The Development of the Labour Market Digital Ecosystem in Ukraine

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Abstract

The article is devoted to researching the Labour Market Digital Ecosystem (LMDES) in terms of its effect on the recruitment process during the remote work outspread. The research aims at analysing remote staff attraction through job portals using the Job board software and determining their impact on recruitment. The LMDES applies automation of the staff searching and selecting, scouring for employment opportunities, and the remote interaction with employers, recruiting agencies, applicants, and job seekers in the digital environment. The creation of a virtual space for such an effective interaction can be realised through a Job board software.

Keywords

digital ecosystem, labour market, digital recruitment, remote recruitment, job portal, job board

Introduction

Digital ecosystems have now become a new way of organising economic activity in the labour market. Traditional tools for interaction between job seekers and employers, previously used in Ukrainian companies, are losing effectiveness in the current socio-economic circumstances. Due to the COVID-19 pandemic, digitalisation, and war in Ukraine, remote employment is rapidly developing, which involves growing remote interactions in the labour market. The process of job searching or finding a suitable worker has become more difficult in such circumstances due to the disruption of traditional channels for interaction between key stakeholders in the labour market. Employees (due to getting a job) and numerous companies (due to the provision of necessary personnel) survive depending on the successful realisation of this interaction in the remote mode. Today, recruiters use different technologies and tools to find and attract employees, but not all of them can meet the modern requirements of the labour market, and therefore they show low efficiency, especially in the context of remote interaction. The state of war declaration highlighted the need to develop a digital labour market ecosystem that would include a digital infrastructure for automating recruitment processes, platforms, portals, job sites, digital social recruitment technologies, and artificial intelligence tools to fill vacancies.

Overview of the relevant literature

The issue of recruitment and job search in the labour market has a large scientific base of research, practical methods, techniques, technologies, and tools that are effectively used by both employers and job seekers. In the field of digitisation of remote selection, these issues are covered

in the works of Melis et al. (2021), Courtney et al. (2021), and Cooper (2019). Introducing digital technological innovations promotes the development of job portals and affects the labour market. Among such innovations, Wilson (2021) identifies predictive analytics, telecommuting, work culture, recruiting on social networks, and employer branding; these systems can generate selective lists of candidates who best fit the proposed job as well as reveal candidates who are not actively looking for new opportunities. Bersin (2020) reveals the basics of digital HR, its stages, and the impact of digitalisation on personnel management. Liu et al. (2014) investigated the theory of influence on the job search process, including the theory of behavioural learning, the theory of planned behaviour, social cognitive theory, etc. Ramkumar (2018) identifies the advantages and disadvantages of HR portals, platforms, and social networks for searching for appropriate candidates. Ruparel et al. (2020) devoted their research to the study of professional social networking platforms (PSMs), including LinkedIn, which are considered effective tools for human resource management. From their point of view, in order to use PSM productively, it is strategically important to consider the research contribution from the perspective of both employers and individuals. Goodman and Sanborn (2021) reveal the benefits of using job sites to find appropriate candidates for available vacancies. Back in the early 2000s, Koong et al. (2002) proved the growing popularity of the online Job Boards Software (JBS) among job seekers and corporate recruiters to inform about potential job vacancies around the world. Even then, there were hundreds of Internet job boards in the e-recruitment sector. Each such Internet resource has both common and unique features and attributes. The authors identified and classified the main features and attributes of the world's top five most popular online job boards (Koong et al. 2002). Marchal et al. (2007) investigate the role of intermediaries in the labour market on the Internet in terms of coordination mechanisms between job seekers and employers. This coordination, in their opinion, is determined by various means of communication, applicants' access to job advertisements, and the contents of advertisements placed on the Internet. They highlight the main feature of JBS, namely the high level of information filtering available to applicants, which is achieved by using predefined lists, keywords, or, more often, input fields. Comparing job offers on the Internet with those in newspapers, the authors make conclusions that Internet search engine tools are significantly more focused on the content of advertising; they are usually more standardised and quantified (Marchal et al. 2007).

Some authors have analysed trends in local labour markets in the European Union. In their paper, Rembeza and Klonowska-Matynia (2017) analysed the Polish labour market and tried to present the links between changes in the number of the unemployed in the six largest cities in Poland and the relevant suburban and peripheral areas. Warzala (2019) analysed the changes in the scale of economic activity of the rural population and identified their determinants; the reasons for the differentiation of employment were considered socio-demographic characteristics of labour resources as well as economic differences between rural areas of Poland. The authors in Burneika and Pocius (2019) aimed to discuss the main trends in changing regional differences in economic prosperity and related spatial mobility of the Lithuanian population, as well as some regional consequences of these processes. They concluded that the gap in welfare that emerged in the late twentieth century played a role in accelerating emigration, which still harms the local labour and the economic development of many regions.

In Ukrainian scientific literature, scholars such as Kolot et al. (2022), Tsimbalyuk (2019), Sirotenko (2021), Vonberg and Holovko (2020), or Lobza et al. (2020) addressed the problems of digitalisation in terms of the necessary digital environment for an effective recruitment process. Sharov and Filipov's (2018) publications are aimed to analyse the Ukrainian job sites and job portals. By exploiting digital technologies in the labour market, in recruitment processes, employers expect to increase their competitive advantages and financial and economic performance. However, despite the wide spread of digitalisation in the searching for staff process, there are still issues that need further scientific research, namely the digital ecosystem of the labour market development in terms of recruiting personnel through job portals.

Research methodology

The research aims to analyse and study the processes of the digital labour market ecosystem in terms of staff attracting techniques through job portals, an analysis of international and Ukrainian staff attracting job portals features as well as the extent of their effectiveness, and an analysis of advantages and disadvantages of these hiring methods and tools under conditions of global socio-economic changes due to digitalisation, state of war, and the spread of the COVID-19 pandemic. To achieve this goal, the article examines elements of the digital labour market ecosystem in terms of recruitment through job portals, analyses trends in the recruitment process through job search websites, and analyses the software's types and features that are used to work with job vacancies. To develop recommendations for employers on the effective usage of job portals, it is necessary to summarise the specifics of the most popular international job portals, assess the main staff attracting strategies in Ukrainian job portals, and analyse the structure and dynamics of labour supply and demand.

