Digital Technologies as a Driver of Intellectual Stratification of Human Resources: Socio-Economic Inequality

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Аннотация

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has studied digital technologies as a driver of intellectual stratification of human resources. The article analyzes the phenomenon of digital inequality as one of the key problems of microsystem development, as well as the geospatial characteristics of this problem.

Олег Шахов, Маргарита Шахова, Юлия Сизова, Екатерина Русакова, Михаил Дудин Digital Technologies as a Driver of Intellectual Stratification of Human Resources: Socio-Economic Inequality

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Abstract: The goal of the research is to cover the problem of digital inequality considering its negative consequences for society, to conduct a geospatial analysis of the

distribution of informational resources among the countries around the world and to determine the main trends of their technological development. Methods. This article uses the following methods: empirical, systematic, analytical, economic and other methods for the research of digital technologies as a driver of intellectual stratification of human resources. Results. The author has studied digital technologies as a driver of intellectual stratification of human resources. The article analyzes the phenomenon of digital inequality as one of the key problems of microsystem development, as well as the geospatial characteristics of this problem.

Index Terms: digital inequality, digital technologies, geospatial features, intellectual stratification, microsystem.

I. INTRODUCTION

In the modern era of the emergence of information society and globalization, there is an urgent need to access information resources both at the national and international levels. The features of modern times include the important role of information and information technology (IT) in the socio-economic relations of humanity, the growing share of information products and services in GDP of the world's economies and an increase in the number of people employed in the sphere of information and communications technology (ICT). This explains the relevance of the search for ways

to eliminate digital inequality as a phenomenon that poses a challenge for society at this stage of its development.

In view of the above, the goal of the research is to cover the problem of digital inequality considering its negative consequences for society, to conduct a geospatial analysis of the distribution of information resources among countries and to determine the main trends of their technological development.

II. LITERATURE REVIEW

The study of digital inequality is carried out by scientists all over the world: this issue is addressed not by just one organization. Well-known researchers, such as A.N. Semyonova, V.A. Stupkina [1], M. Rozin [2], T. Aleshkina, Yu. Yarosh [3], N. Albrekht [4], A. Balashova, R. Rozhkov [5], A. Belaichuk [6], D. Bulin [7] and many others, dedicate their work to this issue. Each of them considers IT as a driving force of the present, but at the same time, each one sees in this force a threat of increasing gap between technologically rich and technologically poor countries. Thus, according to the majority of researchers, the modern world is divided not ideologically but technologically. The higher the technological capacities of some countries, the more other countries lag behind them. To address the issue of digital inequality, a number of indicators were developed for an in-depth study of the problem. Such indicators differ depending on the researcher's

individual approach.

III. PROPOSED METHODOLOGY

A. Block Diagram

The phenomenon of the digital gap receives considerable attention from the world organizations, unions, integration associations (International Telecommunication Union, European Union and United Nations institutes). The basis of their actions on overcoming digital inequality is formed by the development of statistical reports, planning of programs for the elimination of technological backwardness of particular countries and regions and formulation of a number of proposals and recommendations concerning this problem. The experience in developing digital inequality calculation indexes is fairly common.

Fig. 1 illustrates Internet access in Russia in 2008–2018.

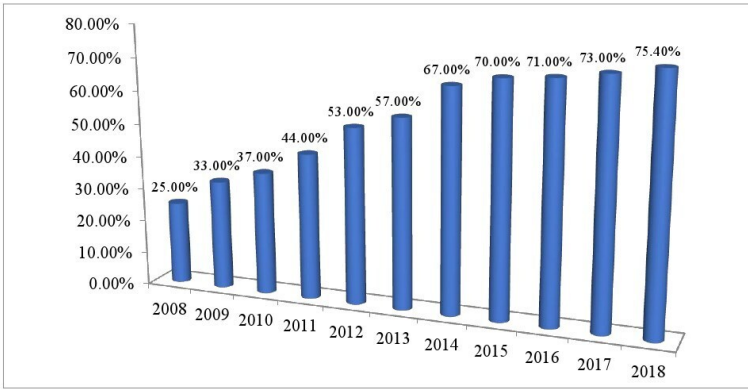

Fig. 1. Internet access in Russia in 2008-2018

B. Algorithm

This article uses the following methods: empirical, systematic, analytical, economic and other methods for the research of digital technologies as a driver of intellectual stratification of human resources.

IV. RESULT ANALYSIS

According to the indicators of development, in the modern global space, digital technologies represent a dynamic sphere. For instance, today, the number of mobile connections notably exceeds the number of people. Moreover, the number of people who can use a mobile phone exceeds the number of those who can satisfy their basic needs. In addition, the volume

and direction of information flow in countries, their unions and continents are constantly growing, as a result of which the volume of such information in 2016–2018 accounted for more than one-third of the global GDP. These trends are especially impressive considering a certain slowdown in the growth of international trade in goods and services and the international movement of capital.

