsistent and inefficient development of digital technologies is the low level of scientists' specialization in a particular field of information and communication technologies. To determine the level of scientific specialization they determine the index of scientific specialization.

It is calculated as the ratio of the share of publications in the field of science in the aggregate of scientific publications of authors from a particular country in publications indexed in the Scopus database to its share in the global number of indexed publications. In this case, if the index value is more than 1, the field of science is among the areas of specialization of the country. Of course, there is a certain element of subjectivity in the calculation of this index. For example, the publication may not be indexed, or excluded from the database, for reasons beyond the author's control, etc.

As it can be seen from the table 4, Russian ICT scientists specialize in 4 scientific areas: computational mechanics, ICT application in Earth Sciences, general computer science problems and computer science (other). In other areas of scientific specialization, there is either a slight increase or decrease; for example, we lost positions in the direction of computer vision and pattern recognition, which is promising in all areas of the economy.

Position in the direction of computer graphics and computer design is significantly reduced. It is obvious that certain scientific areas of ICT need to be given more attention because of their active use in security, counterterrorism, human health, the creation of new information and communication products, etc. In this case, they should be reflected in the program "Digital economy". It is the priority research areas that should become a mechanism for creating tools for

the digital economy, which will contribute to an increase in the share of gross output, produced using ICT.

Table 4 - Indices of scientific specialization of Russia on publications in the field of ICT, indexed in Scopus, by research areas (Abdrakhmanova, 2019).

Research area	Periods		Change +; -
	2006-2008	2016-2018	
Human-computer interaction	0,26	0,40	0,14
Computational mechanics	2,04	1,85	-0,19
Information system	0,46	0,70	0,24
Artificial intelligence	0,21	0,38	0,17
Computer graphics and computer design	0,59	0,24	-0,35
Computer vision and pattern recognition	0,83	0,49	-0,34
Computer education and architecture	0,14	0,75	0,61
Computer networks and communications	0,61	0,77	0,16
Control and system design	0,60	0,88	0,28
Medical informatics	0,09	0,25	0,16
Information science and librarianship	0,22	0,23	0,01
Signal processing	0,41	0,58	0,17
Applied computer science	0,73	0,71	-0,02
ICT application of in Earth Sciences	0,36	1,86	1,5
Software development	0,28	0,45	0,17
Theories and methods of computer science	0,40	0,85	0,45
General computer science problems	0,31	1,24	0,93
Computer science (other)	0,17	1,10	0,93

In 2018, gross ICT output in Russia amounted to 3.2% of GDP, while in South Korea 9.6%, Switzerland 6.7%, Japan 6.0%, the USA 5.4%, and Germany 5.0%. At the present stage of economic development, it is necessary to take a number of measures to increase the share of ICT in GDP to the level of leading countries. This requires the development of a Strategy for the ICT development, with a clear algorithm for the development of this sector of the economy, transparent mechanisms of state support, and consistent steps for the introduction of ICT products in other sectors of the economy. Another important reason for the backwardness of the Russian economy in international rankings from the leading countries of the world is the low share of ICT specialists.

In Russia, it is 2.2% of total employment, in Finland 6.8%, in Sweden 6.6%, in the UK 5.1%, in the USA 4.1%, in Germany 3.8%. 1.6 million ICT specialists work in Russia, among which 32.6% in information and communication, 14.2% in manufacturing, 6.0% in public administration, 2.8% in education, 2.7% in healthcare. And only 0.4% of specialists work in agriculture, forestry and fisheries. Table 5 shows that the higher the average monthly wages, the higher the proportion of ICT professionals is. Consequently, the wages of these professionals is the main factor determining their share in each of the areas of the economy. Exceptions are such economic activities as mining, financial and insurance activities.

In order to achieve the indicators of leading countries according to the specific weight of specialists in ICT, it is necessary to increase their number about 5 times, i.e. up to 8 million people. In the near future it will not be succeeded because the issue of bachelors, specialists and masters on the main ICT specialties made 54994 people or 5.7% of all graduates in 2017. In addition, 31043 specialist of middle management in the ICT sector graduated in 2017, which accounted for 6.1% of the graduates of vocational secondary education institutions.

The introduction of digital technologies for the agro-industrial complex is a serious task that must be solved as soon as possible. The provision of agriculture with the simplest elements of ICT is minimal today. According to the results of the all-Russian agricultural census of 2016, 70.6% of agricultural organizations, 50.7% of farms, 14.8% of smallholders and 82.4% of non-profit associations of citizens engaged in horticulture were provided with telephone communication. 8.5% of the agricultural organizations had internal fixed telephony and 76% of the smallholders had a mobile connection (table 6).

Table 5 – ICT specialists by type of economic activity and level of salaries, 2018.

