

## Assessing the Development of Digital Employment in the Labor Market on the Example of the IT Sector: Basic Metrics



**Tatyana A. KAMAROVA**

Ural State University of Economics

Yekaterinburg, Russian Federation

e-mail: Kta@usue.ru

ORCID: 0000-0003-0087-9310; ResearcherID: ABC-9312-2021



**Natalya V. BARANOVA**

Ural State University of Economics

Yekaterinburg, Russian Federation

e-mail: Baranova\_usue@mail.ru

**Abstract.** The article is devoted to the assessment of the development of digital employment in the IT sector. The aim of the study is to determine the metrics of digital employment in the IT sector in the gender and territorial perspective, which can be used for monitoring the development and comprehensive assessment of the labor market in the area under consideration. We provide our own understanding of the essence of the term “digital employment”. The research was conducted by benchmarking and content analysis of information about the supply and demand of labor force in the IT sector; the information was retrieved from Russian government and commercial job search and recruitment websites (Rabota Rossii and HeadHunter). The subject of the content analysis was information about the number and composition of vacancies and resumes in the digital segment of employment in the IT sector, including vacancies containing references to remote working hours, both overall in the sample, and in the context of

---

**For citation:** Kamarova T.A., Baranova N.V. (2022). Assessing the development of digital employment in the labor market on the example of the IT sector: Basic metrics. *Economic and Social Changes: Facts, Trends, Forecast*, 15(6), 199–214. DOI: 10.15838/esc.2022.6.84.12

gender and industry. The content analysis covered vacancies and resumes in all federal districts: Central, Northwestern, Southern, North Caucasian, Volga, Ural, Siberian and Far Eastern. The results were used to calculate the structure of professional qualifications, to identify gender specifics and general trends in the development of digital employment in the IT sector, both on average in the country and in the federal districts. The analysis of information on the demands of the labor market participants in the area under consideration allowed us to conclude about the asymmetry of supply and demand. In order to assess the development of the market for professional qualifications in the IT sector, the metrics of digital employment were identified, which help to evaluate its quantitative and qualitative characteristics, including in the gender and territorial perspective. The research results can further be used in monitoring the development and comprehensive assessment of digital employment in the IT sector, and also serve as the basis for the development and implementation of state policy programs to regulate digital employment in the labor market of the IT sector.

**Key words:** digital employment, remote employment, information technology sector, IT sector, gender, resume, vacancy, labor market

### Acknowledgment

The reported study was funded by the RSF (project 22-18-00614, “Research on the impact of digital employment on fertility and parental well-being”).

### Introduction

The relevance of the study is due to the processes of globalization, digitalization, informatization, wide implementation of information and communication technologies (ICT) and the Internet in the labor organization and increasing their role in the state economy. In today’s rapidly changing digital economy conditions, under the influence of many different factors, employment is transformed, its digital forms are developing, the structure of the country’s economy is changing, including the information technology sector (hereinafter – IT-industry). In order to identify the scale, structure, gender specifics and efficiency of digital employment in the IT sector in a timely manner, metrics of socio-economic assessment of the development of this segment of employment are important to use. The development of such metrics is one of the expected results of the IT sector development strategy until 2025<sup>1</sup>, according

to which this sector in Russia has the potential for global competitiveness and should become one of the most important points of economic growth. Currently, the share of IT specialists in the total number of employees does not exceed 1.2%, while in countries with a developed digital economy this indicator reaches 2.0–3.4%. In order to achieve a leading position in the economy’s digitalization, Russia needs a significant increase in qualified IT personnel in the short term. This requires new approaches to the systematization of information on the current supply and demand in the labor market, the use of relevant metrics to assess the development of digital employment in the IT sector, and the adjustment of state employment policy.

**The purpose of the study** is to critically evaluate and select the main metrics of digital employment in the IT sector, which are available on digital job-hunting and recruitment platforms (job websites).

<sup>1</sup> Strategy for the development of the information technology sector in the Russian Federation in 2014–2020 and in perspective until 2025. Available at: <https://digital.gov.ru/ru/documents/4084/> (accessed: June 25, 2022).

**Objectives of the study:**

1) to conduct a content analysis of supply and demand in the digital segment of the labor market in the IT sector according to job search website; (работный портал)

2) to identify metrics that characterize the development of digital employment in the IT sector according to the data of job search website;

3) to identify the gender characteristics and structure of digital employment in the IT sector in the context of federal districts.

The novelty of the study lies in the possibility of using the information base of digital job search and recruitment platforms to assess the scale, gender and territorial specifics of digital employment in the field of information technology.

**Literature review**

The result of the Fourth Industrial Revolution (Industry 4.0) was the transformation of modern society, which, in turn, led to the development of digital forms of communication in the social and labor sphere and the employment sphere. Due to the unprecedented development of the IT sector, the labor market has gained considerable flexibility, digital forms of employment in various industries have emerged, such as remote, platform, self-employment based on digital technology, etc.

Understanding digital employment as part of the digital economy is a new problematic research area. Although scientific interest in the issues of digital employment transformation began to form more than 20 years ago, the conceptual and terminological framework in this area is very poorly developed. The analysis of scientific publications confirms that nowadays there is no unified approach to defining and understanding the essence of digital employment, but it allows us to highlight the diversity of its forms.

The mainstream of digital employment is currently remote employment. This segment in the labor market is quite broad (Kolossova, Ludanik, 2018; Fedchenko et al., 2018; Kalashnikova, Filippova, 2020), due to which researchers raise the issues of advantages and disadvantages in using remote

employment, and pay attention to the factors that determine the prospective development of remote (Mamontova, 2019; Musaev, 2019; Dashkova, Zvyagintseva, 2020; Razumova et al., 2020; Lapina, Stuken, 2017; Róbert et al., 2019). The benefits of remote employment include the ability to have a flexible work schedule and reduced travel expenses; special attention is paid to the employment opportunities that remote employment offers to people with disabilities and women with little children.

Along with the advantages, many publications also highlight the disadvantages of remote employment (Gebrial, 2008; Pasha, 2018; Zemlanukhina, 2019; Tonkikh, 2019; Thulin, Vilhelmson, 2019), which may serve as a barrier to its development and spread in the labor market. The main problems of remote work are related to the communication interaction between colleagues and manager.

