

Competency readiness of labor resources to digital economy

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Abstract — Currently, the economic development of countries is directly dependent on the full scale of digitalization processes. As a new trend in social development, digitalization has replaced informatization and computerization. On the scale of economic and social life of both a single country and the whole world, it leads to an increase in the efficiency of the economy and an improvement in the quality of life. Questions arise about the impact of digitalization on work, what competencies are needed by modern workforce, is staff ready to change. The article is devoted to the research of the readiness of labor resources for labor activity in the context of digitalization. The article is based on a research conducted by the authors to clarify trends in the research of the question of how much labor resources are ready to change competencies for work in the digital economy. The research methodology provided for conducting a pilot sociological survey by questioning labor resources aged 15 years and older. It was interviewed 278 people of the municipality of the city of Yekaterinburg. The results can be used in a further larger-scale and more detailed research of the competence of the workforce for digitalization processes, as well as in adjusting the employment policy to prevent structural unemployment with the full-scale introduction of digital technologies in all spheres of human life. The result of the survey was an understanding of the prospects for researching the readiness of labor resources for trans professionalism and employment in the digital economy. The conducted research gives grounds to assert that the readiness of labor resources for labor activity in the context of digitalization is gradually being formed and also depends on the success of the introduction of digital resources to transform the work of organizations.

Keywords — *labor resources, digitalization economy, professionalism.*

I. INTRODUCTION

Digital technologies are an essential condition for the development of modern society. New organizational systems of business processes lead to the transformation of social and labor relations between employees and employers. With the development of the digital economy, the functions of personnel management are not minimized, but on the contrary will acquire the greatest importance. The personnel management system will be the leading subjective factor of the company's competitiveness in the market. However, the

conditions of the digital economy require significant changes in the targets of personnel management in order to achieve business results. [1]

In the summer of 2017 in Russia adopted a program of "Digital economy of the Russian Federation" in order to implement the Strategy of information society development in Russia on 2017-2030 was approved by Decree of the President of the Russian Federation No. 203 of May 9, 2017. [2]

With the advent and introduction of digital technologies, people's lives are changing dramatically in all spheres: work, life, leisure, education, etc. The requirements for means of production, communications, and information technologies are changing. The issues of data accumulation, analysis and use come to the fore. There is a question of the development of new competencies related to digital technologies.

A country's readiness for the digital economy is determined by the network readiness index [3], the ICT development index, the cybersecurity index, the digital competitiveness index, and the digital evolution index. In 2017, Russia ranked 41st after Singapore, Finland, Sweden, Norway, the United States, the Netherlands, Switzerland, Great Britain, Luxembourg and Japan in the network readiness index. In 2018, Russia went down to 42nd place. [4; 5]

The analytical center of the National Agency for financial research [6] and the SKOLKOVO Foundation conducted a research in 2017 aimed at assessing the readiness of Russian companies to transition to digital technologies [7]

Since human resources are the main re-source and engine of change in the digital economy, the purpose of this is to clarify, firstly, whether there are problems in understanding the essence of the processes of digitalization, secondly, to what extent and in what areas workers already face digitalization, and thirdly, how the respondents' skills in the field of digital technologies are manifested and whether the respondents are ready to change their competencies in connection with the development of digitalization.

II. MATERIALS AND METHODS

According to the authors' the methodology of the research of the degree of readiness of labor resources for labor activity in the digital economy provides for the conduct of sociological research. The survey was conducted in July 2019 in Ekaterinburg, as, in our opinion, the primary processes of digitalization are more clearly manifested in enterprises in large cities and megalopolises.

The survey conducted by the authors is pilot, as its purpose is to clarify the existence of the problem of unavailability of labor resources to work in the digital economy and not understanding the essence of digitalization. The pilot research will clarify the problem; correctly, determine the further tasks of the research and put forward reasonable hypotheses. Since the range of the survey limited the number of respondents in the scale of labor resources of Ekaterinburg is not large, only 278 people, the results of the survey can be used for General orientation and adjustment of the main provisions (hypotheses, goals and objectives) perspective larger-scale re-search.

