

# Prospects for the Development of the Digital Labour Market in Ukraine: The National and Regional Aspects

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## Abstract

The development of the Fourth Industrial Revolution has caused numerous problems in traditional labour markets, occurring both at the national level and the level of individual regions of the country. However, breakthrough technologies of the recent decade have initiated new forms of labour organisation, mainly digital jobs and the formation of a digital labour market, which contributes to solving the problems mentioned above. The paper's goal is to assess the readiness of the economy of Ukraine and its regions for forming a digital labour market to determine promising strategic directions for its development. The findings justify the significant prospects for developing the digital labour market in Ukraine at the national and regional levels. Also, they determine the priority types of digital jobs in selected regions as well as form the methodological basis, information, and analytical base of the organisational and economic mechanism for managing its development.

## Keywords

digitalisation of economy, Fourth Industrial Revolution, digital labour market, digital freelance, digital outsourcing, assessment of digital labour prospects, national and regional market levels

## 1. Introduction

Nowadays, digital technologies are actively implemented in almost all sectors of the world economy. A powerful impetus for their spread gave the beginning of the Fourth Industrial Revolution (Industry 4.0). It involves a combination of self-regulatory systems for various purposes (industrial, domestic, public administration, human activities, etc.) of human intelligence, information, and communications technologies (ICTs), and automated production (Schwab, 2017). Based on this, the digital economy, which is characterised by the digitalisation of business processes and their transfer to the Internet, is formed. Global experience shows that digital technologies of the Industry 4.0 are increasingly determining the competitiveness of national economies and individual business structures as their elements. In this context, there is a problem of determining the optimal strategies for the development of national economies in line with global trends in digitalisation, taking into account their existing potential. From this perspective, the digitalisation strategy can become the basis for advanced innovative development and ensuring high standards of quality of life in Ukraine, which, in turn, has a substantial potential for developing ICTs.

We should note that as the Industry 4.0 is developing, the share of living labour force, both physical and intellectual, is decreasing significantly. The ICTs of the Industry 4.0 play an increasingly important role in all spheres of human activity. New production technologies in various industries, new management methods at all stages of production, and the commercialisation of products are introduced. The ICTs of the Industry 4.0 also make substantial transformations in the methods of public administration, ensuring human life, etc.

However, the Industry 4.0 triggers many problems that can exacerbate social and economic contradictions and cause crises. Evidence shows that these problems are particularly acute in the labour markets and the staffing of enterprises and institutions in industries that actively implement the Industry 4.0 technologies. Moreover, it happens at the national and regional levels, which differ in the features of their socio-economic development. On the other hand, the ICTs of the Industry 4.0 creates conditions for solving the mentioned problems, mainly through developing digital employment and forming a digital labour market. Therefore, we consider the digital labour market as a global labour market segment. In this segment, the interaction of its subjects in creating, buying, and selling labour services (information products) and the formation of demand and supply takes place remotely and exclusively with the help of ICTs. In most cases, new forms of employment (informal employment) and new forms of labour relations are used in the digital labour market.

Accordingly, research aimed at identifying and analysing the problems of the impact of the ICTs of the Industry 4.0 on national and regional labour markets, as well as determining the prospects for developing digital labour markets of various levels to solve the outlined problems, are being updated. Their results should be the basis of the strategy of infrastructure support (personnel subsystem) for innovative development of the state and its regions in the conditions of the Industry 4.0 and the formation of digital economy.

## 2. Literature review

We consider it expedient to group them according to the following directions.

### *2.1. Study the influence of digital information technologies (ICTs of the Industry 4.0) on forming the digital labour market*

Recent studies show that computerisation threatens to reduce the number of jobs for low-skilled occupations (Frey and Osborne, 2017). At the same time, automation and artificial intelligence do not threaten to radically replace human resources at work (Acemoglu et al., 2020; Acemoglu and Restrepo, 2019). Even if we are increasingly dependent on information as a resource in the capitalist production process, the importance of human labour in this process does not diminish, including its role in the creation of added value (Cárdenas-García et al., 2019). ICTs also have a positive effect on the labour market: they facilitate the search for human resources, shorten the time it takes to find a job, increase the productivity of employees, improve the situation with the involvement of human resources in the economy through remote jobs, and provide access to education (Goloventchik, 2019). Yashchyk et al. (2021) raise the issue of the creation of a digital labour market by promoting the informatisation of society, which shapes the demand and supply of ICT workers. Zhang (2021) attempts to determine whether the digitisation of the labour market and the application of the platformisation of production can help overcome rural-urban inequality and create additional opportunities for rural and marginalised urban youth to achieve social mobility. Unfortunately, he concludes, recent trends in the digital labour market are reinforcing rather than overcoming inequality and stratification in rural China.

