

Digital Economy: Human Capital, Technology, Communications*

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Abstract—The formation of an appropriate institutional environment is an important precondition for the effective development of main spheres of human activities in the digital economy. Personnel and education play a key role in promoting the development of the digital economy. It is obvious that land, labor and capital - traditionally regarded as key factors of production at all stages of human development - undergo radical changes in the era of the digital transformation of the economy when the cost of goods, services and information are rapidly declining. Human capital will be assuming the role of the main national asset. And that does not refer to any human being, but only to persons having competence in the field of new technologies, able to research, able to introduce the new, able to perfect the old. In this regard, it can be recognized that human and information capital are becoming the main factors of production in the future economy, while the role of a key factor will be assigned to human capital. The digital economy is not just a new stage in the development of information technology; it is a manifestation of radically new business models, having the improved effectiveness resulting from eliminating optimization and intermediaries. A business is becoming more dynamic and more complex; today it does not have a single correct answer to the question of how to organize its activities. Companies developing new technologies and using various kinds of innovations change business rules and break down any barriers.

Keywords—*digital economy; human capital; information and communication technologies; innovations; knowledge economy; labor market; digitalization*

I. INTRODUCTION

The most important condition for the effective development of the state in modern economic conditions is the augmentation of the human capital. This capital is regarded as the most valuable resource, which is becoming more important than natural resources in the context of the formation of the information society (knowledge based society), of the tertiary sector of the economy (the service sector) coming to the fore, as well as of the globalization of public life, where the role of the individual becomes the most important factor in the democratization of political life.

The scientific and technological revolution, which began in the middle of the twentieth century, put forward science as a leading factor in economic growth, which influenced the strengthening of the man's role in production. Today, for the effective development of production, it is necessary to use complex highly skilled labor, capable of performing an extensive set of functions and operations and requiring a high level of professional training, experience and creativity, instead of simple labor with its basic functions and operations. Modern entrepreneurs struggle for the recruitment of knowledge workers, because they cope with their work much faster and more efficiently.

Most employers have realized that it is necessary not only to attract highly qualified workers, but also to invest sustainably into improving human knowledge. In turn, employees should be prepared for the continuous acquisition of new knowledge and quick retraining, as well as for self-improvement. Thus, in the knowledge economy, there is a transition from the use of simple production labor to highly qualified human resources endowed with special physical

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and mental abilities that generate income for owner and company [4].

Consequently, the phenomenon of human capital acquires an interdisciplinary dimension in modern social sciences and becomes an object of study, including political science: "in modern developed countries, the branches of human capital represent a zone of interweaving and interaction of not only social, but also fiscal, investment and political problems" [1]. In the context of the formation of the global information society, according to some experts, there is a transition "from high-tech technologies to high-hume technologies" [2].

As a result, there is a change in human consciousness - both individual and collective. In the new conditions of postindustrial development, a personality of a postindustrial type is being formed, which becomes the central link in global social change. In this context, the concept of human development or the concept of human potential attracts the attention of the world expert community, various international organizations, state institutions, the media, public organizations, etc. In recent years, this concept has been actively developed in many countries of the world, has become the subject of discussion at various international conferences and congresses, and is used in public administration of different countries, in educational and cultural fields.

The trend of recent years is that the topics of human capital, intellectual property, etc. is becoming the subject of discussion not only in the framework of sociology and economics, but also in political science. Speaking about the digitalization process of the economy and society, first of all, it is necessary to clarify the terminology. In the broadest sense, the process of digitalization is usually understood as a socio-economic transformation initiated by the mass introduction and assimilation of digital technologies, i.e. technologies for the creation, processing, exchange and transmission of information [5].

World experience shows that human as such plays an increasingly important role in the development of the modern information society. In recent years, there has been a serious interest in the problems of improving the quality and efficiency of using human potential both in the scientific community and in reputable international organizations (UN, UNESCO, World Bank, etc.). This concept is increasingly being used not only in connection with the analysis of the processes of socio-economic development of various countries and regions of the world, but also in connection with the need to solve environmental, demographic and a number of other fundamentally new problems of the further development of civilization, one of which is information inequality between people, countries and regions of the world in an actively forming new environment of the world community [3].