The authors developed a questionnaire consisting of 10 evaluation questions on the merits of the topic studied (readiness assessment of labor resources to work in terms of digitalization) including: knowledge and understanding of the respondents about digitization and the digital economy; a manifestation of digitalization in all spheres of life; character and scale of the organizations employing the respondents and the impact of digitization in the production process; the degree of obviousness of the skill of the respondents in the field of digital technologies; the willingness to change their competences in connection with the development of digitalization. In addition, the original questionnaire additionally included 5 questions of socio-demographic nature, assessing personal parameters: gender; age; profession; employment status; level of education. In the process of developing the questionnaire, a pilot survey was conducted to ensure that the survey was clear and understandable and to avoid ambiguity in the questions.

The respondents' answers during the survey were automatically entered into the database and processed with the help of specialized software, which eliminates the possibility of arithmetic errors in the processing of the results. According to the results of the survey, the distribution for each question, the correlation of individual indicators was determined and the tables of conjugacy of answers were constructed.

III. RESULTS AND DISCUSSION OF THE RESEARCH

Within the sociodemographic block of questions, the answers were distributed as follows:

1. The majority of respondents are women, this gender group accounted for 80.6% of the total number of respondents.

2. The majority of respondents were aged 18 to 44 years, including: 18-24 years (20.5%); 30-34 years (17.27%); 40-44 years (14.75%). The survey involved all age groups of respondents from 15 to 72 years. The median age was 39.3 years. It can be argued that the majority of respondents in terms of stages of career development are at the stages of «formation» and «promotion» and it is their work that will affect the processes of digitalization in full.

3. Evaluation of respondents by level of education showed that all groups of vocational education were covered: 13.7 % of respondents have secondary vocational education; 66.9% - higher education; 17.3% - representatives of the labor force of the highest qualification, that is, are holders of degrees in various fields. 2.1% of the respondents do not have vocational education (General secondary education).

4. Employment status is an important characteristic, as it suggests the degree of activity of the Respondent in the labor market, in addition, it can be argued that employers and self-employed pay more attention to self-development and assessment of their competence level. Because employers are responsible for the development not only of themselves but also of their employees, and freelancers and self-employed are not dependent on the person making social and labor decisions (the employer). The employment status of the respondents is represented by the following distribution: 89.2 % - employees; 4.3% are self - employed or freelancers; 3.6% are employers; 2.5% are cooperative members and helping family members; 0.4% are unemployed.

5. The respondents' professions are various, among them: HR specialists, high school teachers, teachers, tutors, real estate specialists, managers of different levels, managers of different directions, medical workers, engineers, bank employees, accountants, economists, drivers, entrepreneurs, programmers, lawyers, trade workers, etc.

When asked about the knowledge of what digitalization is, the respondents' answers were distributed as follows: Yes, 59.7% know, 25.6% find it difficult to answer unambiguously, and 14.7% do not know. (Fig. 1). Slightly more than half of the respondents are sure that they know what digitalization is. However, a high percentage of those who find it difficult to answer or un-ambiguously give a negative answer.

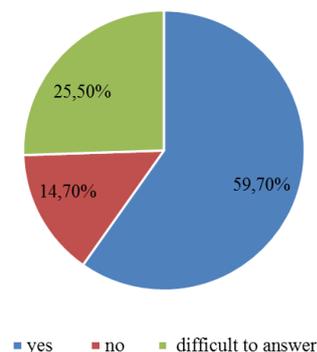


Fig. 1. Distribution of respondents' answers to the question «Do you know what digitalization is?»

In this regard, it is interesting to see the conjugation of answers to the question about the knowledge of digitalization and the definition of digitalization, which is chosen by respondents (table. 1).

TABLE I. RELATIONSHIP OF KNOWLEDGE ABOUT DIGITAL-IZATION AND THE CHOSEN DEFINITION OF DIGITALIZATION

Definition digitalization \ Knowledge about digitalization	When everyone will work on computer and only in the field of IT automatization	Replacing people in organizations with robots	An Approach to Using Digital Resource to Transform Organization Work	Digitalization of information	Expanding the scope of digital technology	digital-based economic activity	Total
yes	1	10	1	151	1	1	166
difficult to answer	0	3	5	63	0	0	71
no	1	4	5	31	0	0	41
total	2	17	11	245	1	1	278

According to table. 1 it can be concluded that the vast majority of respondents give the correct definition of digitalization. Among them are those who answered that they know what digitalization is, and those who found it difficult to answer, and those who did not know what digitalization is. It can be assumed that the in-formation space, including the media, create the conditions for the formation of the correct view on the understanding of the essence of digitalization.

