

# Competence Readiness of Personnel for Digital Economy

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**Abstract**—Over the past two decades, digitalization has become an integral part of our daily life. The spread of digital technologies has transformed both business in which they have integrated firmly, and the entire world economy. At the same time, with the further spread, digitalization requires significant improvement in education and personnel training, talents of high qualification able to implement digital development of economy. Digitalization cannot emerge by itself, and the main role here is played by qualified personnel which are not easy to find. For employees to effectively function in the new conditions, definite competencies and skills are required. Those employees are referred to, which do not have professional education in the field of information and digital technologies, demonstrating skills at the level of the Internet users or basic knowledge of PC, this being absolutely insufficient for rapidly developing digitalization transforming the major part of economy. The authors consider the economic contribution of digitalization, profits and opportunities for business due to its rapid development. Special consideration is paid to personnel and infrastructure as key factors of the digital breakthrough. The need to update national education system is regarded, taking into account its focus on personnel training for digital economy. Based on an expert survey, the authors made an attempt to assess the competence readiness of personnel for challenges of digital environment. Although the number of specialists in the field of information and communication technologies is analyzed by statistic researches, the information on competence readiness of personnel to challenges of digital environment which takes into account the needs of employers and business community is not analyzed. The expert survey results confirm the insufficient readiness of personnel for digitalization of economy, and the need to involve both business and education system into this process. The paper stresses the need to involve business into the process of forming and developing digital competencies among employees engaged in production. In the conditions of economy digitalization the mastery of digital competencies is sharply relevant for the majority of professions.

**Keywords**—*digital economy, digitalization, personnel, competence readiness, digital skills, infrastructure.*

## I. INTRODUCTION

Developing at a rapid pace, digitalization, cloud databases, robotics, and other digital powers have radically changed all aspects of modern society life, this process still going on. The role of digital technologies in society, business, economy, education, personnel training is becoming more relevant today than ever. Mostly, it is associated with the global spread of the Internet which has been integrated into life along with the growing electronic and calculating powers.

Domestic and foreign scientists associate the term “digital economy” with the name of the American computer scientist Nicholas Negroponte who in 1995 applied it in his scientific work *Being Digital* on the transition of companies to the digital future, as well as with the name of the Canadian businessman Don Tapscott who used this term in his book *The Digital Economy: Promise and Peril In The Age of Networked Intelligence* in 1995. The last book describes opportunities of the Internet to change all aspects of society life: new services by means of the Internet, general mobile communication tools, and the way of business based on the wide use of information communication technologies [1].

## II. RESEARCH METHODS

The results of theoretical and applied researches presented in publications of domestic and foreign scientists served as a methodological basis for the research conducted.

In the course of the problem research we used the following methods: logical analysis and synthesis, graphic modeling, generalization, statistic research, documentary analysis, as well as expert survey in which leaders of a number of industries took part.

## III. RESULTS AND DISCUSSION

Due to the development of information communication technologies, there appeared:

- new kinds of employment, professions in industries with high digital opportunities;
- more simple procedures for receiving, transferring, processing and storing information, creating databases;
- high investment in digital technologies increasing in labor productivity, due to the fact that employees received more tools to complete their tasks;
- opportunities for online training in real time;
- improved indicators of production of high-tech goods and services, innovation developments, etc.

Despite the fact that new technologies contribute essentially to economy, they generate certain risks associated with the functioning of the labor market: the existing functions of the labor force are being destroyed, professional skills are becoming outdated, and jobs are changing. Today we know that digital automation allows some countries and enterprises to produce goods and services on an unprecedented scale, increase in labor productivity, and expand operations at minimal cost. This circumstance proves that enterprises will not need much labor force in the near future [2].

So, we are talking about the other aspect of digitalization which requires the need to receive definite basic technological knowledge and skills which have to be acquired as soon as possible, in order to retain a job.

Nowadays it has become obvious that digitalization integrated into the entire economy revealed the problem of low readiness of workforce for the constantly changing digital business environment.

Fig. 1 presents data on the training by Russian educational institutions (bachelor's, specialty, master's) in the field of digital technologies and production of related goods and services.