The empirical methods of research were used in order to select for analysis the most popular and effective foreign and domestic job portals that attract the employee and meet the requirements of the new socio-economic reality. The theoretical basis of the study includes the works of national and foreign researchers in the field of both classical and digital recruitment. Logical, systemic, comparative, synergetic, structural, functional, and complex approaches are also used for the research. The interpretation of economic categories is based on formal and logical methods, in particular: analysis and synthesis, abstraction, generalisation, induction and deduction, and analogy. Methods of observation and comparison, as well as mathematical and statistical methods, are used in the research to identify practical aspects of the labour market and the demand for labour. Sociological and expert methods are used to identify the most popular staff attracting job portals, as well as to determine the current demand for labour. The methods of formalisation, convergence "from abstract to the concrete" and "from concrete to abstract" are applied in the analysis of those labour market problems that have deepened due to modern phenomena (globalisation, digitalisation, state of war, viral pandemic, etc.) Also, functional and structural, graphic, and complex methods are used to substantiate the authors' view on most social phenomena and processes studied in the research.

Findings and discussion

By analogy with the ecosystem, Chang and West's (2006) classic approach defines the digital ecosystem as "an open, loosely connected, clustered, demand-driven environment of self-organizing agents, where each species is active and responsive to its benefit or profit" (p. 6). It includes two elements – types and basic technologies/services to support digital ecosystems. Digital ecosystem technology consists of advanced architecture of web services – intelligent agents that organise themselves to share knowledge. Technologies and services for digital ecosystems include: digital infrastructure; interactive community; data structure and information arrays; innovative forms of digital interaction, provision of digital services and their consumption; high availability of connection and digital processing for any information; effective usage of information through accessibility for business analytics; platforms for business, government, and human activities integration as well as advanced information systems; an environment to support different digital ecosystems and the needs of different digital ecosystems; interdisciplinary interaction to increase productivity and development; knowledge bases (KB) used to store complex structured and unstructured information to support digital communication based on common terminology; ensuring self-organisation, authority, self-training, self-survival, self-coordination, which aims at creating a sustainable environment for network organisations or agents (Chang and West 2006).

A digital ecosystem is a distributed, adaptive, open socio-technical system with self-organisation, scalability, and sustainability properties, such as, to some extent, natural ecosystems. Ecosystems' digital models are based on knowledge of natural ecosystems, especially on aspects related to competition and cooperation between different actors (Zhu 2015; Weill and Woerner 2015). A digital ecosystem is a group of interconnected resources of digital technologies that function. It consists of providers, customers, partners, applications, service or data providers, and all relevant

technologies (Brush 2019). Digital ecosystems consist of interacting organisations that are digitally connected and modular; they are not governed by hierarchical authorities, as is the case with the regular supply chain (technology partners, system integrators, independent software vendors, channel partners), so these ecosystems have become a new way of organising economic activity, one that is different from companies, supply chains, and hierarchies (Jacobides et al. 2019). In general, digital ecosystems have become available due to digital platforms, and all of them are eventually built on a single basic platform: the Internet. The Internet and new technology platforms are the basis for digital transformation that has recently been taking place in business and in the labour market. It can be concluded that digital ecosystems consist of companies, people, data, processes, and things that are connected by mutual sharing of digital platforms. These ecosystems in the labour market are designed to ensure cooperation and mutually-beneficial outcomes for all stakeholders to create flexible services that can be changed and quickly adapted to the ever-changing needs of the labour market**.**

According to Fuller's approach, the main characteristics of the digital labour market ecosystem are as follows: it consists of groups of companies or platforms (owned by different companies) and, therefore, it does not belong to any single organisation; it includes networks of volatile relationships related to job flows and unemployed persons; the relationships between ecosystem participants include both competition and collaboration, often involving complementarities between different vacancies and candidates; the participants of the ecosystem develop together by changing their capabilities and relationships (Fuller et al. 2019).

The digital ecosystem in the labour market can be viewed by both the job seeker and the employer. Any combination of systems and technologies used for attracting workers (job candidates) on the one hand and for finding employment opportunities on the other, in a digital environment can be considered a digital ecosystem of the labour market. The digital ecosystem of the labour market must be open and create a digital environment to bring together its participants: jobseekers, employers, employment intermediaries, and government agencies (Fig. 1).
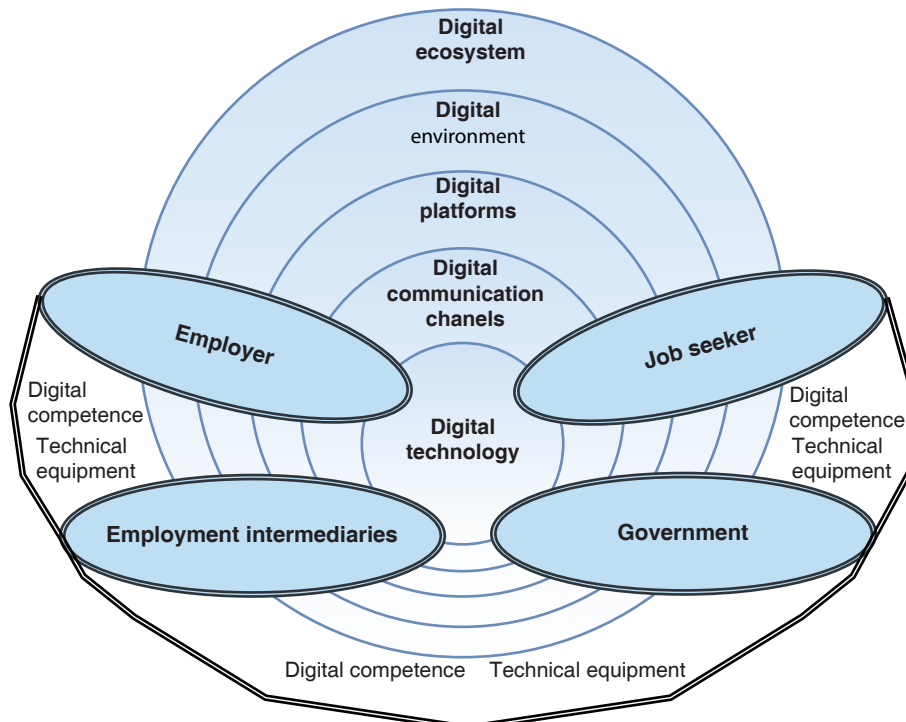

Figure 1. The digital labour market ecosystem

Source: Own elaboration.