Nevertheless, in recent years, there has been an increase in vacancies with the requirement to work with the help of ICTs and remotely. It was especially evident during the COVID-19 pandemic, when companies were forced to reorient their operations to allow employees to work from home to avoid layoffs (OECD, 2021). Piroasca et al. (2021) prove in their work that the labour market has finally turned towards digitisation after the pandemic. The use of ICTs in one's professional activities will soon become a mandatory condition for almost all vacancies.

## **2.2. Study the specifics and types of digital employment and working conditions in digital markets**

Internet freelancing as an alternative form of work is gaining more and more popularity in research and practice. Independent workers offer services on digital labour platforms. Gussek and Wiesche (2022) created a model of IT freelancer career development and described the role of the team and digital work platforms in this activity. Soriano, Cabalquinto and Panaligan (2021) conducted a study on the role of workers on local digital platforms in the Philippine context in developing favourable attitudes towards digital labour markets. The work of Kuhn and Maleki (2017) is devoted to studying the peculiarities of human resource management by companies that engage employees through digital online platforms. Melián-González and Bulchand-Gidumal (2021) defined, analysed, and systematised the characteristics of the digital labour market. The obtained results deepen knowledge about working conditions in digital markets, their differences from working conditions in the traditional market, and specify the requirements for digital workers. In their research, Harmon and Silberman (2019) raise the issue of trade unions in the digital labour market. Based on the results of its application, they reveal a method of assessing working conditions on digital platforms to form practical recommendations for the social protection of workers in digital markets.

## **2.3. Study of the peculiarities of the formation of the digital labour market in Ukraine**

Azmuk (2020) investigates the transformation of Ukraine's labour market during the transition to digital economy. He identified the main trends of the labour market of Ukraine and performed a comparative analysis of them with world trends. He noted the structural changes in employment by sector, the level of flexibility of employment forms, and the level of digitalisation. He showed that digital platforms act as social elevators for highly qualified professionals. Their negative point is the spread of social, economic, professional, and other inequalities in the digital space. Based on the research, the author proposed measures to harmonise the labour market during the transition to digital economy. Chervinska (2021) analyses the impact of digitalisation on the formation of the digital labour market in Ukraine, as well as its structure, state, and development trends. She outlines the positions of Ukrainian specialists in various types of digital employment on global digital markets and notes the prospects for developing the Ukrainian digital market. Pyshchulina (2020) reveals the influence of information and computer technologies (ICTs) on the formation and development of the digital economy of Ukraine. She compares it with the processes of its formation in many world countries. She pays considerable attention to analysing the impact of digitalisation of the economy on the formation of the digital labour market. She considers the impact of ICTs and digitalisation in general on the main types of digital activities: freelance and outsourcing.

However, a quantitative assessment of the prospects for developing the digital market in Ukraine has not been provided yet, which does not allow for making informed management decisions regarding the development of strategies for its further development.

Summarising the results of the analysis of literary sources, we can note that despite considerable progress in research, many topical issues still need to be resolved. For example, issues are related to the evaluation according to formalised procedures of the readiness of the country's economy and its regions, in this case of Ukraine, for forming a digital labour market. Moreover, issues are related to determining promising directions for developing the digital labour market at the national and regional levels, analysing alternative options, and selecting the best given external conditions and existing potential.

## **3. The purpose and objectives of the study**

The aim is to assess the Ukrainian economy's and its regions' readiness to form a digital labour market to determine promising strategic directions for its development and solve problems caused by the Industry 4.0 in traditional labour markets.

To achieve this aim, we formed the following tasks:

- identify problems in the labour market caused by the Industry 4.0, as well as outline the main approaches to solving them;
- assess the level of readiness of Ukraine for the development of digital economy;
- determine the prospects and problems of the formation and development of digital labour market in Ukraine;
- determine individual features of the development of digital labour market in the regions (based on the example of freelancing as the primary type of digital employment), build profiles of the regions (the main cities as their representatives) from the positions of the state, trends, and prospects for the development of the main types of freelancing in them.