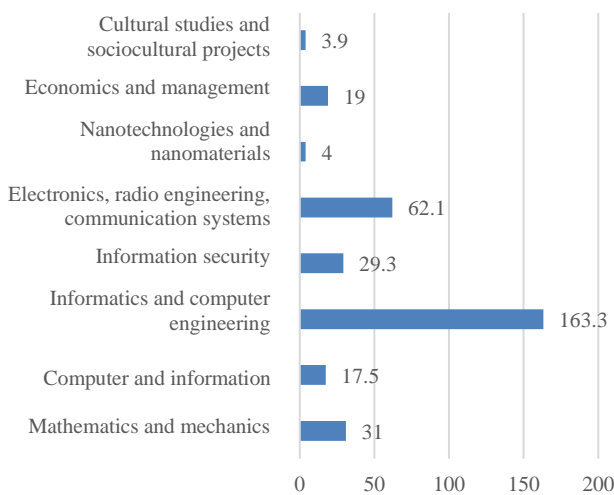


Fig. 1. Number of students at the beginning of the 2018/2019 academic year (thousand people) [3]

As Fig. 1 shows, the leaders in the training of personnel in the field of digital technologies are technical specialties, the outsiders are specialties of social and humanitarian profile.

Note that according to a study recently published in the United States by the Brookings Institute [4], the Cornell College of Arts and Sciences approved the requirement for all

undergraduates to take a digital data science course. This approach seems to be completely correct and effective, for the adaptation period of graduates to practical activity in the new digital environment will be shorter and more productive.

The ongoing structural changes caused by globalization and rapid technologic changes due to digitalization can lead to outdated of professional skills which become even more marked and evident during the entire life cycle [5]. One cannot but agree with this, since new technologies, in the first turn, lead to changes in activity structure, labor organization, but not to the growth in general unemployment. However, digitalization rate does not completely exclude the growth of structural unemployment.

Note that, on the one hand, digital economy as a whole demonstrates high rates of growth in many countries, and the future of the Russian labor market will largely depend on it. Thus, based on the data of McKinsey, R. Bukh and R. Heeks cite figures indicating that on the world scale the Internet creates 3.1 jobs instead of every one destroyed, this effect being even more significant in promising countries [6]. On the other hand, many domestic and foreign scientists agree that at the modern stage of creating technologies the major challenge is to liberate production from living labor [7].

Therefore, the observed changes place high demands on flexibility in the labor market. Modern business should be directly involved in technological progress. Since digitalization has taken a strong position, it places special demands on personnel training. In this regard, the process of developing skills that meet the needs of economy should be continuous throughout the entire professional activity.

This obliges business not only to identify the competencies of employees, formed during the training period, but also to develop them in accordance with the peculiarities and specifics of their production process.

Fig. 2 presents information on digital skills of population for a number of countries.

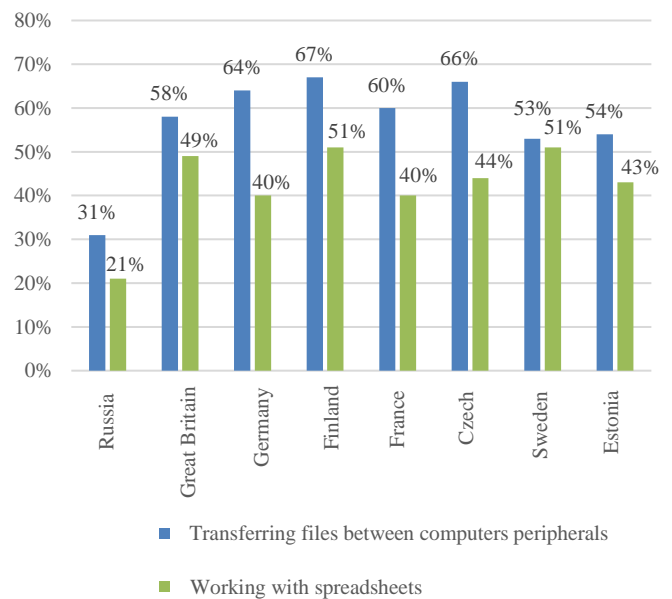


Fig. 2. Digital skills of population (as a percentage of the total population aged 15 and over, at the end of 2018) [3]

It is obvious that the low proportion of the Russian population with the digital skills necessary for business, in comparison with this indicator in a number of European countries (Fig. 2), can lead to a significant lag in economy. Population also uses the Internet for communication. For example, in 2018, in order to send or receive e-mail, the Internet was used by 42% of Russians aged from 15 to 74, while in Sweden this indicator was equal to 94%, in the Czech Republic – 93%, in Great Britain and Germany – 92%, in the USA – 91%, in Italy – 77%. In Russia, 23% of the population read or downloaded online newspapers, books and magazines using the Internet, in the Czech Republic – 91%, in Germany – 74%, in the UK – 72% [3].

