

Peculiarities of Intellectual Development of Human Capital at the Regional Level in the Context of Digital Transformation

Natalya Gerasimova

*Department of Applied Economics and Economic Security
Belgorod State National Research University
Belgorod, Russia
ngerasimova@bsu.edu.ru*

Alessio Zuppelo

*Operation Readiness Management
Eni S.p.A.
Milan, Italy
ufficio.stampa@eni.com*

Anna Kulik

*Department of Applied Economics and Economic Security
Belgorod State National Research University
Belgorod, Russia
kulik@bsu.edu.ru*

Dmitry Solovjev

*Law Institute
Belgorod State National Research University
Belgorod, Russia
1394276@bsu.edu.ru*

Abstract—At the current stage of development, the digital economy encourages the use of innovative technologies to be used for training, create various webinars, conduct video conferences, implement online learning platforms and practice distance learning. The article examines the intellectual development of the region's human capital, since the activation of the human resource is recognized as an important factor in the effective digital transformation of the economy. The authors analyze the main competencies of the region's working-age population and reveal the life cycle of education for the region's working-age population. In addition, the trends affecting the development of human capital in the context of digital transformation are identified and characterized. The results of the study have shown the level of digital literacy is influenced by an individual's professional activity. Digital literacy is analyzed in percentage points by type of employment and, based on the analysis, new requirements for the working-age population of the regions in the development of digital transformation are proposed. In conclusion, authors propose measures that can contribute to high growth rates for the development of the economy of the regions and the country in general.

Keywords—*intellectual development, human capital, human resources, digital technologies, digital economy, regional development.*

I. INTRODUCTION

The formation of a digital economy has become a global trend of socio-economic development during the last few years. The potential of the digital economy is largely associated with the development of the region's human capital, in particular with the development of the human capital component. The role of human capital is defined in various concepts and manifests itself through social and financial institutes. It delineates human resource management and human capital management, which makes it possible to analyze not only social parameters, but also to study the influence of factors on the innovative, digital economy and the

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knowledge economy as the next stage of social and economic development.

Trends in the development of the region's population in the context of digital transformation are linked to economic globalization, accelerating scientific and technological progress, comprehensive informatization of activities, innovations, which result in ensuring the required level of competition. The manifestation of all these conditions leads to the emergence of new characteristics of working-age population of the region, which relate to the ability of the person to develop primarily intellectually, to think creatively, to generate new ideas, and actively introduce innovations into labor activity. Conditions arise that inevitably lead to the transformation of the so-called knowledge economy.

II. METHODOLOGY

Methods related to theoretical research used in this article include abstraction, synthesis, analysis, and generalization. Based on the method of abstraction and synthesis, a study of the research problem was carried out, and a detailed description of the human capital as an object revealed the characteristics of trends that affect the development of human capital in the context of digital transformation. The method of analysis and generalization allowed to identify the levels of literacy of the population, graphically present the data, and draw conclusions.

III. RESULTS AND DISCUSSION

The digital economy brings regions to a new level of development. The peculiarities of digital development of regional economies are considered in the writings of foreign and Russian scientists and researchers. Thus, the author defines the digital economy as the automated management of the economy based on advanced information technologies; a new economic order based on efficient information management of the production system, which the modern world needs to achieve successful economic growth [8].

According to the author [13], the digital economy is a system of economic, social and cultural relations based on digital technologies.

The digital economy includes a variety of economic activities in which the use of digital information and knowledge is a key production factor, modern information networks become an important field of activity, and the effective use of information and computer technologies acts as an important driving force for improving the efficiency and optimizing the structure of the economy [8]. There is a perception that the digital economy is “an economy based on the production of goods and services by high-tech business structures and the distribution of these products through e-commerce” [3].

The concept of digital economy also refers to a set of economic and social activities provided by information and communication technologies, such as the Internet, mobile and sensor networks (including the implementation of communications), financial transactions, education, entertainment and other business activities based on the use of computers, smart phones and other devices [9].

The digital economy can be classified as an activity that uses digital data sets. The digital economy forms the information space and leads to the creation of a new information infrastructure related to the use of information and telecommunication technologies in the region. It also creates a new technological base in the social and economic spheres. That is, the digitalization process transforms regional economic industries into an innovative organizational form based on information technology. In these circumstances, the need for a systematic approach to the development of the intellectual component of human capital is growing, since all plans for the implementation of the stages of the digital economy are not possible without the participation of the region’s working-age population with certain intellectual skills and competencies. Human resources are a key area in the development of the digital economy and an important factor in the effectiveness of its implementation.

Three major trends, geopolitical, demographic and technological, affect human capital development in digital transformation.