II. METHODS

The research methodology was based on general scientific research methods. The system analysis method made it possible to approach the subject of research

comprehensively and diversely as well as to establish the relationship and interdependence of the concept of human potential and the concept of the information society. The method of comparative analysis was useful in characterizing the main indicators of the Human Capital Development Index in Russia and abroad. The forecasting method made it possible to assess the prospects for the development of the Russian human potential in the information society.

III. RESULTS

The results of the study show that information and communication technologies, knowledge and skills are presently becoming vital to success for an increasing number of Russian citizens; they are needed to increase the efficiency of the work they perform, of intercommunication, access to information, and services. The following results were obtained in the study of information and communication competencies as a component of human capital.

The importance of information and communication skills in Russia as a component of human capital is growing rapidly. This confirms the constant growth in the share of jobs for which the possession of computer or Internet skills is mandatory (see "Fig. 1"). Among those who changed jobs more than 10 years ago, only 7% had information and communication skills as a prerequisite for hiring. That share rose to 23% for those who started work from 3 to 10 years ago. Possession of information and communication skills is a prerequisite for 30% who work today, while for another 14% such skills help in performing their work.

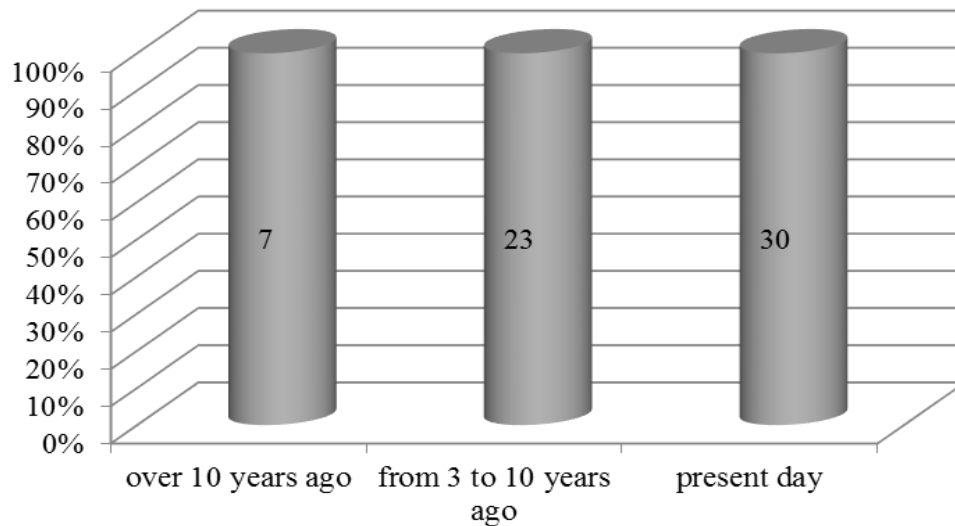


Fig. 1. The share of jobs in the Russian Federation, requiring the possession of computer or the Internet skills as a job prerequisite (in %).

The high demand for workers with information and communication skills is also confirmed by Rosstat data: in 2018 about 42% of Russian organizations felt the need for personnel with information and communication technologies user skills. The development of the information society also increases the demand for specialists in the field of information and communication technologies.

In 2018, specialists in the field of information and communication technologies in Russia accounted for 2.3% of those employed in enterprises of the business sector (about 2% in 2017), which is slightly lower than the figures for the European Union (3% in 2017; later these data did not feature in the European Union surveys) and significantly less than in countries such as the Netherlands (6%), Germany (5%) and Norway (4%).

At the same time, the demand in Russia for this information and communication competence is very high. In 2018 37% of enterprises needed specialists in the field of information and communication technologies. Among all the organizations surveyed by Rosstat (including government and budget organizations), this indicator reached 45% of population, with the index of the use of information and communication technologies in the region at 0.48, taking these indicators into account when calculating the integral indicator would increase the correlation to 0.55.

The presented data indicate that information and communication competencies today are a prerequisite for socio-economic development based on the use of information and communication technologies.