The impact of digitalization became a challenge for the organization and structuring of the labor market and contributed to the emergence of digital employment. One of the first works devoted to this particular type of employment is authored by N.A. Azmuk, who attempted to formulate a definition of digital employment and to reveal its essence; the author justified segmentation of the labor market into digital and traditional, defined the features of the digital labor market, the advantages and risks of using digital employment (Azmuk, 2020). E.A. Chernykh (2021) highlighted the criteria of this phenomenon, defined the socio-demographic characteristics of platform workers, and established a correlation between these characteristics and the quality and sustainability of employment.

M.V. Chudinovskikh (2021) justified the advantages of using platform employment, at the same time revealing the threats and risks of it using. The main problem is related to the lack of legislative regulation and legal status of platform workers, which can reduce the level of their social protection. A similar problem of “non-standard” regulation and the need for its further solution are noted

by foreign researchers (Dieuaide, Azaïs, 2020). Digitalization, on the one hand, has created endless opportunities for the development of new forms of employment, and on the other hand, has contributed to a significant increase in uncertainty in the labor market. For example, the development of digital forms of employment has acutely raised the problem of the “hidden status” of digital employers, which requires an early transformation of public employment policies and a new type of digital management (Chen et al., 2020).

R.N. Abramov and A.V. Bykov emphasize that the penetration of digital technologies into the labor sphere has contributed to the development of platform and remote employment. The COVID-19 pandemic has only accelerated the digitalization of a number of individual areas of employment, primarily related to delivery and transportation services. According to the authors, the growth of the platform employment sector in the large Russian cities is associated with unskilled labor and precarious employment conditions. One can agree with them that fundamental changes in employment need to be comprehended and their consequences should be analyzed (Abramov, Bykov, 2021).

A review of scientific sources helps us to identify a general trend: many researchers include non-standard distance and platform forms of employment in digital employment. In our opinion, this approach to defining the essence of digital employment is too limited. We should agree that distant (remote) and platform employment are forms of digital employment, which has been manifested especially clearly in the post-pandemic period. However, we understand digital employment in a broader sense – employment with the use (more than 70% of working time) of digital technologies and ICTs as an integral part of labor activity. At the same time, the actual work process can be carried out both in a stationary workplace and in a remote form, the ways of using digital technologies and ICTs may differ depending on the form of employment.

All of this leads to problems of statistical accounting of digital employment itself and its forms, which develop under the influence of digitalization (remote, platform, etc.)<sup>2</sup>. It is extremely difficult to estimate the volume of platform employment in Russia due to the lack of its statistical accounting; the number of self-employed registered on platforms also does not allow conducting reliable conclusions (Sinyavskaya et al., 2021). In general, records of digital employment do not cover it in its entirety; specific types of employment are not highlighted. As the digitalization of the economy is ongoing, labor market measurement tools need to be improved to encompass existing and emerging forms of digital employment.

It should be emphasized that in domestic statistical publications digital employment is recorded only among the employed in professions associated with the intensive use of ICTs (Abdrakhmanova et al., 2022), which confirms our thesis of ICTs as an integral part of digital employment.

As for foreign accounting methodologies, research on new forms of employment, their scale, and prevalence is conducted by the European Foundation for the Improvement of Living and Working Conditions, identifying new trends and actual problems of new forms of employment, including digital, to provide adequate social protection and decent working conditions (Mandl, 2020).

The works of domestic and foreign scientists are devoted to the issues of methodology for assessing digital types of employment. Thus, D.V. Malyar investigated the correlation between remote employment and the development of the digital economy and found out that the use of remote format in different sectors of the economy depends

<sup>2</sup> Demyanova A.V. Statistical measurement of the impact of economy digitalization on employment: A presentation to the report at the meeting of the section of science, innovation, education and information society statistics of Rosstat Scientific and Methodological Council (April 9, 2021). Available at: <https://rosstat.gov.ru/storage/mediabank/ryCC4yXJ/Demyanova.pdf> (accessed: November 10, 2022).

on the degree of use of digital technologies in manufacturing, as well as on the ability to “digitize” the results of work. We can agree with him that ICT-based remote employment contributes to the deployment of the digital economy, and the volume of such employment can serve as a metric for the digitalization of the economy (Malyar, 2019).

N.V. Tonkikh, M.V. Chudinovskikh, and T.L. Markova studied the gender aspects of women’s remote work in the digital economy. Metrics of remote employment made it possible to assess its scale and prospects for the development of this segment of employment among women in terms of the ability to combine parenting and social functions (Tonkikh et al., 2019).

Despite the coverage of many aspects of digital employment, it can be noted that in the scientific literature there are not enough independent studies dedicated to the assessment of the development of digital employment in the labor market based on open sources, which can be digital job search and recruitment platforms.

### Materials and methods

The methodology of the study was based on our own understanding of digital employment. The distinctive feature of digital employment is, in our opinion, the use of ICTs as an integral part of labor activity, occupying more than 70% of working time. The IT specialists can be referred to digital employment, as their work is associated with the intensive use of ICTs.

Digital employment involving the use of ICT can be carried out both in “standard” conditions at the stationary workplace (no more than 40 hours according to the Labor Code of the Russian Federation on the territory of the employer), and through non-standard forms (remote, hybrid, platform, flexible work mode, self-employment, freelancing).

Statistical and socio-economic analysis and benchmarking methods were used in the study. The empirical study of supply and demand in the digital employment segment of the IT sector was conducted through content analysis of information on the total number and composition of resumes and vacancies published on Russian state and commercial digital job search and recruitment platforms (job portals).

The information base included resumes and vacancies in the IT-sector, representing the segment of digital employment, published in the public domain on the largest employment portals – the commercial online resource HeadHunter and the state web-service Rabota Rossii.

Key search criteria: vacancies and resumes indicating “information technology” specialization.

Information on supply and demand was collected on June 19, 2022 in all federal districts. The number of processed vacancies and resumes in the segment of digital employment in the IT sector are presented in *Table 1*.

Vacancies and resumes were processed using Microsoft Excel.

Table 1. Number of vacancies and resumes in the digital employment in the IT sector by federal districts

Platform	Federal district	Number of resumes	Number of vacancies
HeadHunter	Central	249 157	29 867
	Northwestern	104 698	8 550
	Southern	40 994	3 461
	North Caucasian	6 403	390
	Volga	62 240	8 257
	Ural	22 496	3 635
	Siberian	24 320	3 867
	Far Eastern	8 984	1 201
	<i>Total for the Russian Federation</i>	<b>519 292</b>	<b>59 228</b>
Rabota Rossii	Russian Federation	150 384	20 490

Source: own calculation using the data of HeadHunter and Rabota Rossii portals.