These circumstances affect the continuation of complications in the interaction of public institutes based on modern digital technologies both at the national and international levels. As a result, massive data flows become the basis for the formation and development of the digital economy, which is able to fully and effectively ensure production, processing, storage, transfer, use and protection of information. In particular, today, as argued by some researchers, in order to obtain an economic effect, it is important not only to have a certain resource but to have comprehensive data about this resource and the possibility to use them in the course of planning and decision-making [1].

If each ICT segment of the world market is considered separately, it can be noted that the growth has occurred in the following categories: data centers, software for companies and IT services (Table I).

Table I. World expenditure in the ICT sector

	Expenditure in 2016 (USD bln)	Expenditure in 2017 (USD bln)	Dynamic in 2017	Expenditure in 2018 (USD bln)	Dynamic in 2018
Data centers	153	173	1.3	177	2
Software for companies	314	333	6	357	7.2
Hardware	642	597	-7.5	600	0.4
IT services	866	900	3.9	943	4.8
Communication services	1,399	1,384	-1.1	1,410	1.9
ICT in general	3,391	3,387	-0.3	3,486	2.9

Source: [8].

Fig. 2 presents the dynamics of world expenditure in the ICT sector in 2016–2018.

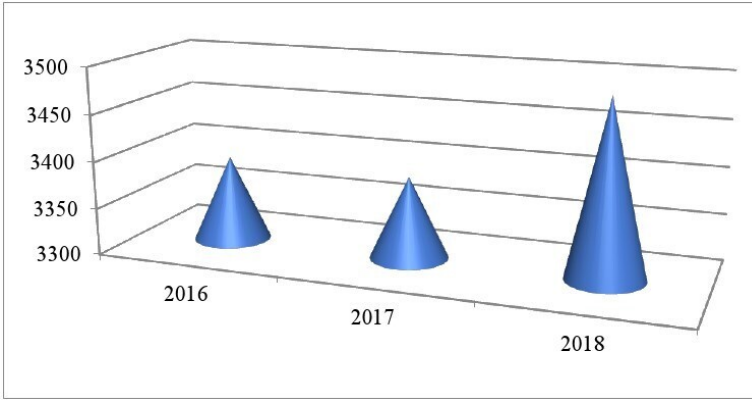

Fig. 1. Dynamics of world expenditure in the ICT sector in 2016–2018.

Despite the gradual elimination of borders and the establishment of close relations among countries, there is still an obvious asymmetry, which also manifests itself in the level of access to information resources. Highly developed countries accumulate the majority of information resources. Their investment in the development of science, technical education, information infrastructure, as well as the development of various projects, significantly exceeds the contribution of under-developed countries. Countries with a high level of development are able to spend much more funds on the knowledge sphere. Effective legislation on intellectual property enables them to assert their right for scientific developments. The phenomenon of monopolization in information sphere has such negative consequences for society as stratification of the population on the grounds of intellect, an increase in the demand for employees of the information sector as compared with the traditional one and an obvious gap in their income. The capability of highly developed countries to provide jobs in this area leads to labor migration of interested qualified employees from countries with lower potential [9]. Thus, examining the global ICT market, it can be reported that out of 250 largest world companies in this industry from 34 countries, 116 companies (46 %) belong to the USA and 39 (16 %) to Japan [11]. Thus, the essence of digital inequality lies in the polarization of the world's countries in terms of possessing effective knowledge and the ability of its implementation in the

form innovation, which, in turn, ensures a country's income growth [9].

Summarizing the opinions of many scientists working on this issue, digital inequality can be defined as follows: it is a gap between the world's countries in terms of access of their citizens, households and business entities to modern ICT and its effective use for the purpose of economic growth and development, caused by asymmetry of scientific, socio-economic, institutional and technological achievement levels, which threatens to deepen international disproportions and escalate imbalances among countries. That is, digital inequality reflects the differences among and inside countries in terms of access to infrastructure, including computers and the Internet or even such "regular" communications as fixed telephone lines. The digital gap may exist between developed and developing countries (global gap) or within one country (national gap). It can manifest itself in various demographic characteristics, such as age, gender, income or different areas (for example, urban and rural). Most often, the gap is manifested in various conditions of people's access to ICT. Mobile access, the number of Internet users and personal computers are also indicators that determine the gap size. It is often the case that a particular country can achieve a comparatively high level in some area, for instance, mobile access, but at the same time, it may lag behind in terms of the Internet access index.

By researching global digital inequality, the International

Network of UNESCO Chairs in Communications (Orbicom), based on the developed Infostate index, identifies four groups of countries depending on the ICT development level (Table II):

– highest level – 33 countries, including 15 % of the world's population: 22 European, 7 Asia-Pacific and 2 Arab countries, as well as Canada and the USA;

– high level – 12 % of the world's population;

– average level – more than one-third of the world's population, including large countries, such as China and Indonesia, as well as small countries – Jamaica, the Maldives;

– low level – one-third of the world's population, including 46 countries, 31 of which are African countries [10].