Analysis of the impact of human capital on the development of the information society was carried out by statistical methods using indicators that reflect the level of socio-economic development of the regions of Russia and the use of information and communication technologies in various fields of activity. Indices (and sub-indices) were used in particular as integral indicators characterizing the main

directions and factors of the development of the information society,

An analysis showed that each of these factors correlates with the index of the use of information and communication technologies in any of Russia's regions taken one by one significantly less than the composite indicator of these factors, the correlation coefficient of which reaches 0.74 (see "Fig. 2"). It means that human capital and the economic environment are independent factors in the use of information and communication technologies and, in aggregate, have a significant impact on the development of the information society.

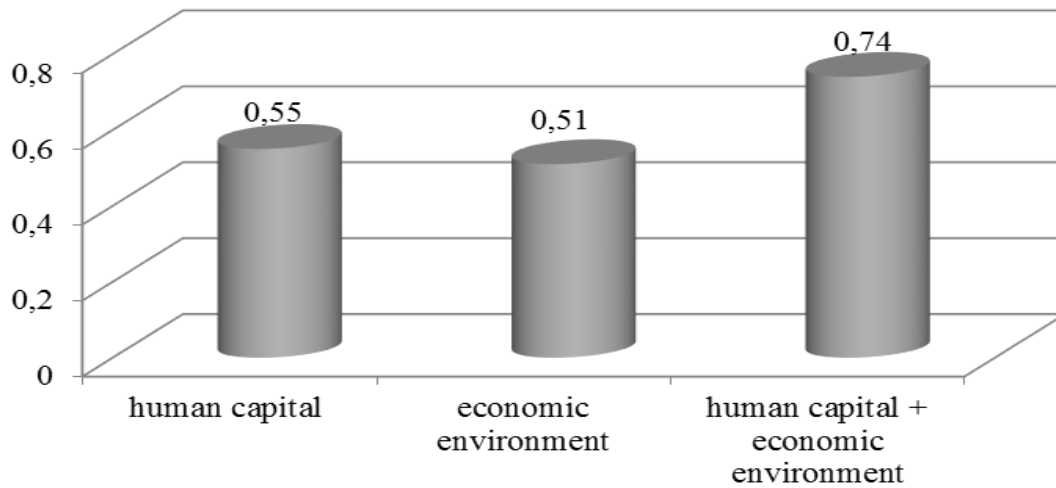


Fig. 2. Correlation of indicators of human capital and the economic environment with the general level of use of information and communication technologies in the regions of Russia.

The data obtained indicate that human capital in Russia today is one of the most important development factors based on information and communication technologies. The higher the regional population's education level, the possession of information and communication technology

skills, the production of information and communication technologies by specialists and the share of scientists, the higher the indicators for the use of information and communication technologies in various fields of activity (see "Fig. 3").