## Results and discussion

To solve the first research task, we conducted a content analysis of the information about the total number of resumes and vacancies in the IT sector, published on the HeadHunter portal<sup>3</sup>. The analysis covered all federal districts (*Tab. 2*).

The Northwestern and Central federal districts are leaders in the number of resumes and vacancies in the IT sector. The interest of employees and employers may indicate the development of the IT sector under consideration.

The Ural Federal District occupies an average position by demand and supply of labor in the IT sector, it can be explained by the economic industrial specialization of the district, where skilled workers of other professions are more in demand. The small supply of labor in the IT sector in Southern and North Caucasian federal districts can also be explained by the territorial specifics, where agriculture is a priority.

The share of vacancies in the IT sector on average in the federal districts is 1.5-fold higher than the share of similar resumes. As for the quantitative

indicators of vacancies and resumes, there is a skew toward the labor supply, which exceeds the demand 8.7-fold on average in all the districts (the least difference between the number of resumes and vacancies is in the Ural Federal District – 6.12, the largest difference is in the North Caucasian Federal District – 16.42). Thus, according to the quantitative comparison of resumes and vacancies we can conclude that the current labor supply cannot meet the demand for specialists in the IT sector.

The benchmarking did not allow us to compare the data obtained in the territorial perspective with similar data on the portal Rabota Rossii<sup>4</sup>, because the geographical areas on the job portals are represented differently and not fully. The level of representation of the real market of resumes and vacancies in the country as a whole was 2.37% and 0.85%, respectively.

The IT sector development strategy reflects the main indicators of development, one of the main metrics is the share of the number of employed in the IT sector in total employment in the economy.

Table 2. Share of digital employment in the IT sector in the context of federal districts

Federal district	Resumes, %	Vacancies, %	Ratio of vacancies and resumes
Central	5.65	10.63	1.9
Volga	3.49	5.77	1.7
Far Eastern	3.81	5.33	1.4
Siberian	3.61	5.13	1.4
Ural	3.50	4.91	1.4
Northwestern	6.72	8.65	1.3
Southern	3.79	4.88	1.3
North Caucasian	3.81	3.75	0.9
Average value	4.29	6.47	1.5

Source: own calculation using the data of HeadHunter portal.

<sup>3</sup> Available at: [https://ekaterinburg.hh.ru/search/resume/advanced?no\\_default\\_area=&area=1118&area=1174&area=1192&area=1932&area=1941&area=1943&area=1946&area=1948&area=1960&area=1975&area=1982&clusters=true&exp\\_period=all\\_time&gender=male&items\\_on\\_page=50&label=only\\_with\\_gender&logic=normal&no\\_magic=false&order\\_by=relevance&ored\\_clusters=true&pos=full\\_text&professional\\_role=10&professional\\_role=12&professional\\_role=25&professional\\_role=34&professional\\_role=36&professional\\_role=73&professional\\_role=96&professional\\_role=104&professional\\_role=107&professional\\_role=112&professional\\_role=113&professional\\_role=114&professional\\_role=116&professional\\_role=121&professional\\_role=124&professional\\_role=125&professional\\_role=126&text=&htmlFrom=resume\\_search\\_result](https://ekaterinburg.hh.ru/search/resume/advanced?no_default_area=&area=1118&area=1174&area=1192&area=1932&area=1941&area=1943&area=1946&area=1948&area=1960&area=1975&area=1982&clusters=true&exp_period=all_time&gender=male&items_on_page=50&label=only_with_gender&logic=normal&no_magic=false&order_by=relevance&ored_clusters=true&pos=full_text&professional_role=10&professional_role=12&professional_role=25&professional_role=34&professional_role=36&professional_role=73&professional_role=96&professional_role=104&professional_role=107&professional_role=112&professional_role=113&professional_role=114&professional_role=116&professional_role=121&professional_role=124&professional_role=125&professional_role=126&text=&htmlFrom=resume_search_result) (accessed: June 25, 2022).

<sup>4</sup> Resumes of job seekers all over Russia. Rabota Rossii. Available at: [https://trudvsem.ru/cv/search?\\_regionIds=&page=0&professionalSphere=InformationTechnology](https://trudvsem.ru/cv/search?_regionIds=&page=0&professionalSphere=InformationTechnology) (accessed: June 25, 2022).

This indicator in 2017 was 0.49%, the forecast for 2025 is 0.60%.

The analysis of resumes revealed the gender structure of specializations in the IT sector, as well as the specifics of “female” and “male” professions (Fig. 1).

On average, the overall gender structure of digital employment was revealed in the districts, which allowed us to identify “typically male” (technical director, IT director) and “typically female” (designer, artist) professions.