TABLE I. DESCRIPTION OF TRENDS AFFECTING THE DEVELOPMENT OF HUMAN CAPITAL IN THE CONTEXT OF DIGITAL TRANSFORMATION

Trend	Trend characteristic
Geopolitical trend	Related to the fact that in 2025 Russia will enter the less centralized global market. This will affect its competitiveness. We note that globalization and access to the international market will remain key factor in economic development. This will lead to a slowdown in economic growth and an increase in inequality, resulting in an acceleration of socio-cultural regionalization (slowdown in world economic growth, changing patterns of globalization, growing fragmentation among countries).
Demographic trend	Related to the fact that there will be a rapid growth of competition for the right to work in low-skilled jobs in the digital economy. At the same time, there will be an increase in the workload of highly qualified employees. By 2025, there will be a change in the nature of personnel competition, as the aging population will leave the labor market and a young population, or the so-called “digital generation, will enter the market.
Technological trend	Related to the introduction of so-called «universal connection» to information networks.

The region’s working-age population is increasingly facing uncertainty, a rapidly changing and outdated context. Vertical hierarchies become useless, horizontal relationships become more complex, and commercialization of ideas and development becomes more important. The area of responsibility is expanding for each participant in the labor market. The personnel that make up the core of human capital must have a certain set of intellectual competencies and a sufficient level of digital literacy. Nevertheless, the level of digital literacy of the population of the Russian Federation is not yet sufficiently high, despite the challenges posed by regions whose solution is linked to the development of infrastructure and the involvement of Russians in information processes, as well as with the growth and expansion of the population’s digital competence. Thus, according to the results of the study [15], the level of digital literacy is influenced by the professional activity of the individual. Working students showed the highest values of the Digital Literacy Index compared with other categories of the population (64 percentage points). Non-working pensioners are the ones who are the least oriented in the digital environment, with a Digital Literacy Index of 51 percentage points (Figure 1).

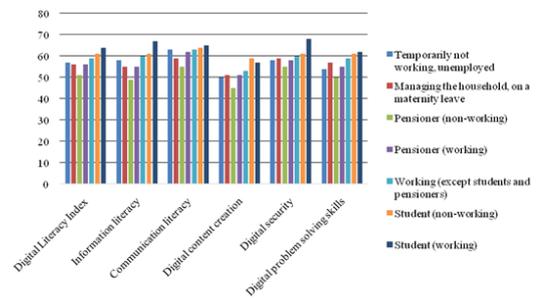


Fig. 1. Digital Literacy Index, in percentage points, by type of employment

Digital literacy in Russia is also largely determined by the region of residence. The residents of the Southern and North Caucasian Federal Districts have the lowest rates of digital literacy. On the contrary, residents of the Northwestern Federal District demonstrate higher rates of various aspects of digital literacy than in the country as a whole.

The level of digital literacy in Moscow and Saint-Petersburg is higher than the national average (62 versus 58 percentage points), while in villages and urban-type settlements it is lower (55 percentage points), as shown in the table.

TABLE II. DIGITAL LITERACY INDEX, IN PERCENTAGE POINTS, BY TYPE OF EMPLOYMENT

Index	Moscow and St. Petersburg	Cities with millions of residents	Cities, except cities with millions of residents and urban-type settlements	Urban-type settlements and villages
Digital Literacy Index	62	59	58	55

Thus, the digital environment affects the development of the regional human capital, and it creates conditions for the high-quality formation of human capital. The digital environment is linked to the educational environment, since in the digital economy there is a shift in emphasis from physical

to intellectual work, leading to a situation of a constant increase in the educational level of the working-age population of the region. We agree with the opinion of O.S. Sukharev [16], that the educational process should be an almost non-stop process. This is very important in a digital society. In the context of digital transformation, human capital is characterized by new qualities, which are based on knowledge, skills, and abilities. New values associated with the development of intellectual abilities and creative skills are becoming characteristic of human capital; human capital carries moral and ethical assets and values. That is, in the era of the digital economy, conceptual knowledge comes to the fore [12].

We agree with the opinion of the authors [14], that the development the digital economy may be hindered by the lack of manpower associated with the transformation of the knowledge economy. Since in the context of digital transformation, the needs of the labor market are being reoriented, the population should have a new list of labor competencies to function effectively in the knowledge economy. By the knowledge economy, we mean the economy, which, as the author notes [1], is aimed at creating a system for the formation and dissemination of knowledge in various forms. However, the creation of certain jobs is not enough. In the context of digital transformation, it is necessary to solve the problems associated with the intellectualization of the labor of human resources. It is the potential of personnel, which carries the necessary set of competencies necessary for functioning in the conditions of digital transformation, leads to an increase in indicators such as labor productivity and competitiveness of the region. The population of the region should have such skills and abilities as:

- creative thinking skills;
- cross-functionality skills;
- ability to work remotely, freelance;
- ability of continuous self-learning, which is an urgent need related to the constant modernization of technologies;
- skills of collecting and working with a large amount of information (Big Data);
- positive thinking and goodwill ability, ability to set and achieve goals (Soft skills);
- knowledge of several foreign languages;
- ability to retrain, continuously, throughout life;
- willingness to change profession at certain intervals;
- willingness to cross-cultural travel associated with globalization.