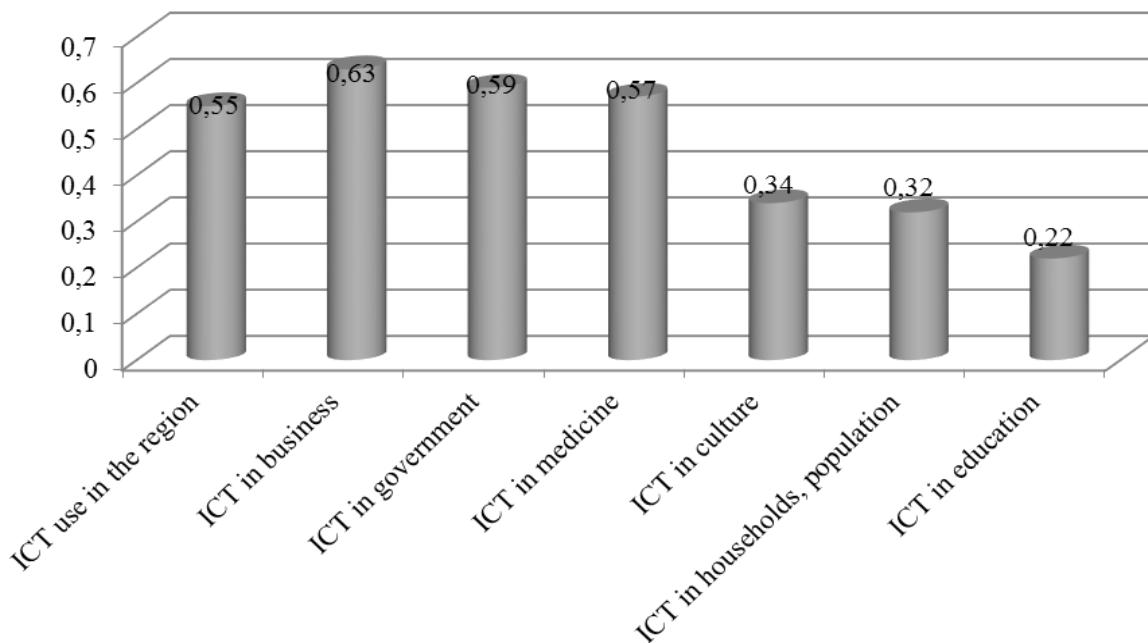


Fig. 3. Correlation of human capital with indices of the use of information and communication technologies in various fields of activity.

An analysis of the relationship between the level of development of human capital and the use of information and communication technologies in various fields of activity in the regions led to the following conclusions: in a number of areas of the development of the information society, the influence of human capital on the level of use of information and communication technologies exceeds the influence of

economic factors. Thus, the relationship between the development of electronic business in the region and human capital is very close (Pearson's correlation coefficient 0.63) and exceeds the correlation with economic factors (the correlation coefficient of any indicators, including integral ones, is much smaller).

The calculation of the integral indicator of human capital development in the regions of Russia required the use of indicators characterizing the level of education of the population (the proportion of students and people with higher education among the population), the training of specialists in the field of information and communication technologies (admission and graduation of specialists), and scientific personnel (the share of researchers in the population), as well as information and communication skills of the employed population (expert assessment of skills).

Simultaneously a study of the relationship of both individual indicators and the integral indicator of human

capital with the level of information use and communication technologies was conducted. The analysis showed that for the formation of favorable conditions for the development of the information society in the regions, all components of human capital were important.

This conclusion is confirmed by the fact that individually each of the components of human capital is less correlated with the index of information use and communication technologies than the integral indicator of human capital as a whole (see "Fig. 4").

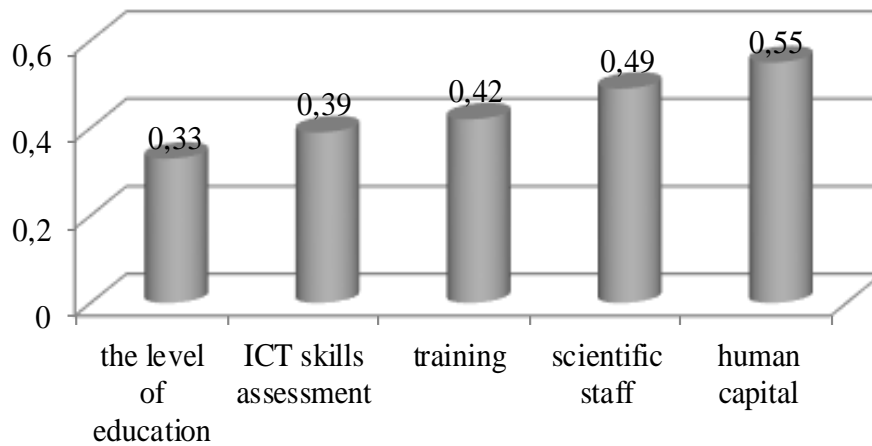


Fig. 4. Correlation of the integral indicator and individual components of human capital with the level of information use and communication technologies in Russia's regions.

According to the data obtained, an expert assessment of the level of information and communication skills among the working population of the region significantly correlates with the level of information use and communication technologies - the less the heads of organizations raise the issue of unskilled workers as the main factor hampering the use of information and communication technologies, the higher is the integral indicator of information and communication technologies usage in the region (correlation coefficient 0.39).

Adding this indicator to the integral indicator of human capital increases the correlation coefficient of human capital with the level of use of information and communication technologies from 0.48 to 0.55 (see "Fig. 5").