The main prerequisites for the successful functioning of the digital labour market ecosystem include state support and the technological equipment of its stakeholders. In our opinion, the main

problems of the digital labour market ecosystem in Ukraine are as follows: the discrepancy between the job seekers' characteristics and the requirements of vacancies; the employer's significant financial costs to attract a suitable employee; the difficulty in checking the candidate's qualifications before accepting them to the organisation; too many available employment opportunities for job seekers due to duplicating the same vacancies on different platforms; and generality about job responsibilities and requirements for candidates in particular vacancies.

Therefore, we need a single digital labour market environment, where all stakeholders will interact according to certain rules; they should be transparent and understandable to all. The labour market digitalisation is aimed at optimising the processes of interaction between various stakeholders through digital social, mobile, analytical, and cloud technologies. This will allow stakeholders to increase their effectiveness and efficiency, thus saving financial and time resources. The digitalisation of the recruitment process involves the transfer to the digital environment of all the processes for search and selection, talent management, etc.

Digital tools for interacting with job sites are implemented through a software for vacancy announcements (Job board software – JBS). These are search engines that collect job lists from employers and other sources, and organise them into an easy-to-use database. Their search features allow users to place and filter tasks based on keywords related to location, position, industry, and salary. Some JBSs are general, while others specialise in specific economic activities, such as finance, IT, or agriculture. The job posting software is multifunctional, serving job seekers, employers (looking to fill their vacancies), and companies (looking to create job sites and job boards).

According to Baquiche (2020), JBS is a popular vacancy announcement software that allows entrepreneurs, community managers, and publishers to create niche whiteboards such as RemoteOK, AngelList, or UnicornHunt quickly and without writing a single line of code. JBS allows websites to host a vacancy board such as Glassdoor or Indeed. It is designed to connect employers with candidates and enables them to post and promote vacancies, allowing candidates to sign up and apply for relevant job advertisements (Baquiche 2020). There are many options for JBS software for both recruitment agencies and in-house staffing services. Each of them has unique features and business requirements. It is possible to select the type of software for vacancies that correspond to the appropriate field of business and usage, i.e. for public use, for colleges and universities, for enterprises for internal recruitment, for local vacancy sites, for recruitment agencies, etc. As pointed out by Capterra (2022), JBS's security software helps companies advertise for job openings, both internally and externally.

Bamieh and Ziegler (2020) justify the rapid increase in JBS usage, which is due to severe restrictions, social distancing, and increased involvement of staff working from home. They predict that the changes will have a lasting impact on work organisations and employers becoming more open to remote recruitment. The authors emphasise that to measure the impact of the labour demand, it is optimal to research online job sites, and JBS is a direct indicator of the current labour demand, as all changes can be observed in real time (Bamieh and Ziegler 2020). Arthur (2021), who identifies the JBS as the main source of information on the labour market during the global COVID-19 pandemic and the lockdown policy, holds a similar view. Researching the labour market and understanding its effects requires obtaining and analysing data as close as possible to real time, especially if the rules change rapidly and local lockdowns are introduced. In this regard, the author recommends using data from JBS and websites in labour market research, offering an open methodology that provides a quick and detailed survey of the labour market in such unpredictable conditions, and describes web apps that allow stakeholders to obtain such data (Arthur 2021).

In Ukraine, the usage of JBS intensified during the COVID-19 pandemic and over the past few months, as Russia's military invasion of Ukraine has become widespread. The war forced many people to change their qualifications as well as it caused unemployment. The results of a sociological survey by the Rating group show that more than half of the employed citizens (53%) (1,000 people were interviewed) lost their jobs due to the war. Slightly less than a quarter (22%) of people continue to work as usual, and almost as many (21%) have switched to remote work or work part-time. Very few citizens got a new job (only 2%). Sociologists note that this situation in the labour market indicates not only economic problems, but also psychological ones. Losing a job adds to uncertainty; change is always associated with anxiety about the future and the relatives. Residents

of the eastern regions (74%), internally displaced persons (66%), and young people under 35 (60%) suffer the most.

In such conditions, many enterprises in Ukraine were forced to switch to remote work. For some businesses, the remote format is very common. The rest must adapt, as this situation will perhaps last for many months. Therefore, the best thing a company can do to operate effectively is to establish a good relationship with its employees and potential candidates. Changes in communications between operational management, HR managers, and potential candidates require appropriate software support. Not everyone can quickly and efficiently adapt to new circumstances. After all, most people are used to working in the office. Likely, standard approaches in HR and recruitment will also change. Therefore, it will be suitable to adopt the IT representatives' methods in recruitment.

For employer companies having open vacancies, vacancy announcement software links them to potential candidates, providing an easy-to-use database where vacancies can be placed, therefore digitising the hiring process. Employers can post vacancies and track all activities on their vacancy lists. Some vacancy notice boards also allow employers to search for resumes and then contact potential employees registered on the platform.

Companies that create a vacancy bulletin board need appropriate instruments. Some of them use an unbranded vacancy bulletin board software (the so-called "white label software") to publish and monetise vacancy announcements on websites, while others use these solutions to develop new vacancy bulletin boards. These solutions allow companies to create compelling contents that give job seekers easy-to-use search options and provide recruiters and other HR-professionals with the opportunity to attract talents. They can also deliver automated job advertising, user profile analysis, and more.

For job seekers looking for new career opportunities, vacancy bulletin boards provide a variety of search options, including location filters, job description keywords, and salary levels. Once they find the list they want, job seekers can get additional information on each position and find links to submit resumes, portfolios, or additional questions. Separate job portals allow job seekers to upload resumes or integrate LinkedIn profiles, so they can easily apply for all vacancies.