According to experts, digitalization will optimize production and logistics operations, im-prove labor market efficiency, equipment produc-tivity, RD (research and development department) efficiency, reduce resource consumption and production losses. [8]

Since most respondents are aware of the inevitability of digitalization, it is important to assess whether the respondents expect changes in their work. Next, consider the respondents' opinion on the possible changes in their work activities due to the development of the digital economy (Fig. 2).

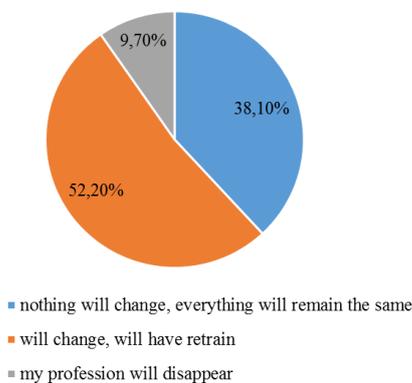


Fig. 2 Distribution of respondents' answers to the statement «With the development of the digital economy, your work ... »

According to Figure 2 the majority of respondents 52.2% believe that work will change, they will have to retrain. Almost ten percent (9.7%) believe that their profession will disappear and, therefore have to retrain and learn a new career. Recent trends in studies of the prospective labor market confirm some of the respondents' concerns about the instability of professions [9]. However, a large percentage of

respondents 38.1% believe that nothing will change, it is not necessary to retrain. In this regard, it is necessary to conduct explanatory work on the necessary competencies in the digital economy, where and how they can be formed. It also requires a more in depth analysis of trends in the labor market in terms of employment of workers with different skill levels. Because of these studies, career guidance should be conducted. It is necessary to focus the workforce on new and in demand now and especially in the future profession.

Two key factors have a particularly significant impact on the process of employment and hiring/attracting workers. First, the transparency of information about both employer companies and potential candidates has increased significantly thanks to the Internet and special web services. The second factor was the significantly increased competition between companies in the search and attraction of the most talented and qualified specialists [10].

The next question concerned the level of digitalization in the organization in which the Respondent works (Fig. 3).

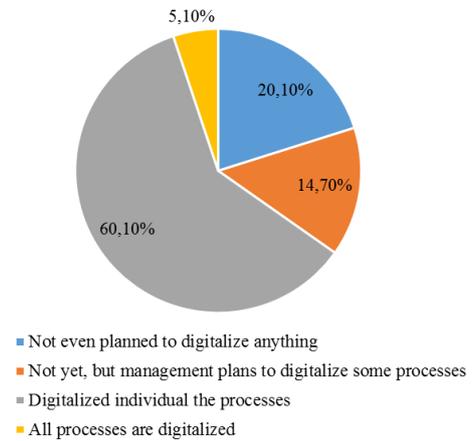


Fig. 3 Distribution of respondents' answers to the question about the degree (level) of digitalization in the organization in which they work

According to Fig. 3 only 5.1% of respondents said that all processes in the organization are digitalized. An absolute majority of 60.1% said that some processes have been digitalized. It is planned to introduce digitalization in organizations in 14.7% of respondents. Only 20.1% of respondents believe that the organizations in which they work are not covered by the processes of digitalization. However, most organizations are involved in digitalization processes to varying degrees. It can be stated that digitalization in varying degrees of activity covers various organizations, regardless of ownership and industry affiliation.

In this regard, it is interesting to determine the relationship between the level of digitalization and the sector of the economy; these results are presented in table. 2. It is also interesting to reflect the relationship between the level of digitalization and the scale of the company (table. 3).

According to table 2 the highest percentage in the answer «all processes are digitized» scored lending and insurance (31%) and culture and arts (40%). In the answer «digitalized individual processes» leaders are housing and communal services (86%), logistics, procurement (83%), consumer services (82%), industry (66%), communications (service enterprises of the production sector) (66%). In response,

«Nothing and not even planned to digitize anything» in the systems of freight transport (60%), health (50%), agriculture (50%).