The main task of the knowledge economy is to develop and use a range of high-tech products in a specific area or industry. These competences should be sufficiently universal for the working population of the region, and the universality lies in the fact that they should be applicable in the educational system, during the performance of labor functions, and in the course of personnel training related to additional vocational education and corporate training (Figure 2)

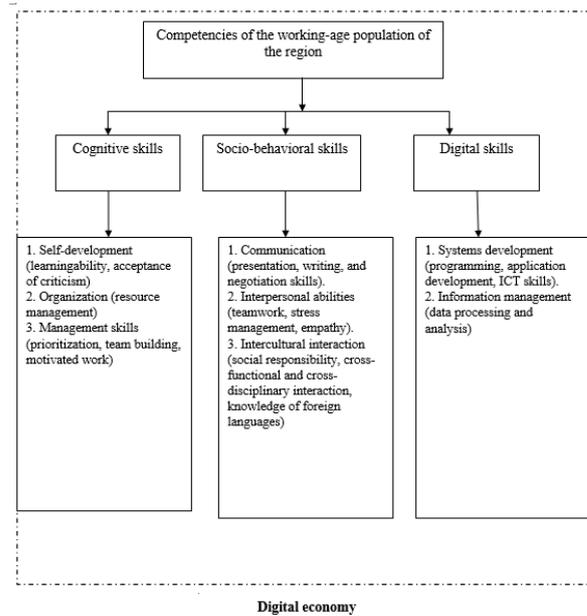


Fig. 2. List of basic competencies of the region's working population in the context of digital transformation

Thus, in order to be effective in the context of digital transformation, a person do not need to acquire knowledge once, once developed skills are not enough, new knowledge should be acquired constantly, regularly. Meanwhile, the learning process can be implemented through:

- training in an educational institution;
- gaining professional experience in the process of performing labor functions;
- self-education using Internet technologies.

At the same time, according to foreign experts, training for Russians ends after graduation and no more than 25-30 years later (which is quite difficult to approve, since correspondence courses are in great demand, many people receive a second higher education, the average cost of employers' training in Russia is 10 times less than in Europe, and educational programs cover only 15% of the active population and 1% of pensioners, while in developed countries these figures are 40% and 5%, respectively [10]).

As indicated above, in order to keep pace with the rapid development of the knowledge economy and remain relevant in the labor market, a person must learn throughout their life and adapt to constant, rapid and unexpected changes.

The main requirements of employers in the digital economy, are that graduates of higher education institutions will be ready to face new challenges and to implement the acquired competencies in completely new conditions. Therefore, in countries with a higher digital development index than in the Russian Federation, the issue of new content and new characteristics of the education system has been raised in recent years, with a change in emphasis from acquiring disciplinary knowledge to developing “universal skills of the 21st century”, which will correspond to the skills of the working population of the region.

For Russia, this is still a somewhat problematic area of activity. Today, there is no systemic solution in the country

for updating skills throughout life. Education for most people ends with graduation from a higher educational institution, no later than 25-30 years. The life cycle curve for the education of the actual population in the region is shown in Figure 3.

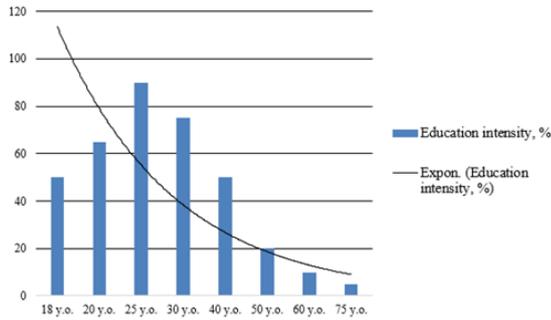


Fig. 3. Life cycle of the region's working population education

On-the-job training is also quite formal; it is often represented either by formal advanced training, which does not lead to real skills development and renewal, or by filling gaps in the education system. Thus, there is an urgent need to change and modernize the education system. Changes in the education system, motivation and labor market involve the introduction of innovative elements that will ensure individualization, personalization, accessibility and efficiency of education for everyone. The peculiarity of training and advanced training of new personnel should be the implementation of individual development paths and the allocation of personal profiles of citizens' competencies.