Depending on how stakeholders use the software to place vacancy announcements, in our opinion, the following types can be distinguished (Fig. 2).
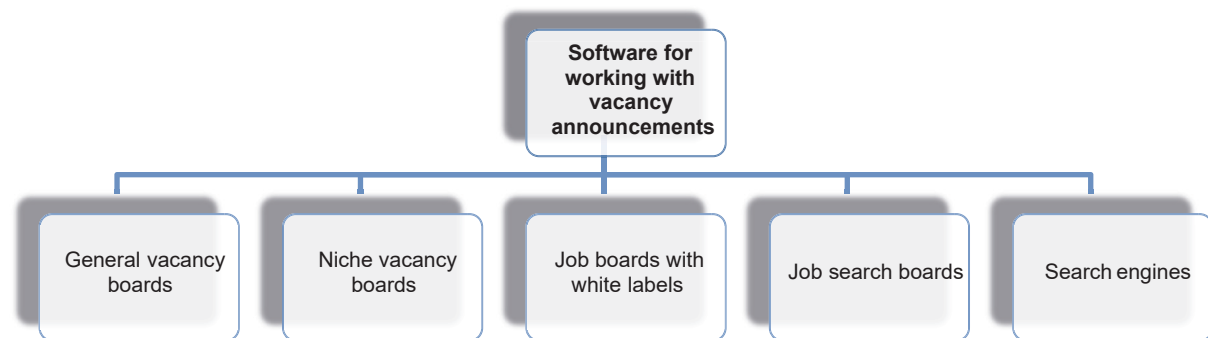

Figure 2. Types of software for working with vacancy announcements

Source: Own elaboration.

Some JBSs offer portals and platforms for general or traditional vacancy types, while others have specialised areas with a narrowly defined platform for more niche positions. To attract the most qualified candidates for the vacancy, employers need to focus on placing vacancies on the relevant vacancy notice boards. It should be noted that many companies place ads on several portals and platforms at the same time, and job seekers also often search on different sites. Therefore, if companies evaluate proposals of several bulletin boards and believe that each of them can offer different benefits, they should consider a subscription to the optimal number of them. For employers who tend to either join that digital environment or just post vacancy announcements on the company's website, it would be optimal to use a white-labelled job posting software that provides a wide range of JBS tools. These solutions often include design tools, social media integration, SEO tools, tools

for integrating a whole network of vacancy bulletin boards, recruiter and employer interfaces, back-office software solutions, and more. There are free bulletin boards in this software segment, which typically monetise features such as website hosting, product support, and installation.

Other portals and platforms offer similar services by providing databases for vacancies, but they are not affiliated with companies that may place vacancies. Instead, search engines create vacancy lists that have already been posted on other portals and platforms, and compile them into a general, user-friendly list. Some of these platforms offer two options; both provide companies with digital tools to work with candidate databases and provide job seekers with aggregate lists of vacancies from other sites. Therefore, when choosing the optimal job portal to attract candidates, HR managers need to consider whether the solution excludes employment opportunities from the Internet or enables only creating lists of vacancies that are downloaded separately.

In addition, the effectiveness of interaction with job portals can also be increased with additional features, such as hosting on a web server or client server (software to work with vacancy announcements can be purchased as a separate licence and hosted locally through client servers, or it can be stored in a cloud); classification and distribution of vacancy announcements, when employers can place vacancies on a network of several job sites, which includes job portals, bulletin board platforms, job aggregators, job search engines, and social networks; big data collection and analysis, which is accomplished by some JBS to give an idea of vacancy announcement contents and gather various analytical data on the outcomes of bulletin board functioning.

Opportunities to involve different categories of personnel and close vacancies promptly depend on the segment of the labour market, which is covered by specific job portals. The specification of a particular segment will be related to the specialisation of JBS: the general specialisation focuses on providing a full range of vacancy announcement tools, including company profile design tools, customisable templates, resume-search capabilities, employer dashboards, payment gateways, recurring subscriptions, SEO tools, marketing, and integration with platforms such as Google Job Search and job aggregators; industry specialisation is manifested in the fact that common JBS's searching capabilities allow users to filter results based on keywords, industries, and job responsibilities; some job portals specialise in certain areas or segments of the labour market, accepting only specialised vacancy announcements, which facilitate the recruitment of appropriate employee by the employer; local specialisation is important if the employer is not focused on freelancers or remote workers, and the location of the candidate is a key requirement (in such circumstances, if the employer and the candidate do not want to discuss the issue of relocation, then the candidate's proximity to the workplace would be decisive); regional specialisation is typical for JBS, which indicates only vacancies in a particular region (although technically they allow messages to be posted from anywhere, but can relate to a specific region, depending on the company employer and the job seeker who use the job portal).

Job search and recruitment platforms are equipped with a great number of lists and additional resources, such as career coaching, resumes, and blog posts, with useful tips. Using a job search website is one of the best and most effective ways to find and apply for dozens of opportunities.

To choose the best network channel for recruiting, you need to research the various websites available for job search and recruitment. In our opinion, companies make such a choice based on a consistent analysis of the job portal considering the following indicators and characteristics: job offers and resumes on each site, user's interface, potential total costs of services, staff recruitment fees, availability of extended functions, candidates' experience coverage (resume), and the reputation of a job portal. Many job portals were analysed according to the described algorithm. In turn, this allowed us to identify the best of them in the global JBS market: Indeed, Monster, Glassdoor, FlexJobs, The Ladders, AngelList, LinkedIn, LinkUp, Scouted, Snagajob, specifics and features of which had been studied in the authors' previous publications (Glassdoor 2022; Polner 2022). The results of the research show that job portals are both search engines and databases for vacancies; they offer premium services for job seekers, such as career coaching, cover letter-writing techniques, etc.; they help candidates with any level of education and experience to find a job in any field; most of them are free in terms of searching employment opportunities.