#### **4. Materials and methods of research**

We used the following methods in the research process. First, we used the literature analysis and method of logical generalisation in identifying and systematising the problems caused in the labour market of the Industry 4.0, as well as the main approaches to their solution – in identifying market opportunities and threats, as well as the strengths and weaknesses of Ukrainian digital freelance and outsourcing – when determining the features of the regional development of the digital freelance market. Second, system analysis of indicators in the Network Readiness Index (Dutta, Lanvin, 2021) – in the formation of a factual basis for assessing the internationally recognised indicators of the level of readiness of Ukraine for the development of digital (network) economy. Third, the method of SWOT analysis – to substantiate the feasibility of developing promising activities in the digital labour market in Ukraine. Fourth, the method of expert assessments – in assessing the strength and weaknesses of the types of digital employment on the prospects for the realisation of existing market opportunities and counteraction to market threats in the development of these types. Finally, methods of analysis and synthesis, comparative analysis – in improving the methodological framework for assessing the level of readiness of the country and its regions for the development of digital economy; in improving the method of SWOT analysis; during building profiles of the main cities that characterise the specifics and prospects for the development of types of digital freelance in the regions of the country. The approbation of the developed approaches was executed in analysing problems and prospects, as well as in substantiating the development of digital labour market in Ukraine and its regions.

#### **5. The results of a study to assess the readiness of the Ukrainian economy to form a digital labour market and the choice of promising areas for its development**

##### **5.1. Problems in the labour market caused by the development of the Industry 4.0. Approaches to solving**

The literature analysis to determine the essence of the Industry 4.0 technologies and the consequences of their implementation in various spheres of human activity allowed us to systematise the primary labour market problems caused by the Industry 4.0. Table 1 provides a brief description of these problems as well as their main reasons related to the development of the Industry 4.0 in the world.

**Table 1.** Problems in the labour market caused by the development of the Industry 4.0

Problems	Reasons
1. Unemployment in the so-called Third World and developing countries	Return of automated production to developed countries
2. Loss of relevance of traditional professions and the need for new ones	The collapse of traditional industries and the emergence of new industries and sectors
3. Functional and technological unemployment	The radical changes in production and management technologies
4. Underemployment, lack of social guarantees and protection of labour rights, anti-sociality	New forms of work organisation and new forms of labour relations, for example, freelancing or outsourcing, are effective in the Industry 4.0 conditions
5. Disappearance of needs in professions that involve monotonous, algorithmised activity (physical or mental)	Automation of production and management, artificial intelligence, self-learning of machines and equipment
6. Needs for constant training and retraining	Rapid changes in equipment and technologies
7. Psychological problems of people caused by machines make decisions. Human-machine conflicts	Artificial intelligence in management
8. Exacerbation of the problem: talent – mediocrity	In the conditions of automation and implementation of artificial intelligence systems, only creative activity is entrusted to a person
9. Exacerbation of the problem: the owner of capital (physical or intellectual) is an employee	The reduction of the role of humans (except talented creative workers) in automated systems of both production and those that provide services
10. Intellectual and technological inequality. Geographic inequality (city – village)	The spread of ICTs in ensuring human life (banking, public administration, the Internet of Things, etc.) in conditions of unequal access to the Internet, as well as to relevant gadgets

Source: Own elaboration.

Based on the analysis of literature sources devoted to the problems caused by the introduction of the Industry 4.0 technologies (Table 1), we identified the main approaches to their solution. According to the results of systematisation, the following groups are recognised:

1. The development and implementation of state employment programmes and/or other ways of their financial support, e.g. the introduction of unconditional basic income (experiments in this direction, with some success, are/were being conducted in several countries, including Finland, Italy, Spain, and others).

2. Purposeful stimulation of the processes of formation and development of the digital labour market as promising from the standpoint of employers and employees in the deployment of the Industry 4.0.

3. Improving the legislative regulation of new forms of labour organisation, in particular digital freelance, etc.

4. State stimulation of opening in educational institutions of different levels of innovative actual directions and specialties of preparation. An example is the Bachelor's training in the programme 'System Engineering (Internet of Things)' at the National University Lviv Polytechnic (Institute of Computer Technology, Automation, and Metrology) in Ukraine.