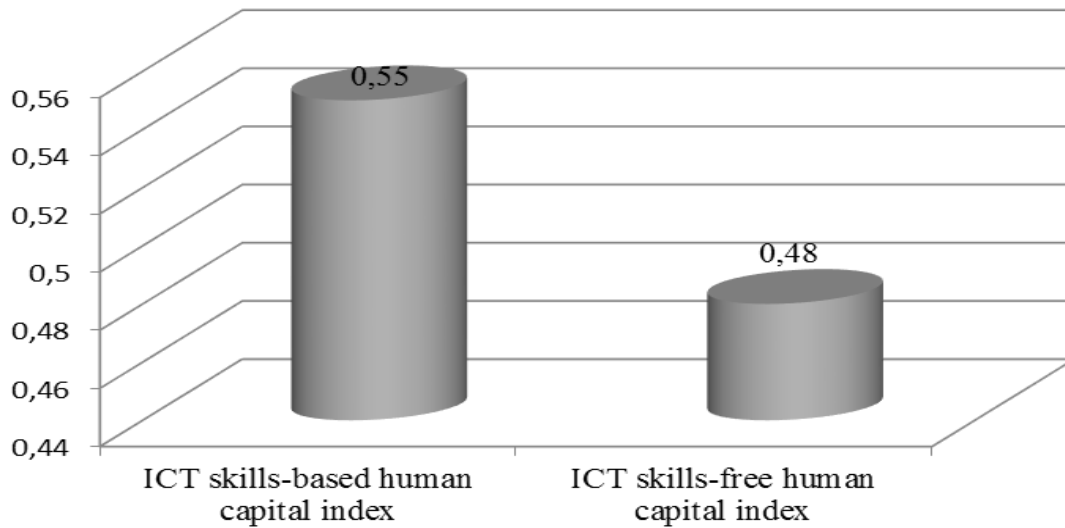


Fig. 5. Correlation between the human capital index, which includes the assessment of information and communication skills, and the index, excluding this assessment.

Relying on a continuous stream of innovations, the production of goods and services in the field of information and communication technologies has become a prominent segment of today's world economy, forming a separate industry - the information and communication sector. According to DigiWorld, the share of the information and communications sector in 2011 was 6.1% of global GDP. The global financial and economic crisis in the first decade of this century has slowed down economic growth, but the information and communication sector has maintained a positive development trend and in 2011 showed an increase of 4.3%.

According to preliminary data of the Ministry of Communications of Russia, the volume of the Russian market of information and communication technologies in 2019 increased by 8.6% - up to 2.087 trillion rubles, although the share of the information and communication sector in Russia's GDP fell from 4.3% in 2018 to 3.9% in 2011.

The widespread use of information and communication technologies leads to important social and economic effects: it changes the face of modern society, makes a significant contribution to the growth of the economy and labor productivity, expands the capabilities of people and helps to improve the quality of their life.

IV. DISCUSSION

The formation of the information society is considered as a sociotechnical problem, requiring for its solution the consistent and priority development of technical innovations, their implementation in social practice, as well as the active development of the whole complex of socio-political opportunities and economic benefits arising from their technical potential. The saturation of national territory with communication elements and nodes of the information and communication infrastructure, the level of accessibility and

frequency of use of the main elements of information and communication technologies by the population and various organizations - all this indicates the transition of society to the information status.

Accordingly, the emergence and development of the information society is understood as a direct and objective social consequence of scientific and technological progress and is assessed as a step in the development of modern civilization. The economic foundations of the information society are being formed thanks to a large-scale reduction in the cost of disseminating information, made possible by the development of fundamentally new types of electronic communications [6].

However, the complication of the sociotechnical forms of the movement of information and knowledge causes unpredictability of social, political, and sociocultural problems and the consequences, simultaneously related to both the scale of technological risks and the increase in speed and freedom of access to information resources while solving problems of commercial, social, diplomatic, military, and other nature. Recognizing this, we cannot but admit that information and communications are becoming a more important component not only in the context of the technological, but also the social and cultural development of modern civilization.

At the same time, there is a growing belief that ideological and philosophical interpretation of informatization processes, developed within the framework of technological determinism, considerably narrows and formalizes the boundaries of ideas about the real nature, content and sociocultural meanings of the processes of transformation of an industrial society into a post-industrial type of development.