We agree with the opinion of the authors, who have expressed the view that profound changes in the model of higher education are inevitable as a condition for the efficient functioning of society [Barber M., Donnelly K., & Rizvi S., 2013]. Regardless of the profession they receive, modern graduates must have the digital skills that students acquire during their training by learning about innovative ways of communicating information.

Among the new forms and methods of education are: remote and virtual laboratories, network forms of cooperation between universities and the external environment, electronic libraries of universities, repository of scientific data, educational models and applications, CDIO-based learning, STEM-education model [5].

Nowadays, the use of gamization, a learning based on the game, is widespread. Gamification as a way of learning is spreading not only in higher and vocational education, but also in secondary and primary schools. The development of interactive methods of teaching students, based on solving a certain kind of problems in the created virtual reality, increases the motivation for learning, decision-making, and the application of the acquired knowledge in practice.

E-learning is considered to be a new phase in the computerization of education in most developed countries [15].

The modern educational process implies a decrease in the time of interaction between a student and a teacher, an increase in the proportion of independent work. As part of increasing the level of assimilation of educational material by students, it is necessary to pay attention to the quality of the

proposed educational and methodological materials, the form of information presentation, as well as the level of information literacy of the teacher who develops e-learning manuals for learners.

A modern student is a representative of the “digital generation”, “an indigenous inhabitant of the digital society” - digital native [11]. At the same time, the level of digital education of the teacher should not only not be inferior to the level of the student, but surpass it in the context of mastering the technologies of presenting educational material in order to increase the level of student's interest in the educational process.

According to the author, “traditional education deals with “ready-made” theory and practice, while non-traditional education considers students as a source of information and new knowledge, when students themselves pose questions and seek answers to them. In this case “the development of the brain, but not its fixation” occurs. In such a social context, the role of digital technologies, which allow expanding the capabilities of learners, developing their leadership qualities, making it possible to learn more about the student them self, personalize learning, and manage this process with feedback, is important” [11].

Thus, education as a public domain during the digital era enhances the scientific intensity and innovativeness of economic processes in the country, and the quality of the knowledge acquired by students depends directly on the level of the teacher's qualifications. Big data technology is used in the development of the National Teacher Development System. This is one of the priority projects of the Ministry of Education of the Russian Federation, which is developing a systematic model for the continuous development of professional skills, updating the content of curricula, and improving the model of certification of teachers. It is planned not only to raise the level of teachers, but also to create flexible competencies, because they need to teach children to work effectively in a team, to create their own projects, to solve multidisciplinary tasks, and to work in a convergent environment [2].

Continuing education should stop being peripheral, it should be the backbone of the entire education system. In the interests of the digital economy and in order to effectively use human potential, as a result of the implementation of directions for the development of personnel and education, the widest possible circle of citizens should be provided with the opportunity to engage in production activities, taking into account their qualifications and mobility, including fully using remote technologies. But in addition to improving the quality of human capital through various educational programs, it is necessary to increase the demand for this capital from the Russian economy. In this context, a systematic and coordinated movement is required in a wide range of areas that affect the growth, development and demand for human capital in Russia. For a successful transition to the digital economy, it is necessary to establish close integration between employing companies and educational organizations in order to bring training programs in line with the real needs of the labor market. In this regard, existing educational organizations can become essential links in the education system and significantly expand their current functions.

IV. CONCLUSION

The digital economy imposes new demands on the working population of the regions. These requirements are primarily related to the need for the population to acquire digital skills and competences that enable them to perform work functions in the knowledge economy. The main system of measures aimed at creating a more productive mass of the working population through the system of education in digital transformation is:

1. Creation of an advanced offer of personnel with target competences by the educational system.
2. Shifting the focus of educational programs from the development of subject knowledge and memorization of information to the development of personal and metasubject competencies.
3. Stimulating the inflow of talents into education.

For effective work in the digital economy, higher education institutions need to move away from the usual operating model, not only by modernizing and improving existing forms of educational activity, but also by significantly expanding the scope of activities by introducing fundamentally new forms of education. First of all, it is necessary to provide the possibility of training people of all ages, to develop appropriate training programs for this purpose. Since the digital economy stimulates the use of innovative technologies, it is necessary to use digital technologies for teaching, create various webinars, conduct video conferencing, implement online learning platforms and practice distance learning. These technologies not only meet the requirements of the digital economy, but also significantly increase the efficiency of training, help focus on obtaining the necessary skills, lead to a high-quality implementation of the competence-based approach to training, increase the level of digital literacy of all categories of the working population of the region. The implementation of these measures can lead regions and, consequently, the entire Russian Federation not only to the world average, but also to higher growth rates, guaranteeing by 2025 that the Russian Federation would be part of the group of countries with a developed knowledge economy.

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