5. Introduction of various programmes of retraining and advanced training of experts (on various technologies and forms of training) on new, actual conditions of the Industry 4.0 directions and specialties of preparation.

6. The simplification, reduction of bureaucracy, increasing the efficiency of licensing and accreditation procedures in educational institutions of different levels of innovation relevant to the conditions of the Industry 4.0 specialties of training/retraining.

7. Opening and comprehensive implementation of free education programmes for the elderly, particularly ICTs users. For example, the service 'Diia', which implements the concept of 'State in a smartphone', Ukraine.



8. Technical support for the availability of digital business, development of digital employment, and distance education in different regions (in particular, high-speed Internet coverage of all regions of the country, as the current situation is unsatisfactory).

The identification and systematisation of approaches to solving the main problems in the labour market, which are caused by the deployment of the Industry 4.0, shows that a significant part of these problems can be solved by forming and developing the digital market. Experience indicates that the formation of a digital market is beneficial to both employers and employees. The development of the digital market makes it possible to align their interests.

**5.2. Assessing Ukraine’s readiness level for the development of digital economy**

The Network Readiness Index (Dutta, Lanvin, 2021) generalises countries’ readiness for digital (network) economic development. The rating is based on a score of countries on four complex indicators: technology, people, governance, and the impact of digitalisation. However, only the rating does not give an accurate idea of the chances of a specific country (Ukraine in particular) to form digital economy. In particular, the difference in the scores of countries whose ratings differ significantly (by 8–10 or more positions) may be within 1–2 points, which indicates their approximately equal readiness. The rating assessment, based on the point score of each of the four complex indicators and their generalisation into an integral indicator, can lead to gross errors. They are failing to realise the available favourable opportunities for the development of digital economy – in the case of the devaluation of the country’s readiness level; wrong choice of digitisation strategies – in the case of revaluation. In the first case, there is a risk of lost opportunities, and in the second one – direct losses are associated with the adjustment of strategies. In this situation, it is advisable to determine a specific country’s level of readiness for the development of digital economy according to each of the four comprehensive indicators of the Network Readiness Index rating compared with other countries on a verbal-numerical scale. To numerically assess a country’s level of readiness for the development of digital economy, we used the approach (Illiashenko et al., 2021) which involves the normalisation of their scores on some complex indicators:

$$O_N = \frac{(B_A - B_{min})}{(B_{max} - B_{min})}, \tag{1}$$

where:  $O_N$  – normalised assessment of the analysed country’s indicator,  $B_A$  – actual point assessment of the analysed country’s indicator,  $B_{min}$ ,  $B_{max}$  – respectively, the minimum and maximum point assessment of the indicator from all compared countries.

We propose to interpret the  $O_N$  scores calculated according to a formula (1) using Harrington’s verbal-numerical scale (Harrington, 1965), taking into account the associated level of risk (Illiashenko et al., 2021). The essence of the interpretation is clear from Table 2.

**Table 2.** Assessment of the level of country’s readiness for the formation of the digital economy and the associated risk

Range of values $O_N$	Readiness level	Risk level
0.00–0.20	Very low	Disastrous
0.21–0.37	Low	Critical
0.38–0.63	Average	Increased
0.64–0.80	High	Minimum
0.81–1.00	Very high	Conditionally absent

Source: Own elaboration.

The proposed approach is based on Network Readiness Index scores. Their use allows for determining verbally and numerically the level of readiness of the analysed country relative to other countries for developing digital economy and the accompanying risk.

According to the proposed approach and the data (Dutta, Lanvin, 2021), a normalised assessment of Ukraine's readiness to form a digital economy was performed (Table 3).

**Table 3.** Initial data and results of calculation of normalised values of complex indicators of readiness of Ukraine for the formation of the digital economy, 2021

Indicator	Compared countries, score		Evaluation of Ukraine		
	Max	Min	Score	Normalized	Level
Technology	Switzerland 85.67	Congo 6.45	41.51	0.44	Average
People	Denmark 80.81	Chad 8.25	48.87	0.56	Average
Management	Norway 90.3	Yemen 16.95	58.19	0.56	Average
Influence	Singapore 88.17	Chad 21.32	49.16	0.42	Average

Source: Own elaboration.