It is noteworthy that in 2018 the proportion of the population performing financial transactions via the Internet was 94% in Finland, 91% in Sweden, 39% in Russia, and only 15% in Japan. It is also noteworthy that only 49% of Russian organizations of business sector had websites. At the same time, in Finland this figure was 96%, in Sweden – 92%, in Japan – 90%, in Germany – 87% of organizations.

So, many countries including the USA and most of European countries have already built significant digital infrastructure.

Speaking about infrastructure, it should be noted that S.N. Bobylev, V.S. Tikunov and O.Yu. Chereschnya regard human capital as a key factor in the digital development of economy, and its lack as a limiting factor. Undoubtedly, it is the Internet and growing computing power that are driving the extension of interrelations that ensure the spread of digitalization all over the world and digital transformation of society. At the same time, about 60% of inhabitants of the world still do not have access to the Internet, an opportunity to use it, or the means to pay for it [8].

As for the Russian Federation, over the past years, the country has expanded its digital capabilities, developing sectors of digital and information technologies (IT). Already today in our country there is an increase in the number of organizations using broadband Internet, which has opened up large access to the World Wide Web and has led to an increase in the number of users of Internet resources.

Thus, over the past 10 years, the share of Russian organizations using broadband Internet access has more than doubled: from 39.3% of the total number of organizations in 2008 to 86.5% in 2018.

According to the Digital 2020 data, the number of Internet users amounted to 118 million or 81% of the total population of the country [9].

Modern business largely spread in social networks where it promotes its goods and services, including the state sector. So, at the beginning of 2020, in Russia the audience of social networks amounted to 70 million users, i.e. 48% of the total population [9].

Thus, developing at a rapid pace, digital and information technologies have changed the life of the whole society, not only opening up new opportunities, but also revealing new problems.

Practice shows that business is lagging behind technological progress, and the main reason is the low willingness of

personnel to comply with digital trends. To obtain economic benefits from the digital economy, measures are needed to strengthen the digital sector, develop the appropriate infrastructure, as well as successfully apply these new technologies.

Today digital economy and business require radically new qualitative characteristics of workers. Particularly, a significant place is given to digital knowledge and literacy, as well as PC mastery, and ability to work in specific programs: Word, Excel, CRM, 1C “Bukhgalteriya”, Storencash, AdobeAfterEffect, CANVA, etc.

The gap observed between the needs of digital economy and knowledge combined with skills holds back productivity within an individual enterprise, as well as economic growth of the whole country.

The need to introduce new approaches to personnel training is also mentioned in the Program Digital Economy of the Russian Federation approved at the end of July 2017 until 2025, as well as in the approved Federal Project Human Resources for the Digital Economy, which provides for the formation of key digital competencies and increasing financial literacy among the population. These documents are about an increase in the period from 2018 to 2024: 1) the share of the population with digital literacy, from 26% to 40%; 2) the number of people accepted and trained in higher education programs in the field of information technology, from 46 thousand people up to 120 thousand people per year; 3) the number of specialists who have undergone retraining in the competencies of the digital economy within the framework of additional education, from 200 thousand people up to 1000 thousand people

It should be noted that, despite the huge resource potential (productive, scientific technological, personnel), Russia demonstrates a strong lag in precisely those fields where digital technologies, and those technologies which help to perform digital training are being formed.

In this context, the role of personnel potential of enterprises, industries, regions is of crucial importance. The necessity to solve new problems using old methods referred to the interaction between business and education is clearly revealed. Experts of NIU VShE (Higher School of Economics – National Research University) conducted a research of the contribution of universities to the social economic development of Russian regions, estimating three sub-indices: the contribution of education into the development of regions, to the development of human capital, to the innovation development. As a result of the research, it was found that the drivers of regional development are Moscow and the Moscow region, St. Petersburg and the Leningrad region, the Krasnoyarsk Territory, the Samara region, the Republic of Tatarstan and others, where there is a very high contribution to the economic development of the region, to the development of human capital, and to the innovation development. A high influence level has been observed in the Astrakhan region, the Kirovsk region, the Novosibirsk region, but in the Republic of Mordovia and the Ivanovo region such an index as the contribution to the human capital development has a reverse dynamics while two other indexes are growing. In the Amursk, Bryansk, Vladimir, and Penza regions a low level of education influence in all three sub-indices is observed [10]. The conducted research has shown that education and an increase in qualification of personnel in

the process of labor activity increasingly acquire relevance and necessity for a digital model of economy.