In addition to international job portals, we researched more than two dozen different websites related to the local Ukrainian market. That made it possible to identify local specifics and make

recommendations on how to exploit these resources effectively. Generalised recommendations on the Ukrainian recruitment process and job portals in terms of remote recruitment had been studied in the authors' previous publications (Kravchuk et al. 2021a; Kravchuk et al. 2021b; Kravchuk et al. 2022; Varis et al. 2022). The most popular Ukrainian job portals were researched, namely: *Work. ua*, *Rabota.ua*, *Jobs.ua*, *Eurabota*, and *Grc.ua*. The war has affected all spheres of life, including the labour market; tens of thousands of people lost their jobs, while organisations and businesses lost their personnel. All statistical data on the Ukrainian labour market is published by the State Employment Centre. The list of vacancies is updated on a daily basis. As of April 1, 2022, it comprises 33,528 vacancies. The digital ecosystem of the labour market elements that are relevant during the war is summarised in Figure 3.

Job search sites

- *Work.ua.* One of the most popular job search sites
- *grc.ua.* A well-known resource that publishes hundreds of vacancies every day
- *Robota.ua.* The "Vacancies for victory"section added

Job search platforms

- *Jooble*. Work on different schedules and areas, about 80 thousand vacancies
- *Jobs.Dou.* Vacancies for IT companies
- *Jobs for Ukraine.* Academic, scientific, artistic, professional, other job vacancies
- *Upwork.* Vacancies for freelancers
- *Робота в тилу.* Here you can also offer your help
- *Hire for Ukraine.* Posting resumes of HR managers, IT specialists, creative workers, builders, architects, the services sector
- *UA Talents.* Non-profit job search platform
- *ВзаємоДія.* The unit of job search sites. Here you can search for work in different countries and specialisations

Telegram channels for job search

- *RobotaNow.* Work for all specialisations and fields
- *Goodjob.* Vacancies in Ukraine and abroad, language courses, tips on how to make up a resume
- *Resume Vacancies.* Creative vacancies, volunteer proposals
- *Happy Monday.* Vacancies, recommendations
- *Zaichenko team.* Vacancies for journalists, design professionals, marketers, IT specialists
- *UaJobNow.* Employment in Ukraine, Europe, and remote jobs
- *Remote Job.* English-language channel with vacancies in the field of design, sales
- *Lobby X.* Working and volunteering opportunities in Ukraine

Figure 3. The labour market digital ecosystem's elements relevant during the war in Ukraine

Source: Own elaboration based on the TSN research.

To analyse the effectiveness of Ukrainian job portals for attracting employees, we studied the dynamics of supply and demand for labour on the two most popular local sites as of 15.06.2021 and as of 12.05.2022. The results are shown in Table 1 and Table. 2.

Comparing the dynamics of demand and supply for labour on *Work.ua* and *Rabota.ua*, we can conclude that the total demand in all areas of professional activity is greater on *Work.ua*, except for retail trade, agriculture, and law, where *Rabota.ua* predominates in several vacancies. As for supply, its volume is also larger on *Work.ua*, except for logistics, warehousing, customs; real estate; security, safety, and retail, with a significant predominance in logistics and retail. The latter indicates the greater popularity of *Rabota.ua* among job seekers in these areas. However, the quantity of resumes per one vacancy on *Rabota.ua* is higher in all areas of professional activity, except media, publishing; IT, computers, Internet; working specialisations, production; agriculture and agribusiness; telecommunications and communications; transport; HR; banks and finance; and jurisprudence. Therefore, except for the listed areas of professional activity, the opportunities for candidates at *Work.ua* are greater, as the labour supply for one vacancy is greater.

Table 1. Comparison of weekly dynamics of supply and demand for labour on *Work.ua* and *Rabota.ua* as of June 15, 2021

Fields of activity	Demand and supply of labour on *Work.ua*		Demand and supply of labour on *Rabota.ua*		Absolute deviation of supply and demand on *Work.ua* and *Rabota.ua*		Resume loading for 1 vacancy		Absolute deviation of Resume loading for 1 vacancy
	vacancies	resume	vacancies	resume	vacancies	resume	*work.ua*	*rabota.ua*	
Administrative and managerial staff	14 106	30 316	6 043	13 745	8 063	16 571	2.15	2.27	–0.13
Construction, architecture	65 82	4 641	3 326	2 763	3 256	1 878	0.71	0.83	–0.13
Accounting, audit, taxes	56 88	6 909	3 254	4 621	2 434	2 288	1.21	1.42	–0.21
Hotel and restaurant business, tourism	10 189	6 276	3 557	4 669	6 632	1 607	0.62	1.31	–0.70
Design and creativity	2 713	3 698	787	2 174	1 926	1 524	1.36	2.76	–1.40
Mass media, media, publishing	1 964	4 699	1 006	2 280	958	2 419	2.39	2.27	0.13
IT, computers, Internet	8 698	6 875	6 597	3 914	2 101	2 961	0.79	0.59	0.20
Beauty, fitness, sports, wellness	2 334	1 886	1 577	1 353	757	533	0.81	0.86	–0.05
Culture, music, show business	688	1 717	259	1 234	429	483	2.50	4.76	–2.27
Logistics, warehouse, customs	8 877	7 973	6 890	9 851	1 987	–1 878	0.90	1.43	–0.53
Marketing, advertising, PR	5 263	5 228	3 620	4 368	1 643	860	0.99	1.21	–0.21
Medicine, pharmaceuticals, healthcare	4 408	4 250	2 747	3 214	1 661	1 036	0.96	1.17	–0.21
Real estate	643	239	332	288	311	–49	0.37	0.87	–0.50
Education, science	2 759	5 255	900	2 563	1 859	2 692	1.90	2.85	–0.94
Security, safety	1 570	2 816	1 270	2 854	300	–38	1.79	2.25	–0.45
Sales, purchase	14 398	11 592	11 479	10 743	2 919	849	0.81	0.94	–0.13
Working specialties, production	16 428	10 328	13 991	7 984	2 437	2 344	0.63	0.57	0.06

Retail	9 791	11 071	12 053	14 048	−2 262	−2 977	1.13	1.17	−0.03
Agriculture, agribusiness	1 186	944	1 221	888	−35	56	0.80	0.73	0.07
Insurance	208	112	143	104	65	8	0.54	0.73	−0.19
Telecom and communications	4 335	3 484	1 440	516	2 895	2 968	0.80	0.36	0.45
Top management, senior management	1 113	4 753	610	2 573	10 503	2 180	0.43	4.22	−3.79
Transport, automobile business	7 498	6 487	1 694	1 111	5 804	5 376	0.87	0.66	0.21
Human resources	1 928	2 672	1 606	1 806	322	866	1.39	1.12	0.26
Banking and finance	3 646	3 954	2 797	1 740	849	2 214	1.08	0.62	0.46
Jurisprudence	1 019	2 417	1 024	1 853	−5	564	2.37	1.81	0.56
Other fields of activity	560	722	382	284	178	438	1.29	0.74	0.55
Total	148 592	151 314	90 605	103 541	57 987	47 773	1.02	1.14	−0.12

Source: Own elaboration based on the analysis and generalisation of job portals' data.