As follows from Table 3, according to all complex indicators, Ukraine has an average level of readiness for the formation and development of digital economy. It corresponds to an increased level of risk. However, this is only a generalised assessment that needs to be clarified by the type of digital employment. There are two main types of digital employment: digital freelance and digital outsourcing (from now on: freelance and outsourcing).

Freelancing is a form of digital employment evolving worldwide in the 21st century. According to the data of Pyshchulina (2020, p. 59), 2018 68% of freelancers worked in North America, 51% – in Europe, 21% – in Latin America, 18% – in Asia, 15% – in Australia, 9% – in the Middle East, 7% – in Africa from the total number of freelancers in the world. According to a paper by Cutter, Litan and Stangler (2016), the total share of freelancers in the United States is 34% of the total population (53 million people), and this share has a clear upward trend. Freelance is developing intensively in Ukraine. According to the growth rate of the freelance market in 2019, Ukraine ranked 5th in the world (Payoneer, 2019). Ukrainian freelancers occupy high positions in programming, which is promising from the standpoint of the introduction of the Industry 4.0 technologies. Such kinds of specialists primarily work as freelancers in Ukraine. For example, these are young people (university graduates) with a sufficiently high level of education who cannot find work according to their preferences through traditional forms of employment. Also, these are experienced specialists who have reached a high professional level but, due to many reasons, are not satisfied with career growth or are not satisfied with traditional industrial and legal relations.

According to the paper data of Pyshchulina (2020, pp. 62–66), digital outsourcing has become widespread in recent decades. It involves the transfer to third parties of business processes or parts thereof using computer programmes and the Internet. The most popular areas of outsourcing services are IT, quantum computing, financial technology, artificial intelligence, machine learning, cybersecurity, cloud computing, and more. Unfortunately, Ukrainian specialists in digital outsourcing have other positions in world markets than their counterparts from China or India. However, in recent years, they have become increasingly popular (TechExpert, 2021). Given the rapid growth of business needs in digital outsourcing and the growing position of Ukrainian specialists in the market, it is advisable to assess the prospects of this type of digital employment in Ukraine.

### 5.3. Assessment of problems and prospects for developing digital freelancing and outsourcing as types of digital employment in Ukraine

We propose their interpretation of the SWOT analysis for evaluation. It allows for a detailed assessment of market opportunities and threats to developing the specified types of digital activities. Table 4 presents a corresponding matrix of SWOT analysis built to assess the prospects and problems of digital freelance development in Ukraine. In the cells of the Table 4, estimates characterise the degree of influence of the strengths and weaknesses of freelancing on the prospects of using current market opportunities and countering market threats. Rating scale: 4 – significant positive impact; 3 – average positive influence; 2 – insignificant positive impact; 1 – practically does not affect; 0 – negative impact.

We used the expert method for the evaluation. The experts were freelancers. The sums of ratings, placed in the cells of Table 4, were calculated (by rows – for opportunities and threats, by columns – for strengths and weaknesses of the organisation's activities). At the same time, a more significant amount in a row (for opportunities) indicates better market opportunities. A smaller amount (for threats) indicates the most severe threats. A more considerable amount in a column (for strengths) indicates the strongest sides of the activity. A smaller amount in a column (for weaknesses) indicates the weakest aspects of the activity.

According to the calculation method, the best market opportunities are entering high-profit (usually foreign) markets – 22 points; expanding the scope of work for freelancers under the Industry 4.0 conditions and employers' interest in attracting specialists under freelance conditions – 21 points each. On the other hand, the biggest market threats are limited types of activities suitable for freelancing and the need-to-know foreign languages – 10 points each.

The most vital points of Ukrainian freelancing are substantial human resources and the high image of Ukrainian freelancers – 24 points each. The weakest: income instability and lack of social guarantees – 5 points each