TABLE II. THE RELATIONSHIP BETWEEN THE LEVEL OF DIGITALIZATION AND THE SECTOR OF THE ECONOMY (%)

Level digitalization / Industry	Not even planned to digitalize anything	Not yet, but management plans to digitalize some processes	Digitalized individual the processes	All processes are digitalized
Industry	11	20	66	3
Agriculture	50	0	50	0
Construction	43	0	57	0
Freight transport	60	0	40	0
Communication (service enterprises of the production sector)	0	17	66	17
Trade and catering	22	16	59	3
Material and technical support	0	17	83	0
Housing and utilities	0	14	86	0
Activities of political and public organizations	33	33	34	0
Management	29	13	58	0
Credit and insurance	15	8	46	31
Science and scientific service	11	11	56	22
Education	13	20	65	2
Health, physical education and social security	50	0	43	7
Consumer services	9	9	82	0
Passenger transport	40	0	60	0
Communication (service organizations and non-production sector of the population)	31	8	46	15
Arts and culture	20	20	20	40

It should be noted that all industries have the possibility of digitalization. According to V. G. Khalin, G. V. Chernova, spheres and industries related to ICT are easier to digitize. The most advanced in the field of digital technologies are currently the service sector, communications, software development, telecommunications, trade, financial sector of the economy - banking and insurance segments, media business, transport, e-commerce, automotive industry, energy, public administration, housing sector, construction, medicine. [5]

In our research, promising industries and those that are digitalized according to respondents coincided partially. According to the authors of the program «Digital economy of the Russian Federation», the main constraining factors are the shortage of personnel, insufficient level of training, insufficient number of world-class research.[2]

TABLE III. RELATIONSHIP BETWEEN THE LEVEL OF DIGITALIZATION AND THE SCALE OF THE COMPANY

Level digitalization / Company scale	Not even planned to digitalize anything	Not yet, but management plans to digitalize some processes	Digitalized individual the processes	All processes are digitalized
Micro (up to 15 people)	30	7	58	5
Small (up to 100 people)	16	20	58	6
Medium (up to 250 people)	27	12	60	1
Large (over 250 people)	17	16	61	6

According to table 3 conjugacy of answers to questions about the scale of the company and the level of digitalization they can be seen, the distribution of answers is approximately the same and the level of digitalization is almost independent of the scale of the company.

The applied aspect of the digitalization of economic life in the world or the physical manifestation of the digital economy are the establishment of digital conversion centers (modernization), digital robotics, etc. using digital simulation methods «grow» prototypes and create real objects from fine jewelry, human tissue prior to major infrastructure construction. [11]

Therefore, we further found out in which areas of life respondents regularly interact with robots, because in our opinion the primary manifestation of digitalization is in gadgets and robotics with which people encounter in various spheres of life (Fig. 4).

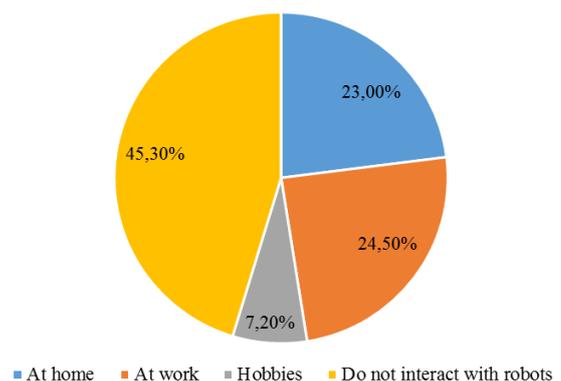


Fig. 4 Distribution of respondents' answers to the question «In what areas of life do you regularly interact with robots? »

According to Fig. 4 almost half of respondents (45.3%) do not interact with robots at all. Approximately the same number of respondents interact with robots at work (24.5%) and at home (23%). This indicates a low level of robotization. This raises the question of what people think of as robots. Today, a lot of automated systems are used in everyday life (robot vacuum cleaner, washing machines, dishwashers, etc.) [12], and the percentage of answers about regular interaction with robots in everyday life is low. Apparently the robot is not associated with respondents automated, talking systems. However, this problem requires additional research. It is necessary in the future to include a question in the

questionnaire that will clarify the opinion of respondents on this matter.