Table 2. Comparison of weekly dynamics of supply and demand for labour on *Work.ua* and *Rabota.ua* as of May 12, 2021

Fields of activity	Demand and supply of labour on *Work.ua*		Demand and supply of labour on *Rabota.ua*		Absolute deviation of supply and demand on *Work.ua* and *Rabota.ua*		Resume loading for 1 vacancy		Absolute deviation of Resume loading for 1 vacancy
	vacancies	resume	vacancies	resume	vacancies	resume	work.ua	rabota.ua	
Administrative and managerial staff	1223	21 209	1 188	13 467	35	7742	17.34	11.34	6.01
Construction, architecture	455	8 664	629	2 964	−174	5700	19.04	4.71	14.33
Accounting, audit, taxes	754	9 255	1 098	4 194	−344	5061	12.27	3.82	8.45
Hotel and restaurant business, tourism	801	8 523	743	4170	58	4353	10.64	5.61	5.03
Design and creativity	460	5 495	318	1 836	142	3659	11.95	5.77	6.17
Mass media, media, publishing	322	6 574	400	2 147	−78	4427	20.42	5.37	15.05
IT, computers, Internet	1367	10 167	2 000	3 767	−633	6400	7.44	1.88	5.55
Beauty, fitness, sports, wellness	461	2 082	601	928	−140	1154	4.52	1.54	2.97
Culture, music, show business	121	1 893	62	779	59	1114	15.64	12.56	3.08
Logistics, warehouse, customs	999	12 235	1 232	11 209	−233	1026	12.25	9.10	3.15
Marketing, advertising, PR	689	7 221	1 108	3 953	−419	3268	10.48	3.57	6.91
Medicine, pharmaceuticals, healthcare	783	5 654	1 134	2 601	−351	3053	7.22	2.29	4.93
Real estate	51	241	68	224	−17	17	4.73	3.29	1.43
Education, science	390	5 619	326	1 457	64	4162	14.41	4.47	9.94
Security, safety	161	3 336	209	1 934	−48	1402	20.72	9.25	11.47
Sales, purchase	1668	15 989	2 363	10 107	−695	5882	9.59	4.28	5.31
Working specialties, production	1742	16 783	3 169	15 636	−1427	1147	9.63	4.93	4.70

Retail	1 068	14 701	1 938	12 803	−870	1 898	13.76	6.61	7.16
Agriculture, agribusiness	257	1 110	473	811	−216	299	4.32	1.71	2.60
Insurance	27	136	24	63	3	73	5.04	2.63	2.41
Telecom and communications	524	5 546	456	569	68	4 977	10.58	1.25	9.34
Top management, senior management	242	4 724	191	1 918	51	2 806	19.52	10.04	9.48
Transport, automobile business	846	11 638	499	1 051	347	10 587	13.76	2.11	11.65
Human resources	226	3 156	384	1 605	−158	1 551	13.96	4.18	9.78
Banking and finance	423	4 706	436	1 014	−13	3 692	11.13	2.33	8.80
Jurisprudence	65	2 511	176	1 529	−111	982	38.63	8.69	29.94
Other fields of activity	2 501	29 034	952	7 595	1549	21 439	11.61	7.98	3.63
Total	18 626	218 202	22 177	110 331	−3551	107 871	11.71	4.98	6.74

Source: Own elaboration based on the analysis and generalisation of job portals' data.

Comparing the dynamics of demand and supply of labour after the war on *Work.ua* and *Rabota. ua*, it can be concluded that the volume of demand for labour on *Rabota.ua* is greater, except for administrative and managerial staff; hotel and restaurant business; tourism, design, and creativity; culture, music, and show business; education, science; telecommunications and communications; top management; insurance. Other areas of professional activity in terms of vacancies predominate on *Work.ua*.

As for the supply side, its volume on *Work.ua* is larger, and the predominance in all areas of professional activity is significant. The latter indicates the greater popularity of *Work.ua* among job seekers in recent times. In addition, the quantity of resumes per vacancy is higher on *Work.ua* both in total numbers and in terms of areas of professional activity. Considering contemporary realities, experts on the future of work, job training, and skills expect great demand in the field of construction for all specialists of all qualifications. The defence industry is going to receive an unprecedented boost. Without exception, all engineering specialisations will be in demand, as well as technicians and technologists who will be engaged in rebuilding destroyed plants, factories, and infrastructure facilities. The development of the energy sector will lead to a growing demand for energy specialists, where it is necessary to establish own gas production, as well as to develop energy production from renewable sources. Ukrainian businesses are already moving to digitalisation. Therefore, IT specialists in various fields will be wanted. Demand for all logistics specialisations is expected to increase. Drivers, port workers, and road builders will be wanted as well. Social professions such as medics, psychologists, and psychiatrists are extremely wanted today and will be wanted in the post-war period.