The processes of development of information activities involve modern people in a fundamentally new circle of cultural interactions and in many respects affect a person's

awareness of his place in social culture. The general basis of the sociocultural dynamics of the development of the life of a modern person is the objective processes of its intellectualization and technologicalization, actively stimulated by the components of technical development. In all probability these processes will become the most important factors in the system-technical restructuring of human activity in the post-industrial era. They consolidate the class of intellectual technologies making it the basis for organizational transforming of various types of activities in the information society, they determine the professionalization and specialization of information activities, and also participate in the active formation of the information services market.

The technical basis of this process is the distribution of automated means of production, processing and transmission of information, and, in particular, of computers with their hardware and software. Computer technologies are the basis for the formation of the information space as a fundamentally new environment for human life. The practical mastery of its capabilities largely determines the success, effectiveness and efficiency of human activities, and also affects the development of economic, social and cultural ties.

Information and communication technologies, occupying one of the central places in the world economy and culture, in some cases have direct benefits for achieving the goals of sustainable development, in others they directly or indirectly harm the interests of the social and environmental spheres. The final conclusion on the degree of impact of information and communication technologies can be expected to be made in the medium or long term [5].

Thus, while formulating state economic policies and development strategies, it is necessary to combine the power of market relations with universal values, take into account the consequences of information and communication technologies on the development of human potential, and create the necessary favorable environment for the spread of information and communication technologies, providing a high-tech economy with a highly qualified workforce. The result of the development of the information society in Russia in modern conditions will depend on whether it can use state and civil society support to quickly and efficiently manage R&D resources and change its attitude towards human potential and its more efficient use.

V. CONCLUSION

Any state is unable to maintain its leading position in the competitive environment of the information society without intensive human development as the basis of a new type of socio-economic development based on intellectual resources. Apart from that, the process of democratization, which has been covering the world community with its “waves” for more than a century, is also an important condition for putting into practice the prerequisites of a “knowledge society,” since only a citizen who is free and has the potential for comprehensive development will be able to fully reveal his creative energy.

The “threshold effect” is a characteristic of the impact of information and communication technologies on economic growth and labor productivity: the penetration of information and communication technologies must reach a certain “critical mass” before they can positively influence economic development, while there is a time lag between the introduction of information and communication technologies and a noticeable manifestation of the economic effect, and the effectiveness of investments in information and communication technologies also depends on favorable conditions for doing business and developing human capital.

Information activity, in the end, is a means of consciously assessing the order and significance of relations between phenomena of reality and is associated with the nature of expediency and value forms of development of consciousness and self-consciousness of consumers of its products and services.

It is noteworthy that the process of informatization and digitalization of social production is a universal trend, but not an end in itself; it is accelerated due to high economic efficiency. The receipt, digital processing and transmission of information is increasingly becoming more important than the physical, analogue movement of products and even sometimes more important than traditional money itself. In addition, the value of companies and firms, their competitiveness is increasingly determined not only by tangible property, but rather intangible: people's knowledge, human capital, ideas, artificial intelligence and the strategic aggregate of key intellectual property (possession of ideas, innovative digital technologies) that provide strategic primacy.

REFERENCES

- [1] Mau W. (2015). Human capital: challenges for Russia. - Electronic resource: <https://www.iep.ru/files/RePEc/gai/wpaper/125Mau.pdf>
- [2] Andreev E.M. The potential for human development. URL: <https://cyberleninka.ru/article/n/chelovecheskiy-potentsial-ustoychivogo-razvitiya> (accessed September 12, 2019)
- [3] Colin K.K. Global problems of informatization: information inequality // "Alma mater" Bulletin of the higher school. 2012. No. 6. Pp. 27-30.
- [4] Forrester S.V. The essence, formation and role of human capital in the knowledge economy // Science of Science. 2015. T. 7. No. 3. Pp. 45-57.
- [5] Sokiev H.V. Fundamentals of the development of the human factor in the informatization of society and human information activities. Journal Club Intelros Credo New. URL: http://www.intelros.ru/readroom/credo_new/k2-2013/19220-osnovy-razvitiya-chelovecheskogo-faktora-v-informatizacii-obschestva-i-informacionnaya-deyatelnost-cheloveka.html (accessed September 25, 2019)
- [6] Chugunov A.V. Development of the information society: theories, concepts, and programs: St. Petersburg: Faculty of Philology and Arts, St. Petersburg State University, 2007. 98 p.