It should be remembered that each stage of economic development has its own requirements for qualified personnel and the set of competencies they should master. Thus, on the way of creating innovative economy and innovative complex on the scale of the country, a region, and an enterprise, there is an urgent need to form innovative labor potential based on innovative and creative thinking, as well as on scientific potential [11].

It is obvious that digital economy reveals the need to develop digital skills and competencies.

Thus, N.R. Kelchevskaya and E.V. Shirinkina regard digital skills as automated behavior models based on knowledge and abilities in the use of digital devices, communication applications and networks to access and control information. In addition, in the authors' opinion, digital skills allow people to

create and share digital content, communicate and solve problems to effectively and creatively self-realize in education, work, and social activities in general [12].

The set of competencies is of great importance for the majority of professions in digital economy:

- computer literacy (the ability to use a text editor, e-mail, electronic databases, Internet search) or IT-competencies (mastery of modern and advanced digital skills);
- ability to network (establishing communications in the Internet environment, attracting more participants, partners, clients);
- ability to work with information and manage information (work with cloud technologies, CRM and ERP systems), etc.

Fig. 3 presents main competencies that personnel should have according to the economic needs.

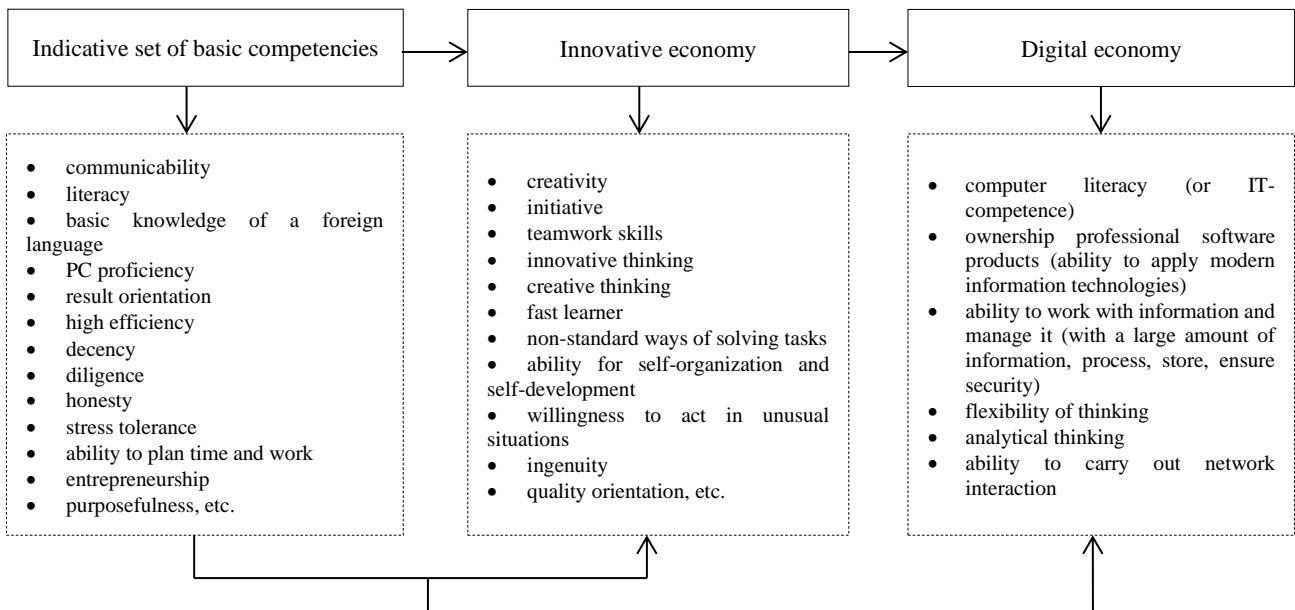


Fig. 3. Systematization of competencies in accordance with economic needs

It is obvious that to break through in the field of digital transformation in industries and enterprises at this stage, the emphasis should be made on retraining of employees, in order to form competencies needed for the new type of economy.

Today, all industries undergo changes caused by new technologies and business models. Efficiency of these changes directly depends on flexibility of personnel policy of a company, its refocus on searching and holding digital specialists [13].

In order to reveal the most demanded competencies in the context of digital transformation the expert survey was conducted. In the survey the leaders of enterprises (structural subdivisions) of the Penza region and the Republic of Mordovia took part. The following areas and economic sectors were surveyed: trade, manufacture, service, construction, agriculture.

The majority of the surveyed personnel have skills of working with digital tools presented in Fig. 4.