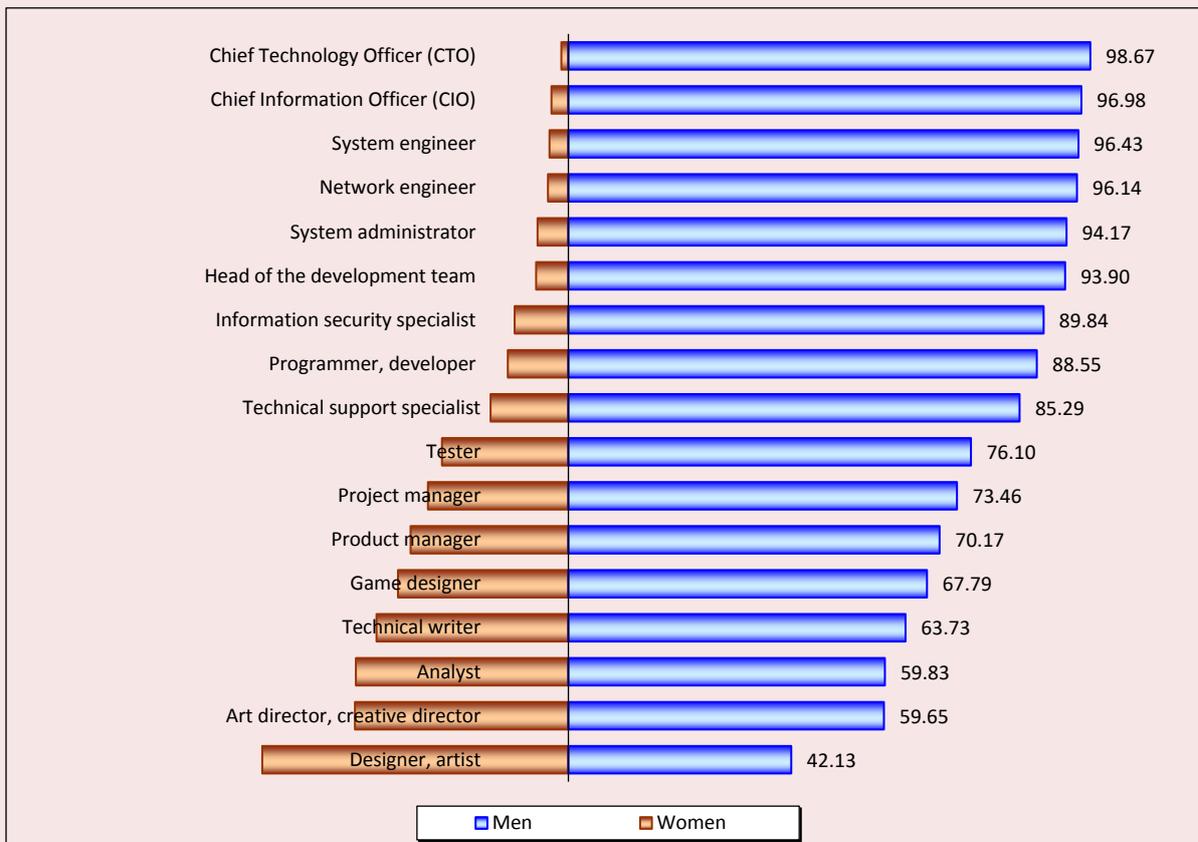
Benchmarking of similar information on the portal Rabota Rossii did not make it possible to identify the structure of occupations in the IT sector due to the absence of these metrics. The information presented on the portal allows us

to consider resumes only for the “Information Technology, Telecommunications, and Communications” sector as a whole. Thus, the share of women’s resumes in this professional field in the country as a whole was 31.91%, and men’s resumes were 68.09%.

The gender structure of IT occupations in the distribution by districts (Tab. 3) reflects general trends in the choice of occupations in the sector.

Thus, in all federal districts, except the Far Eastern, the first place in male resumes is occupied by the profession of chief technical officer (CTO). It is also possible to identify such predominantly “male” professions as system engineer, system administrator, network engineer, and chief information officer (CIO). In almost all the

Figure 1. Gender structure of digital employment by IT occupations on average in the context of federal districts, %



Source: own calculation using the data of HeadHunter portal.

Table 3. Gender structure of digital employment by IT occupations in federal districts, %

Specialization (occupation)	CFD		NWFD		SFD		NCFD		VFD		UFD		SibFD		FEFD	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Technical writer	63.99	36.01	60.20	39.80	88.76	11.24	63.64	36.36	67.86	32.14	57.89	42.11	43.84	56.16	63.64	36.36
Chief technical officer (CTO)	97.69	2.31	98.08	1.92	98.93	1.07	100.00	0.00	99.23	0.77	98.31	1.69	98.76	1.24	98.33	1.67
Tester	77.60	22.40	73.90	26.10	76.19	23.81	81.52	18.48	77.99	22.01	73.99	26.01	73.59	26.41	74.03	25.97
Technical support specialist	88.35	11.65	84.95	15.05	86.01	13.99	86.05	13.95	84.56	15.44	81.96	18.04	85.28	14.72	85.15	14.85
Information security specialist	90.26	9.74	89.42	10.58	91.16	8.84	93.72	6.28	89.43	10.57	87.50	12.50	87.67	12.33	89.57	10.43
System engineer	96.61	3.39	95.63	4.37	96.51	3.49	96.45	3.55	97.04	2.96	95.89	4.11	95.54	4.46	97.79	2.21
System administrator	95.29	4.71	94.87	5.13	94.12	5.88	93.39	6.61	93.45	6.55	93.36	6.64	94.58	5.42	94.27	5.73
Network engineer	96.68	3.32	95.75	4.25	98.07	1.93	96.72	3.28	92.59	7.41	93.81	6.19	96.39	3.61	99.12	0.88
Project manager	70.37	29.63	72.99	27.01	71.28	28.72	78.65	21.35	74.79	25.21	73.36	26.64	73.66	26.34	72.54	27.46
Team development manager	91.78	8.22	92.41	7.59	94.23	5.77	95.17	4.83	93.18	6.82	93.19	6.81	95.57	4.43	95.68	4.32
Programmer, developer	88.47	11.53	87.97	12.03	88.20	11.80	90.61	9.39	88.66	11.34	86.32	13.68	88.65	11.35	89.55	10.45
Product manager	66.56	33.44	71.80	28.20	64.80	35.20	75.68	24.32	68.86	31.14	68.78	31.22	66.33	33.67	78.57	21.43
Chief information officer (CIO)	95.28	4.72	96.70	3.30	97.58	2.42	95.92	4.08	96.55	3.45	96.89	3.11	97.97	2.03	98.92	1.08
Designer, artist	42.79	57.21	42.04	57.96	39.48	60.52	40.77	59.23	40.66	59.34	41.23	58.77	43.64	56.36	46.41	53.59
Game designer	73.21	26.79	68.38	31.62	64.60	35.40	68.75	31.25	66.67	33.33	68.75	31.25	71.94	28.06	60.00	40.00
Art director, creative director	60.72	39.28	58.24	41.76	60.59	39.41	70.42	29.58	55.76	44.24	57.27	42.73	52.11	47.89	62.11	37.89
Analyst	64.72	35.28	63.99	36.01	57.53	42.47	69.30	30.70	58.69	41.31	54.96	45.04	56.07	43.93	53.35	46.65

Source: own calculation using the data of HeadHunter portal.

territories the top five “female” specialties are designer (artist), art director (creative director), analyst, game designer, project manager. In Central and Far Eastern federal districts, the top five “female” occupations include project manager.

Figure 2 shows the five key competencies and skills listed on the resumes of female and male job seekers, averaged across the districts.