TABLE IV. THE RELATIONSHIP OF THE COMPUTER USER AND THE OPERATIONS PERFORMED

Computer user \ Computer Operations	«Noob»	Beginning	Experienced	Advanced	Attacker	Total
Find, install, and uninstall software. Watch news, communicate in social networks, play games. Work with installed software	2	24	101	16	1	144
Find, install, and uninstall software. Work with installed software	0	2	11	1	0	14
Find, install, and uninstall software. Watch news, communicate in social networks, play games.	0	2	4	0	0	6
Work with installed software	1	10	13	1	0	25
Write the program. Find, install, and delete the software. Work with the installed software	0	0	2	0	0	2
Write the program. Find, install, and delete the software. Watch news, communicate in social networks, play games.	0	0	0	1	0	1
Write the program. Find, install, and delete the software. Watch news, communicate in social networks, play games. Work with installed software.	0	0	0	0	1	1
Watch news, communicate in social networks, play games.	3	6	3	1	0	13
Watch news, communicate in social networks, play games. Work with installed software	2	20	31	0	0	53
All of the above	0	1	7	10	1	19
Total	8	65	172	30	3	278

According to table 4, most respondents consider themselves an experienced computer user. However, they can perform the following operations:

- can find, install, uninstall software,
- watching news, communicate in social networks,
- playing games,
- working with the installed software.

All operations proposed in the survey (I can write a program, I can find, install, uninstall software, watch news, communicate in social networks, play games, work with installed software) are able to perform only 7% of respondents. Many researchers and policy papers [2, 13, 14, 15] suggest that one of the key competencies in the digital economy will be analytical thinking and working with big data, knowledge of at least one programming language and the

ability to write simple programs. Therefore, there is a need to learn, form and develop the necessary computer skills.

In this regard, the next question was about the willingness to learn digital technologies (Fig. 5).

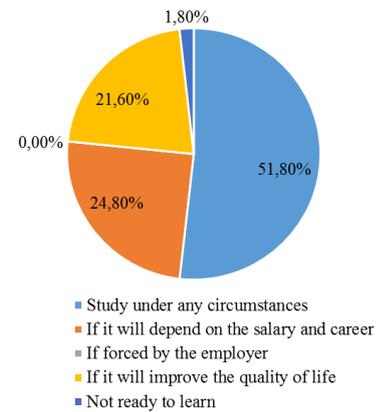


Fig. 5 Distribution of respondents' answers to the question «Are you ready to learn digital technologies? »

According to Fig. 5 only 1.8% of respondents are not ready to learn. Most are willing to study under any circumstances (51.8%), if it will depend on the salary and career (24.8%) and if it will improve the quality of life (21.6%). Quite a large percentage of respondents agree to study under the influence of external factors, if something is guaranteed to change for the better in life.

IV. CONCLUSION

In conclusion, the research concretize the ways and prospects of changing the interest of labor resources to digitalization, regardless of the fields of activity and form of employment.

First, the results of the pilot research showed that almost absolutely all respondents have knowledge or intuitive understanding of what digitalization is and how it manifests itself in the economy and directly in the organizations in which respondents work this is certainly a positive trend, which according to the authors is supported by the media and the entire infrastructure of the labor market.

However, familiarity with the fact of digitalization for about 38% of respondents still does not justify the need to revise their competencies and build personal development trajectories. As the digitalization implies a shift of professionally important qualities with traditionally-established in the direction trans professional there is a need to further research the factors trans professional human resources associated with the impact of digitalization on employment.

Secondly, it is necessary to conduct a large-scale sociological research on the readiness of labor resources for the development and formation of professional competencies related to prospective employment in the digital economy. Lifelong learning is no longer a trend of modern society, but a statement of fact, or rather a tool that allows a person to be in demand in the labor market, to increase or maintain their competitiveness, regardless of circumstances and external incentives. However, according to the results of the survey,

48% of respondents are ready to develop only if they are influenced by external circumstances. Therefore, the question arises, if there is no incentive from outside (at work or at home), will there be enough personal motivation for self-development of the labor force, in order to avoid structural unemployment and additional burden on the departments of labor and employment in the implementation of employment policy. Therefore, it is necessary to revise the directions of development of the state policy of employment and vocational education, taking into account the readiness of labor resources to work in the digital economy.

Third, the survey showed that there is a gradual increase in the coverage of digitization of production processes in organizations, regardless of the size of the company, with the small exception of the industry affiliation of enterprises. Based on the research, it can be argued that the readiness of labor resources to work in the conditions of digitalization is formed gradually and depends on the success of the introduction of digital resources for the transformation of the work of organizations as well.

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