The Ukrainian and world labour markets will no longer be the same as before. The martial law in Ukraine is changing previous paradigms and principles for regional labour markets. Based on the study, it can be concluded that in the local labour market there will be persistent demand for jobs in the field of defence, construction, energy, medicine, IT, logistics, and sales. The analysis of regional vacancies' allocation in the aggregate demand for labour in Ukraine during martial law in March–May 2022 shows a significant and uneven labour demand in the resonance, which continues military action connected with the aggression of the Russian Federation (Figure 4).
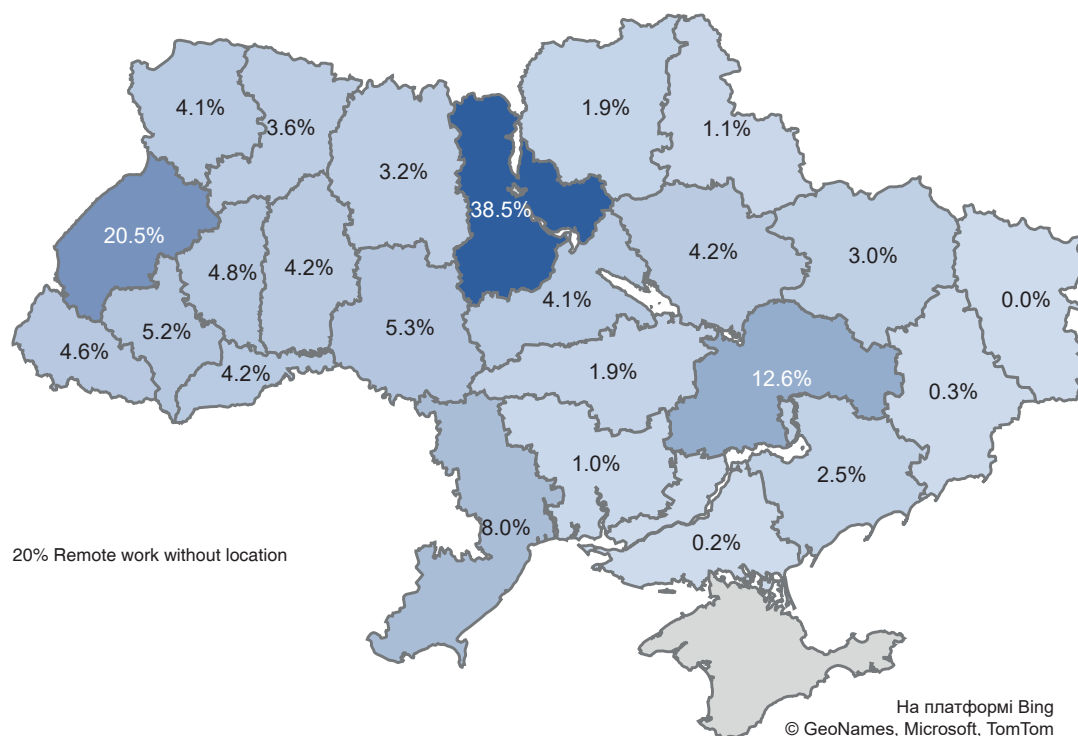

Figure 4. The share of regional vacancies allocation in the aggregate labour demand in Ukraine during martial law in March–May 2022

Source: Own elaboration based on the analysis and generalisation of job portals' data.

The share of demand for labour is too low in the regions bordering the territory of the Russian Federation and where hostilities are taking place (the regions of Kherson, Donetsk, Mykolaiv, Sumy, Chernihiv Zaporizhia, Kirovohrad, Kharkiv, Zhytomyr, and Rivne). Employment opportunities for Ukrainian workers are virtually non-existent in Donetsk, Luhansk, and Crimea. The average level of wages offered on digital platforms in Ukraine is also characterised by significant inequality (Figure 5).
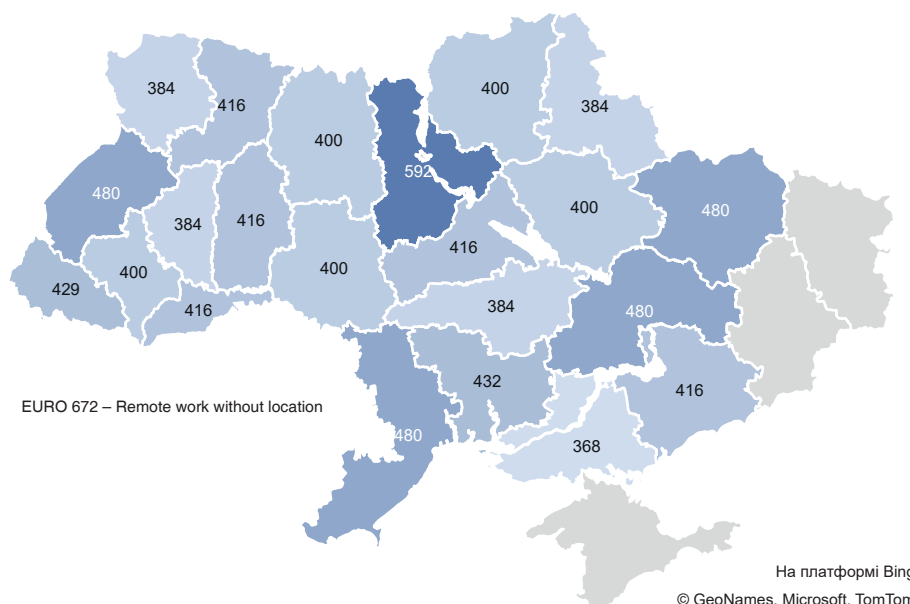

Figure 5. The average wages of regional vacancies in Ukraine during martial law in March–May 2022

Source: Own elaboration based on the analysis and generalisation of job portals' data.

An analysis of the regional distribution of average wages declared on digital platforms for recruiting personnel in Ukraine during martial law in March–May 2022 shows that it is significantly uneven. The highest salaries were in remote employment vacancies without being territorially tied to a particular region. In addition, higher average wages were in Kyiv, Lviv, Dnipropetrovsk, Odesa, and Kharkiv *oblasts* in March–May 2022. The level of average wages on digital platforms for recruiting personnel in Ukraine during martial law in March–May 2022 is around 490 euros (according to the exchange rate of the National Bank of Ukraine as of May 31, 2022).