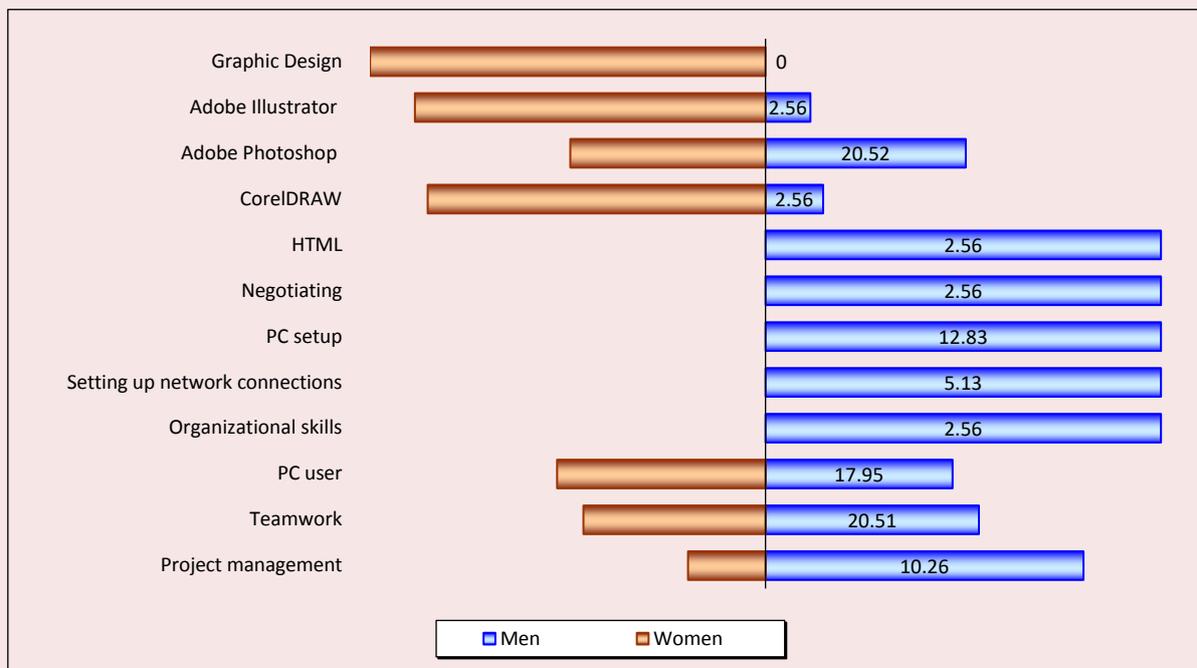
The listed competencies of women and men have some differences, which is most likely related to the identified gender preferences of professions in the IT sector. For example, men have one of the core competencies “project management”, which is required for the positions of CTO and CIO. For women, the professional competency Adobe Photoshop is a key competency for a designer/artist and game designer. We consider it is inappropriate to specify the competence “PC user” for the IT sector, as it is a basic competence.

Benchmarking of information on the portal Rabota Rossii did not allow us to identify the main key skills in the IT sector due to the lack of relevant information. The search filters on this portal contain such key competences as “calling”, “assembling”, “improvement”, etc., which can hardly be called IT competences. In this regard, it should be noted that the list of key competencies on the portal Rabota Rossii requires unification.

The age structure of IT specialists in the context of federal districts makes it possible to see a general trend of male predominance in all age groups (Fig. 3).

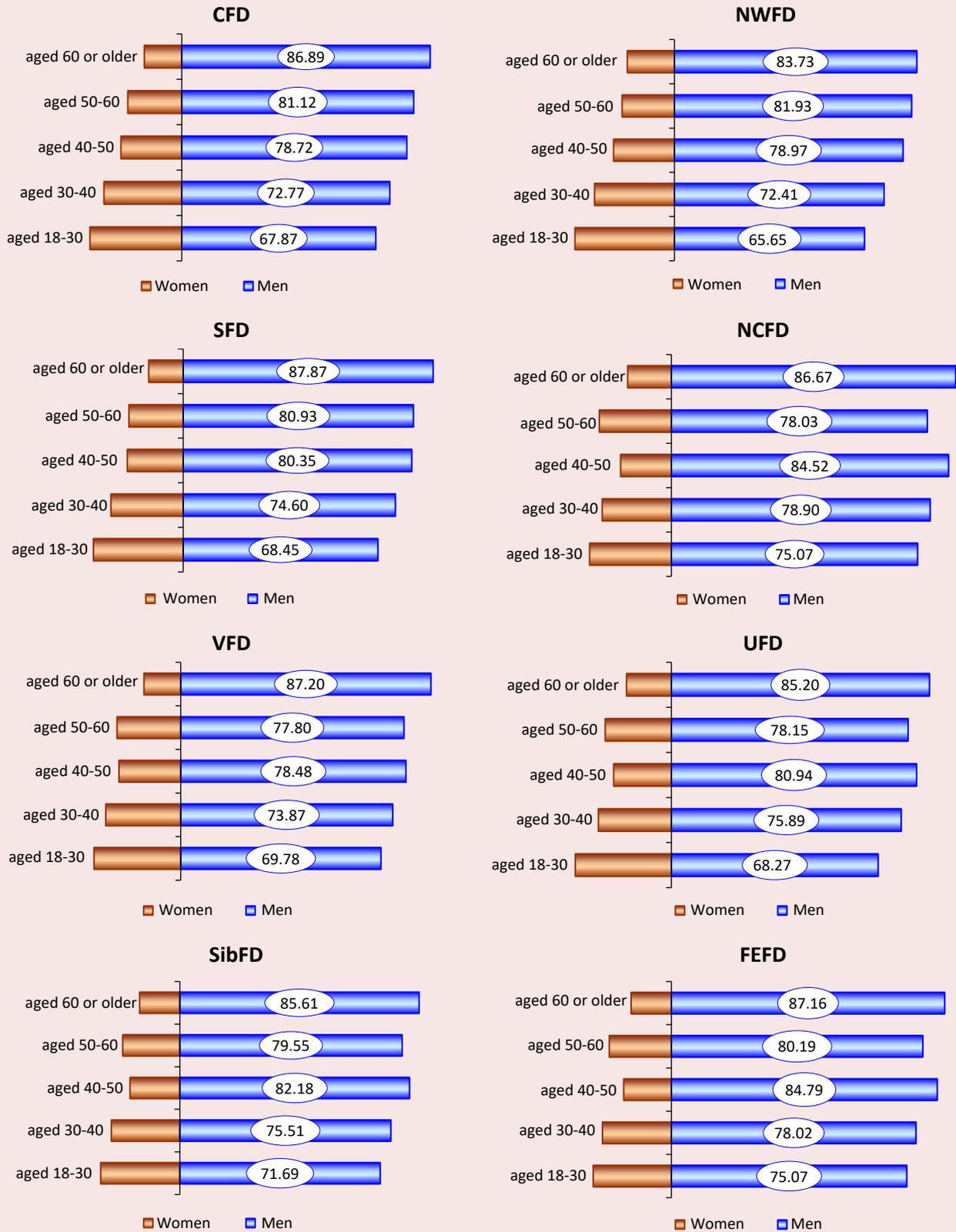
Moreover, it can be noted that interest in this sphere is growing among women, the share in the age group of 18–30 years old is the largest in all districts, especially in the Northwestern, Central, and Ural federal districts.