Table II. Groups of countries by the ICT development level based on Orbicom's Infostate index

Groups of the world's countries by ICT development level			
Highest	High	Average	Low
Australia	Argentina	Azerbaijan	Angola
Austria	Belarus	Albania	Bangladesh
Bahrain	Bulgaria	Algeria	Benin
Belgium	Bosnia and Herzegovina	Bolivia	Burkina Faso
Great Britain	Brazil	Botswana	Butane
Hong Kong	Brunei	Vietnam	Haiti
Greece	Venezuela	Armenia	Gambia
Denmark	Qatar	Gabon	Ghana
Estonia	China	Guatemala	Guinea

Israel	Cyprus	Honduras	Guinea Bissau
Ireland	Colombia	Georgia	Djibouti
Iceland	Kuwait	Dominican Republic	DR Congo
Spain	Latvia	Ecuador	Eritrea
Italy	Lithuania	Egypt	Ethiopia
Canada	Macedonia	Jordan	Yemen
Republic of Korea	Malaysia	Indonesia	Zambia
Luxembourg	Panama	Iran	Zimbabwe
Macau	Poland	Cape Verde	India
Malta	Russia	Kazakhstan	Cambodia
Netherlands	Romania	Kyrgyzstan	Cameroon
Germany	Saudi Arabia	China	Kenya
New Zealand	Seychelles	Costa Rica	Columbia
Norway	Saint Vincent and the Grenadines	Cuba	Congo
UAE	Serbia	Lebanon	Ivory Coast
Portugal	Slovakia	Libya	Laos
Singapore	Trinidad and Tobago	Mauritius	Lesotho
Slovenia	Turkey	Maldives	Mauritania
USA	Hungary	Morocco	Madagascar
Finland	Ukraine	Mexico	Malawi
France	Uruguay	Moldova	Mali

Source: [10].

It can be said that one of the challenges of modern society is growing digital inequality, or digital gap, which leads to considerable geospatial disproportions in socio-economic development – digital asymmetry of the microsystem. An increase in the digital gap between the world's regions means that part of the world community is not able to fully use the advantages of ICT resources. Hence, the level of their innovative activity is lower; accordingly, their economic potential is also low. Today, it is important to understand, which forces have accelerated the implementation of ICT. For this purpose, it is necessary to develop a policy aimed at eliminating the obstacles to the introduction of ICT in each individual region, country and even city. Despite the obvious leadership of highly developed countries, the global gap is gradually narrowing due to the dynamic development of such countries as the UAE, Macedonia, Bahrain, Vietnam, Nigeria, Greece and Cape Verde. At the same time, overcoming digital inequality would contribute to the economic growth and integration of backward countries, raising the level of educational, medical, managerial and other services and providing the active attraction of investments and, consequently, the complex-proportional development of the microsystem.

Rapid changes in the level of computer capability, reduction in prices for silicon chips and electronics, as well as achievements

in the area of wireless connection have made powerful technologies accessible in many parts of the world, which used to lag behind in terms of technology application. This allows developing countries to obtain significant advantages by joining the information society, especially if a country is focused on raising the level of its readiness for digital transformations. Thus, developing countries enrich themselves by participating in the global digital network gaining the ability to use digital goods and add "value" to the whole community. Obviously, readiness for such changes is increasingly important for the developing world. This readiness creates new opportunities for companies and individuals, erases barriers, which previously presented an obstacle on the way to information, goods and services, and promotes the improvement of cultural, social and political well-being. Among new opportunities offered to countries willing to raise the level of their readiness for digital transformations, one can mention the opportunity for application and development of new forms of business, expansion of access to the global market of goods and services, open access to any information for each member of society, overcoming of physical and virtual isolation, awareness of society members in the area of government policy and economic, social and cultural processes of the country or region and the world as a whole, increase in the level of education, medicine, etc.

Recently, many countries have shifted the focus from the issue of access to ICT to the problem of more effective ICT

use in order to promote business innovation and increase management effectiveness and social cohesion. In particular, according to the conclusion of the World Economic Forum, the successful use of ICT is facilitated by the shared environment for ICT, including market conditions and regulatory climate. Such network readiness requires efforts of the entire society, including respective actions on behalf of the population, business and government. At the same time, the readiness to use ICT by all interested parties increases their effectiveness in day-to-day activities. Connection of the population, business and government to the Internet has become an increasingly important factor, as the role of the Internet is growing. The intensive use of the Internet requires high-quality broadband access, as well as fixed and wireless networks.

Governments of many countries invest funds in the construction of digital pipes – national high-speed broadband access based on a combination of fixed and wireless networks – as they accelerate their countries' socio-economic development.

V. CONCLUSION

ICT has become an integral part of life and has a direct influence on people's activities, the development of the microsystem as a whole and each individual in particular. However, despite the overall high level and positive dynamics, the main distinctions in the sphere of ICT implementation

in certain regions and countries are brought to light. Today, IT is viewed as the main driving force, but at the same time, this force is sometimes seen as a threat of widening the gap between technologically rich and technologically poor countries. Thus, according to the majority of researchers, the modern world is divided not ideologically but technologically: the higher the technological capacities of some countries, the more other countries lag behind them.

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