This level of wages in Ukraine is much lower than in the European Union, as shown in Figure 6.
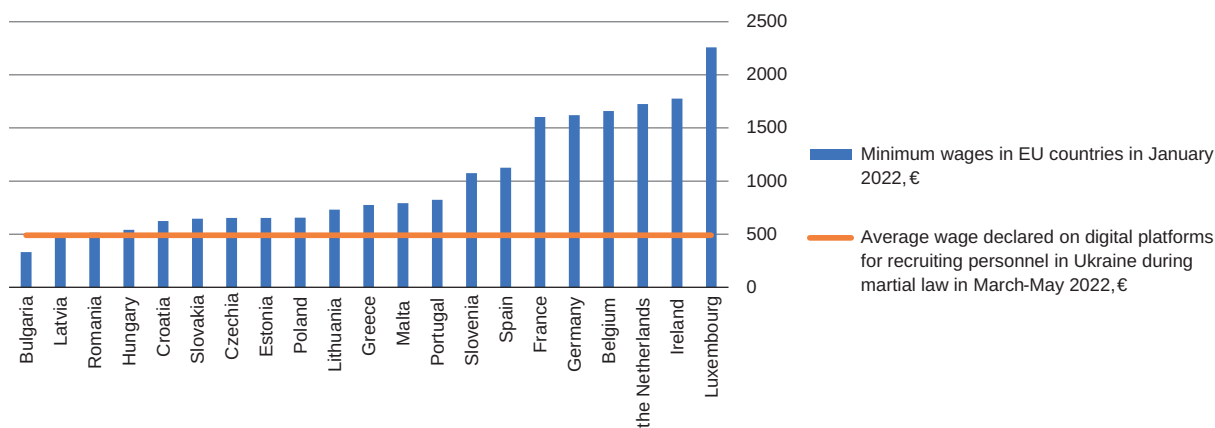

Figure 6. Comparison of minimum wages in EU countries in January 2022 versus average wage declared on digital platforms for recruiting personnel in Ukraine during martial law in March–May 2022

Source: Based on the Eurostat data (2022).

Difficult geopolitical and socio-economic conditions in Ukraine have led to a sharp migration of the labour force. During the period of martial law, more than 4 million refugees from Ukraine crossed the border with Poland after Russia's invasion on Ukraine from February 24 to June 16, 2022, according to Statista (2022). Polish *Seimas* praised the Law on Assistance to Ukrainians as a legacy of Russian aggression, which regulates the legality of the transfer and training of the Ukrainian population in Poland. With the legal stay of Ukrainians in the country, they can look for work and undertake work legally.

Citizens of Ukraine can apply for jobs not only on private sites, but also in the State Employment Centre of Poland through the Bureau of Practice. The most popular search tools are specialised sites: *Jooble*, *Europa.jobs*, *Jobs4Ukraine*, *UAtalents*, *Jobs.pl*, *Gowork.pl*, *Gumtree.pl*, *Pracuj.pl*, *The:protocol*, *OLX*. In addition, Polish sites for the recruitment of staff help Ukrainians in their job search, e.g. *Gumtree.pl*, *Gowork.pl*, *Jobs.pl* or *Pracuj.pl*. The *Pracuj.pl* portal has added the Ukrainian language and created a special bookmark "*Praca* | Work". Many employers who intend to employ Ukrainians post their offers under the Polish label "*zapraszamy pracowników z Ukrainy*". Also, the popular OLX website has opened a category "*Dla Ukrainy*", where a special tab "*Praca | Robota*" contains job offers for Ukrainians in Poland (Khmelnytska, 2022). If one has difficulty finding a job, there is an option to register with the employment service. In this case, citizens of Ukraine will be able to receive unemployment benefits, enrol in vocational training, or receive funding to start their own businesses.

In the absence of experience abroad, most Ukrainians do not have a holistic view of the specificity of employment in the European Union, including what permits are needed, how to choose an employer, and why vacancies which are popular with most migrants are not suitable for newcomers. These and other questions are always ready to be answered by specialised companies, namely employment agencies. The most popular are the following employment agencies: BVS work, Nordstaff Sp. z o.o, *Ewl.com.pl.*, *Randstad.pl*, *Workdepartment.pl*. Finding a job in Poland through social networks is one of the options, given that there have been a lot of specialised pages and groups recently. Polish social networks include *nk.pl*, *grono.pl*, *mojageneracja.pl*, *jakleci.pl*, and others. For example, *Mywpl.eu/* is a social network for migrants, a centralised resource where people who come to Poland can find information they need or ask questions in the user community. There is a forum, a feed with portal updates, an event section, a migrant video library, articles, a directory of educational institutions, and various resources.

Conclusion

The development of a labour market digital ecosystem due to increased recruitment through job portals can be successful through the usage of a job-posting software which provides effective tools for job applicants, employers seeking to close vacancies, and companies that want to create their job sites and vacancy announcements job boards. The main purpose of this software is to establish communication between employers and job seekers, to place and promote vacancies, and to enable various options for candidates to apply for a vacancy.

There has been a rapid increase in JBS usage in recent years in Ukraine due to severe restrictions, social distancing, and increased involvement of home-based staff, the global COVID-19 pandemic, and martial law. In such unfavourable socio-economic conditions, the JBS becomes almost the only place of direct operational interaction between the employer or the recruiting agency and the job seeker. Therefore, it is necessary to increase the efficiency of job portals as a basic element of the labour market digital ecosystem, which is possible through its digitisation through various types of specialised software: general and niche vacancy boards, vacancy bulletin boards with white labels, boards for job search, and search engines.

Opportunities to attract different staff categories and fill the company's vacancies quickly depend on the segments of the labour market, which are covered by specific job portals. The concretisation of a particular segment will be related to the features of the JBS, which include general, regional, local, and industry specifications.

The choice of job portal should be based on a consistent analysis of its indicators and characteristics, such as job offers and resumes, interface usability, potential total costs for recruiting the

personnel to an organisation, advanced features availability, vacancies coverage, candidates' experience coverage (resumes), and the reputation of the job portal. The analysis of many job portals made it possible to identify the best of them in the global JBS market. These include, in particular: Indeed, Monster, Glassdoor, FlexJobs, AngelList, LinkedIn, LinkUp, Scouted, Snagajob. They are both search engines and databases for open vacancies. The analysis of job portals in Ukraine shows the prevailing popularity of *Work.ua*, *Rabota.ua*, *Jobs.ua*, *Eurabota*, and *Grc.ua*. The recommendations developed by the authors regarding the Ukrainian job portals can be implemented into personnel management practice.

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