Figure 2. Gender structure of key skills of job seekers in the segment of digital employment in the IT sector, average across the districts, %



Source: own calculation using the data of HeadHunter portal.

Figure 3. Gender and age structure of digital employment in the IT sector in the federal districts, %



Source: own calculation using the data of HeadHunter portal.

Table 4. Average gender profile of job seekers in the IT sector, %

Indicator	Group	Men	Women
Age	18–30	28.52	35.86
	30–40	44.47	44.06
	40–50	18.60	13.70
	50–60	6.21	5.11
	Over 60	2.20	1.27
Work experience	No experience	14.85	18.16
	1 to 3 years	9.55	11.91
	3 to 6 years	12.47	15.45
	More than 6 years	63.13	54.48

Source: own compilation.

*Table 4* presents a social portrait of a job seeker in the IT sector; the indicators are calculated by the average value of the studied districts.

The main age groups of job seekers in the IT sector are 18–30 years old (generation Z) and 30–40 years old (generation Y). These generations are characterized by the influence of digitalization, active use of the Internet, mobile devices, social networks, which can affect the interest in the studied sphere. The interest of the younger generation in this field can also be noted in the structure of job seekers by work experience, where this age group ranks second among job seekers (both men and women). At the same time, the share of women without work experience is higher than the same share of men, hence the interest of women in the IT sector is growing.

*Table 5* shows the structure of supply and demand in the segment of digital employment in the IT sector according to the “type of employment” criteria.

In the gender structure of labor supply according to the “type of employment” criteria, we can identify common features among women and men. Thus, the first place in the search is full-time employment (with male applicants 4.66 percentage points more than female applicants). Full-time employment also prevails in the structure of demand, and exceeds supply by 37.15 percentage points.

Part-time work and project work are mentioned on women’s resumes more often than men’s, this may be related to the desire to work part-time. Besides, part-time employment assumes, as a rule, a flexible work schedule, which allows a woman to combine family and work responsibilities.

*Table 6* shows the gender structure of digital employment in the IT sector according to the “type of employment” criteria by district. The largest share of men who prefer full-time employment is recorded in the Central Federal District. The highest share of women who prefer part-time employment is in the Ural Federal District.

Table 5. Demand and supply of labor in the digital employment segment by “type of employment” criteria on average in the context of federal districts, %

Type of employment	Resume		Vacancies
	Men	Women	
Full-time employment	58.96	54.30	93.78
Part-time employment	20.42	23.59	4.72
Project work	13.00	15.65	0.45
Internship	6.43	5.58	1.05
Volunteering	1.19	0.88	0.00
Total	100.0	100.0	100.0

Source: own calculation using the data of HeadHunter portal.

Table 6. Gender structure of digital employment in the IT sector by "type of employment", %

Federal district	Sex	Full-time employment	Part-time employment	Project work	Internship	Volunteering	Total
Central	Men	63.29	17.78	12.36	5.65	0.92	100.00
	Women	56.4	21.45	15.57	5.71	0.87	100.00
Northwestern	Men	58.14	19.55	13.77	7.29	1.25	100.00
	Women	51.63	23.02	17.21	7.19	0.95	100.00
Southern	Men	59.03	20.57	13.08	6.18	1.14	100.00
	Women	53.59	24.04	16.35	5.16	0.86	100.00
North Caucasian	Men	57.71	21.73	12.54	6.48	1.54	100.00
	Women	53.11	25.01	16.10	4.72	1.06	100.00
Volga	Men	59.89	19.93	12.57	6.57	1.04	100.00
	Women	57.10	22.99	13.85	5.35	0.71	100.00
Ural	Men	58.03	20.96	13.61	6.24	1.16	100.00
	Women	52.18	25.05	16.25	5.55	0.97	100.00
Siberian	Men	57.07	21.63	12.89	7.27	1.14	100.00
	Women	52.92	24.50	15.46	6.30	0.82	100.00
Far Eastern	Men	58.50	21.25	13.19	5.73	1.33	100.00
	Women	57.49	22.62	14.42	4.68	0.79	100.00

Source: own calculation using the data of HeadHunter portal.

Table 7 shows the gender structure of supply and demand for preferred work schedules on resumes and job openings.

Less than half of job seekers of both sexes prefer to work full-time, as indicated in their resumes, while this schedule prevails in the vacancies. We can note the interest of job seekers in remote work and flexible working hours, with a higher interest among women than men. This can be explained by the fact that remote work allows, for example, reducing transport costs (both temporary and material), working from any location, additional earnings, getting education, participating in social life, continuing work during maternity leave, and also creates employment

opportunities for people with disabilities. Working on a flexible schedule provides the opportunity to allocate work time independently, choose the order of work, and so on (Kamarova, 2018).

The second place in vacancies is occupied by remote work schedule, which may be explained by the advantages of such schedule for employers: opportunity to hire qualified employees from other regions, saving on rent, maintenance of office space, organization of workplaces, etc.

A significant share of remote employment both in the demand and supply structure can be explained by the fact that the IT sector makes it possible to organize work remotely with ICT.

Table 7. Demand and supply of labor in the digital employment sector by "work schedule" criteria on average by district, %

Work schedule	Resume		Vacancies
	Men	Women	
Full time	46.38	44.32	73.57
Remote work	19.01	23.12	17.87
Flexible hours	17.52	19.25	4.31
Shift schedule	12.97	11.98	3.73
Fly-in fly-out work	4.12	1.33	0.52
Total	100.00	100.00	100.00

Source: own calculation using the data of HeadHunter portal.