Type of economic activity	Share of ICT professionals	Average monthly salary, rubles
Information and communication	32,6	66590
including telecommunications	9,7	no
Information technology industry	16,1	no
Manufacturing industry	14,2	40722
Professional, scientific and technical activities	7,4	66264
Transportation and storage	6,2	47474
Public administration and military security, social security	6,0	47803
Wholesale and retail trade	5,4	35444
Financial and insurance activities	5,3	91070
Education	2,8	34361
Healthcare and social services	2,7	40027
Building	2,4	38518
Energy supply	2,2	47482
Administrative activities and related additional services	1,8	31706

Activities in the field of culture and sports, organization of leisure and entertainment	1,3	44439
Extraction of minerals	1,3	83178
Real estate transactions	0,8	33101
Hotels and catering establishments	0,5	26241
Water supply, sanitation, waste disposal	0,4	31586
Agriculture, forestry, hunting, fishing and fish farming	0,4	28699

Internet connection indicators remain unsatisfactory (Ashmarov, 2018). 47.6% of agricultural organizations, 17.9% of farms, 22.8% of smallholders had such connection. This indicator is very important for business entities in rural areas, as it provides access to the necessary information for economic activity.

In addition, a significant part of public services is provided via the Internet. Despite the fact that state support is provided to agricultural organizations, producers still do not have enough funds to purchase elements of digital technologies in crop production. This explains the low level of provision of agricultural organizations with precision driving systems and remote quality of technological processes – 5.4%, in farms this figure is 0.5%.

It is obvious, that the state authorities need to outline measures to solve this problem, determine funding and conduct appropriate work with rural producers.

Table 6 – Share of agricultural organizations, farms, smallholders and non-profit associations of citizens provided with ICT facilities.

	Agricultural organizations (% of total number of agricultural enterprises)	Farms and individual entrepreneurs (in % of the total number of farms and individual entrepreneurs)	Smallholders (in % of the total number of smallholders)	Non-profit associations of citizens (in % of the total number)
Telephone connection	70,6	50,7	14,8	82,4
Internal fixed telephony	8,5	X	X	X
Internet connection	47,6	17,9	22,8	X
Mobile communication	X	X	76,0	X
Precision driving system and remote quality control of technological processes	5,4	0,5	X	X

With one of the world's largest banks of fertile land, as of December 2018, Russia ranks only 15th place in terms of digitalization of agriculture in the world. Solutions for precision agriculture are used only in 3 % of agricultural enterprises in Russia. While in the US this figure reaches 60 %, in the European Union and even higher – 80 % (Melnikova et al, 2018).

Meanwhile, the agro-industrial complex is a very complex component of the national economy, which has a lot of features to which it will be necessary to adapt the applied ICT. This is further complicated by the fact that a large proportion of ICT solutions are imported. This suggests the need to support the domestic production of information and communication technologies, not to mention scientific support. This need is due, among other things, to the negative dynamics of the decline in exports of ICT goods and the increase in their imports. Over the past 4 years, the amount of ICT exports decreased by $ 662 million. Imports increased by $ 7.1 billion (table 7)! Despite the

adoption of a number of regulations related to the development of ICT, imports of ICT goods increased by $ 2.8 billion over the past year.

Table 7 – Exports and imports of ICT goods and services, $ million. (Abdrakhmanova, 2019).

	Exports			Imports		
	2015	2017	2018	2015	2017	2018
ICT goods, total	2767	2061	2105	16482	20837	23599
Computers and peripheral equipment	1630	363	403	6101	7423	8404
Communication equipment	238	476	531	6328	8433	9476
Consumer electronic equipment	385	446	552	1471	1995	2385
Other ICT components and products	514	776	619	2582	2986	3334
ICT services, total	3972	4789	5261	5521	5315	5488
Computer services	2455	3417	4061	2772	3399	3521
Telecommunication services	1418	1247	1072	2388	1470	1486
Information services	99	125	128	361	446	481

On the one hand, this demonstrates the need for ICT products, on the other hand, the lack of own production that can replace imported analogues. As for exports of ICT services, their amount has increased slightly, mainly through the provision of computer services. The amount of imports is in the range of 5.5 billion dollars. Its growth is mainly due to the provision of computer and information services.

CONCLUSIONS.

From the given analytical material, it follows that it is necessary to create urgently conditions for development of ICT production and new, perspective directions of this sphere of activity. To do

this, first of all, it is necessary to determine the resources that will be used in the development of the digital economy. Special attention should be paid to training of digital economy personnel.

The number of graduates should be increased several times, while creating favorable conditions for employment. An important aspect is the financing of research and development, in terms of information and communication technologies. For sufficiently effective work, it is necessary to increase the amount of funding by 5-7 times, and at the same time to determine the scientific specialization of research institutions and universities.

With the creation of new technologies for the digital economy, issues relating to their export will need to be solved. Here it will be necessary to form a program to support the export of information and communication resources.

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