Fig. 4. Digital skills of employees of business units of the Penza region and the Republic Mordovia (as a percentage of the total number of employees)

Digital production requires definite skills from employees. The survey revealed that the majority of personnel mastered PC and could work in Word and Excel programs. But other digital tools are used by less than half of the employees: for example, only 47% of the personnel can work in professional programs, according to the employers.

Fig. 5 shows the competencies in the field of information computer technologies (ICT), necessary for modern personnel, according to the employers of the Penza region and the Republic of Mordovia participating in the expert survey.

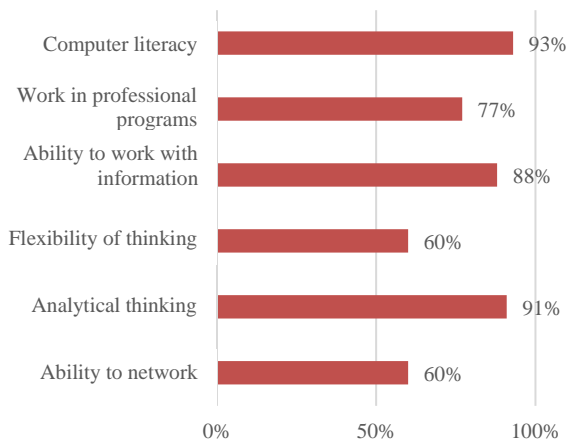


Fig. 5. ICP competencies required for modern personnel, according to employers (as a percentage of the total number of respondents)

From the proposed list, which includes 6 professional qualities and competencies, we can single out three competencies of the highest priority for employers, identified by the survey results: computer literacy (93%), analytical thinking (91%) and the ability to work with information (88%).

The research revealed that in the conditions of global competition and evident achievements of a number of countries in the field of innovative and high-tech economic sectors which are associated with digitalization, basic knowledge and literacy in the field of computer programs, awareness of technologic devices existing at enterprises are insufficient for steady development of modern business system.

Modern leaders of business structures are aware of the fact that any action can ensure an optimal result and beneficial economic effect, due to development and use of communication digital tools.

One of tasks of the research was to reveal the willingness of employees to learn digital skills and increase their competency. The results of the expert survey are presented in Fig. 6.

According to the survey results, an increase in digital skills is quite relevant for modern business, and 84% of business leaders currently feel the need for employees with digital competencies and skills, and are willing to provide them with training.

It is obvious that today any labor is a digital one including that of ICT-specialists, and that of any workers that use digital equipment (for example, PC or equipment with numeric program control) [14].

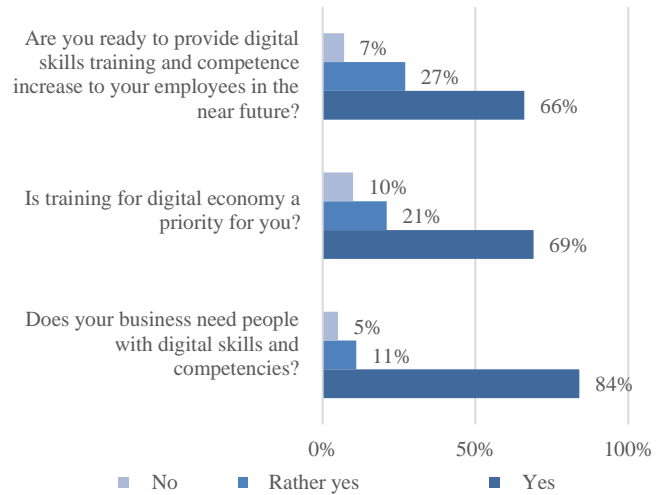


Fig. 6. Results of the expert survey of employers of the Penza region and the Republic of Mordovia (as a percentage of the total number of respondents)

We believe that in the context of the digitalization of economy, among the key priorities on the path of sustainable development and functioning of modern business, it is necessary not only to develop digital competencies of personnel, for which they are already professional, but also to pay serious attention to aspects related to training in basic digital competencies of employees whose professional activities are not directly related to digital technology.

#### IV. CONCLUSION

So, the research results showed that digital transformation opens up wide opportunities for business, labor productivity growth, significant savings, due to reduction of transaction costs. Digital abilities and skills are an important key to an increase in labor efficiency and enterprise productivity. The most demanded personnel competencies used in the conditions of digital economy, and identified by the research are as follows: computer literacy, analytical thinking, ability to work with information, etc.

It is extremely important for all interested parts including employers and governments to invest sufficient funds into training and assimilating skills necessary for work with modern digital technologies, in order to ensure high rates of the country's economic growth.

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