Table 8. Gender structure of digital employment in the IT sector by “work schedule” criteria on average by district, %

Federal district	Sex	Full-time employment	Remote work	Flexible hours	Shift schedule	Fly-in fly-out work	Total
Central	Men	52.35	17.05	16.46	11.56	2.58	100.00
	Women	47.77	20.87	19.28	11.12	0.96	100.00
Northwestern	Men	47.23	18.51	18.11	12.73	3.42	100.00
	Women	43.01	22.17	20.67	12.96	1.19	100.00
Southern	Men	46.14	19.37	17.10	13.24	4.15	100.00
	Women	42.87	24.00	19.26	12.57	1.30	100.00
North Caucasian	Men	45.12	19.88	17.64	13.32	4.06	100.00
	Women	42.83	26.02	18.15	11.72	1.30	100.00
Volga	Men	47.16	18.88	17.40	12.78	3.78	100.00
	Women	46.94	21.83	18.53	11.66	1.04	100.00
Ural	Men	44.34	19.62	17.78	13.37	4.89	100.00
	Women	41.67	24.14	20.52	12.31	1.36	100.00
Siberian	Men	44.00	19.52	18.5	13.73	4.25	100.00
	Women	42.71	23.31	20.00	12.56	1.42	100.00
Far Eastern	Men	44.70	19.22	17.21	13.01	5.86	100.00
	Women	46.74	22.61	17.54	11.06	2.05	100.00

Source: own calculation using the data of HeadHunter portal.

Table 8 shows the gender structure of digital employment in the IT sector by “work schedule” criteria by federal district.

In the Ural and North Caucasian federal districts, the largest share of resumes for both women and men contains a mention of a remote work schedule. Apparently, this is related to the possibility of balancing work and private life, which is especially important for women with little children, as well as for those who take care of family members (we note that over the past five years the total fertility rate in these districts has been high, at 1.67 and 1.81, respectively). Women from the Central and Volga federal districts were the least likely to indicate a remote work schedule on their resumes (over the past five years, these regions have had low average fertility rates of 1.42 and 1.44, respectively). There are general trends across all federal districts: the prevalence of full-time work schedules (with a few percentage points more for men); the second and third most important are remote work and flexible work, respectively (in both cases female job seekers prevail).

Benchmarking of information on the Rabota Rossii portal by type of employment and work schedule does not allow to compare similar information with the data of the HeadHunter portal due to different criteria. Such a relevant query as “remote employment” is missing from the search filters.

### Conclusion

In order to determine the main metrics of digital employment in the IT sector, a content analysis of supply and demand was conducted, taking into account open information on Russian state and commercial job search and recruitment platforms. We defined the basic metrics of digital employment in the analyzed industry: the share and the number of the employed in the overall labor market supply; the structure of the employed in the IT sector by gender, age, specialization, preferred working hours and forms of employment; the structure of competences. The proposed system of basic metrics will help to clarify the list of official statistical metrics for measuring the development of digital forms of employment in the labor market and to

identify demanded professional competencies associated with their application.

The study reveals gender and territorial features of digital employment in the IT sector.

First of all, in the structure of digital employment there are “typically male” IT occupations, which include chief technology officer (share of vacancies 98.67%), chief information officer (96.98%), and “typically female” occupations – designer/artist (share of vacancies 42.13%). Differences in competencies between women and men are related to gender preferences for IT occupations.

Second, a general trend of the predominance of men of all age groups in all federal districts was revealed, along with an increased interest of women aged 18–30 in the IT sphere also in all districts with the predominance of the North-western, Central and Ural (their shares were 34.35; 32.13 and 31.73% respectively).

Third, there is an overall trend in the analysis of preferences by type of employment – the prevalence of full-time employment in all districts under consideration among men (the share of vacancies was 58.96%) and women (54.30%). Besides, there is a prevailing interest of women in remote work

(the share of vacancies was 23.12%) and flexible working hours (17.53%), which is explained by the possibility to maintain a work-life balance and take care of little children; women in the North Caucasian and Ural federal districts had the largest share of resumes with such work schedules (26.02 and 24.14%, respectively).

The empirical results revealed the potential and prospects of using the information bases of digital job search and recruitment platforms to assess the scale, gender and territorial specifics of digital employment in the IT sector and to highlight general trends in the digital labor market. The obtained results showed the presence of differentiation in the metrics used in the Russian state and commercial job portals.

The key conclusions and suggestions from the study are that digital employment assessment needs a centralized mechanism for collecting and processing information based on unified metrics. In order to assess the development of digital employment forms, a comprehensive approach that involves the use of not only the databases of digital job search platforms and statistical materials, but also the results of sociological research seem appropriate.

## References

- Abdrakhmanova G.I. et al. (2022). *Tsifrovaya ekonomika: 2022* [Digital Economy: 2022]. Moscow: Higher School of Economics. DOI: 10.17323/978-5-7598-2599-9
- Abramov R.N., Bykov A.V. (2021). The world of professions in the context of work and employment: Pandemic and digital vertigo. *Monitoring obshchestvennogo mneniya: ekonomicheskie i sotsial'nye peremeny=Monitoring of Public Opinion: Economic and Social Changes*, 3, 4–20. DOI: 10.14515/monitoring.2021.3.2001 (in Russian).
- Azmuk N.A. (2020). Digital employment in the system of regulation of the national economy. *Problemy ekonomiki (Khar'kov)=The Problems of Economy*, 1(43), 52–58. DOI: 10.32983/2222-0712-2020-1-52-58 (in Russian).
- Chen B., Liu T., Wang Y. (2020). Volatile fragility: New employment forms and disrupted employment protection in the new economy. *International Journal of Environmental Research and Public Health*, 17(5), 1531. DOI: 10.3390/ijerph17051531
- Chernykh E.A. (2021). Socio-demographic characteristics and quality of employment of platform workers in Russia and the world. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 14(2), 172–187. DOI: 10.15838/esc.2021.2.74.11 (in Russian).

- Chudinovskikh M.V. (2021). The main trends in the development of digital labor platforms in the context of the pandemic. *Biznes. Obrazovanie. Pravo=Business. Education. Law*, 3(56), 280–284. DOI: 10.25683/volbi.2021.56.370 (in Russian).
- Dashkova E.S., Zvyagintseva V.E. (2020). Remote employment: Assessment and directions of regulation. *Vestnik Voronezhskogo gosudarstvennogo universiteta. Seriya: Ekonomika i upravlenie=Bulletin of the Voronezh State University. Series: Economics and Management*, 1, 83–88. DOI: 10.17308/econ.2020.1/2758 (in Russian).
- Dieuaide P., Azaïs C. (2020). Platforms of work, labour, and employment relationship: The grey zones of a digital governance. *Frontiers in Sociology*, 5, 2. DOI: 10.3389/fsoc.2020.00002
- Fedchenko A.A., Dorokhova N.V., Dashkova E.S. (2018). Flexible employment: Global, Russian and regional aspects. *Mirovaya ekonomika i mezhdunarodnye otnosheniya=World Economy and International Relations*, 62(1), 16–24. DOI: 10.20542/0131-2227-2018-62-1-16-24 (in Russian).
- Gebrial V.N. (2008). Social Aspects of the Phenomenon of Remote Work as a New Type of Labor Relations. *Gosudarstvennoe upravlenie. Elektronnyi vestnik=Public Administration*. E-journal (Russia), 17. Available at: [http://e-journal.spa.msu.ru/vestnik/item\\_377](http://e-journal.spa.msu.ru/vestnik/item_377) (accessed: August 4, 2008; in Russian).
- Kalashnikova I.V., Filippova K.V. (2020). Labor relations in gig economy. *Vestnik Tikhookeanskogo gosudarstvennogo universiteta=Bulletin of PNU*, 3(58), 33–42 (in Russian).
- Kamarova T.A. (2019). Distribution, advantages of application and prospects for the development of distance employment. In: *Chelovecheskii i proizvodstvennyi potentsial Rossiiskoi ekonomiki pered global'nymi i lokal'nymi vyzovami: materialy konferentsii* [Human and Industrial Potential of the Russian Economy before Global and Local Challenges: Conference Proceedings]. Saratov: KUBiK (in Russian).
- Kolosova R.P., Ludanik M.V. (2018). New Architecture of the Russian Labor Market in the Context of the Digital Economy. In: *Sotsial'no-ekonomicheskoe razvitie organizatsii i regionov Belarusi: effektivnost' i innovatsii: sbornik statei* [Socio-Economic Development of Organizations and Regions of Belarus: efficiency and innovation: Collection of Articles]. Vitebsk: Vitebsk State Technological University (in Russian).
- Lapina T.A., Stuken T.Yu. (2017). Work satisfaction of non-standard employed in Russia. In: *The 11th International Days of Statistics and Economics: Conference Proceedings*. Prague: University of Economics.
- Maliar D.V. (2019). Remote employment: Precondition, form of manifestation and consequences of the development of the digital economy. *Biznes Inform=Business Inform*, 10, 165–171. DOI: 10.32983/2222-4459-2019-10-165-171 (in Russian).
- Mamontova S.V. (2019). Remote employment in the context of innovative transformations: Problems and development prospects. In: *Novaya potrebitel'skaia kooperatsiia – draiver prodovol'stvennogo importozameshcheniia i sotsial'no-ekonomicheskogo blagopoluchiiia rossiiskogo sela* [New Consumer Cooperation as a Driver of Food Import Substitution and Socio-Economic Well-Being of the Russian Village: Conference Proceedings]. Tambov: Derzhavinsky Publishing House (in Russian).
- Mandl I. (2020). *New Forms of Employment: 2020 Update*. Luxembourg: Publications Office of the European Union. DOI: 10.2806/278670
- Musaev B.A. (2019). Growth of distance employment as a new trend in the development of the Russian labor market. *Sotsial'no-trudovye issledovaniya=Social and Labor Research*, 35(2), 40–50. DOI: 10.34022/2658-3712-2019-35-2-40-50 (in Russian).
- Pesha A.V. (2018). The impact of precarious employment on the physical and psychosocial health of women. Research overview. *Vestnik Omskogo universiteta. Seriya: Ekonomika=Herald of Omsk University. Series: Economics*, 4(64), 111–125 (in Russian).
- Razumova T.O., Alyoshina A.B., Serpukhova M.A. (2020). Work-life balance under conditions of changes in the quality of working life. *Uroven' zhizni naseleniya regionov Rossii=Living Standards of the Population in the Regions of Russia*, 16(3), 24–37. DOI: 10.19181/lspr.2020.16.3.2 (in Russian).
- Róbert P., Oross D., Szabó A. (2017). Youth, precarious employment and political participation in Hungary. *Intersections*, 3. DOI: 10.17356/ieejsp.v3i1.299

- Sinyavskaya O.V. et al. (2021). *Platfornennaja zanjatost': opredelenie i regulirovanie* [Platform Employment: Definition and Regulation]. Moscow: NIU VShE.
- Thulin E., Vilhelmson B. (2019). New telework, time pressure, and time use control in everyday life. *Sustainability*, 11(11), 3067. DOI: 10.3390/su11113067.
- Tonkikh N.V. et al. (Eds.). (2019). *Distantsionnaja zhenskaia zanijatost' v kontekste instituta roditel'stva* [Remote Women's Employment in the Context of the Institution of Parenthood]. Yekaterinburg: UrGEU.
- Tonkikh N.V., Chudinovskikh M.V., Markova T.L. (2019). Assessment of female telework scope in the conditions of digital economy. *Advances in Economics, Business and Management Research*, 81, 160–163. DOI: 10.2991/mtde-19.2019.30
- Zemlyanukhina N.S. (2019). Current trends in the field of employment. *Gumanitarnyi Nauchnyi Zhurnal=Humanitarian Scientific Journal*, 1, 38–43 (in Russian).

### **Information about the Authors**

Tatyana A. Kamarova – Candidate of Sciences (Economics), associate professor of department, Ural State University of Economics (62, Vos'mogo Marta/Narodnoi Voli Street, Yekaterinburg, 620144, Russian Federation; e-mail: Kta@usue.ru)

Natalya V. Baranova – associate professor of department, Ural State University of Economics (62, Vos'mogo Marta/Narodnoi Voli Street, Yekaterinburg, 620144, Russian Federation; e-mail: Baranova\_usue@mail.ru)

Received August 4, 2022.