**Table 4.** SWOT analysis of the development of digital freelancing in Ukraine

External conditions		Characteristics of Ukrainian freelancing										TOTAL
		Strengths					Weaknesses					
		Strong human resources	High image of Ukrainian freelancers	High level of motivation	Attractiveness of working conditions for freelancers	Possession of IT technologies	Instability of income	Lack of social guarantees	Constant job search and its variety	Permanent self-organisation	Lack of communication with colleagues	
Opportunities	the Industry 4.0 expands the scope of work for freelancers	4	4	4	3	3	0	0	1	1	1	21
	Growing interest of employers	4	4	4	3	3	0	0	1	1	1	21
	Access to high-yield markets	4	4	4	3	3	1	1	1	1	0	22
	Availability of software and hardware	2	2	2	2	3	0	0	1	1	1	14
	The wide range of freelance exchanges and platforms	3	3	3	3	3	1	1	1	1	1	20
Threats	Legislative unsettledness	2	2	1	2	1	1	1	1	1	1	13
	The need-to-know foreign languages	1	1	1	1	1	1	1	1	1	1	10
	The need to form a rating	2	2	1	1	2	1	1	1	1	1	13
	Limitation of activities for freelancers	2	2	1	1	1	0	0	1	1	1	10
TOTAL		24	24	21	19	20	5	5	9	9	8	

Source: Own elaboration.

An assessment of the prospects and problems of the development of digital outsourcing in Ukraine was carried out using a similar approach (Table 5).



**Table 5.** SWOT analysis of the development of digital outsourcing in Ukraine

External conditions		Characteristics of Ukrainian outsourcing									TOTAL
		Strengths				Weaknesses					
		High qualification of specialists	High level of motivation	Attractive working conditions	Possession of IT technologies	Instability of income	Lack of social guarantees	Constant search for work and its variety	Constant self-organisation	Lack of communication with colleagues	
Opportunities	the Industry 4.0 expands the scope of work for outsourcing	4	4	3	3	0	0	1	1	1	17
	Growing demand for specialists from Eastern Europe	4	4	3	3	0	0	1	1	1	17
	Access to high-yield markets	4	4	4	3	1	1	1	1	1	20
	Availability of technology programs	2	2	2	3	0	0	1	1	1	12
	A wide range of platforms	3	3	3	3	0	0	1	1	1	15
Threats	The need-to-know foreign languages	1	1	1	1	1	1	1	1	1	9
	The need to form an image	2	2	1	2	1	1	1	1	1	12
	Limitation of types of activities for outsourcing	2	1	1	1	0	0	1	1	1	8
TOTAL		22	21	18	19	3	3	8	8	8	

Source: Own elaboration.

According to Table 5, the best market opportunity for developing digital outsourcing is to enter high-income markets. Total score is 20 points. On the other hand, the biggest market threats are limited activities for digital outsourcing – 8 points, and weak knowledge of a foreign language (according to the field of activity) – 9 points.

Ukrainian specialists' most vital points in digital outsourcing are high qualification – 22 points, and a high level of motivation – 21 points. The weakest are income instability and lack of social guarantees – 3 points each.

The SWOT analysis results indicate relatively high prospects for developing digital freelancing and digital outsourcing in Ukraine.

#### 5.4. Regional aspects of the state and development trends of the digital freelance market in Ukraine

Determining promising directions for developing the digital labour market in Ukraine requires the mandatory consideration of the regional features of the country in terms of their favourability/disadvantage for specific types of digital employment. For this purpose, we performed the analysis and systematisation of indicators of the state and development trends of the digital freelance market as the primary type of digital employment in the regions of Ukraine.

According to Ukrainian freelance exchanges, in particular, the leading Ukrainian freelance exchange *Freelancehunt.com*, nearly half of freelancers are concentrated in the five key gateway cities of the country: Kyiv, Kharkiv, Lviv, Dnipro, and Odesa (Table 6). These cities are, historically, the centres of the regions of Ukraine (without taking into account the occupied parts of Donetsk and Luhansk regions and the annexed Crimea), respectively: Centre, North, South, East, and West. The main contingent of freelancers from the specified regions, registered on the leading Ukrainian freelance exchange, is concentrated in these cities. This assertion gave reason to consider the specified cities as typical representatives of the respective regions, which reflect the regional features of the state and trends in the development of digital freelance.

**Table 6.** Distribution of freelancers by the place of residence

Places of residence of Ukrainian freelancers	2015		2022	
	Number	Share, %	Number	Share, %
Kyiv	11,670	29.18	31,948	20.61
Kharkiv	1,624	4.06	11,943	7.71
Odesa	1,511	3.78	9,160	5.91
Dnipro	1,562	3.91	8,521	5.50
Lviv	1,195	2.99	7,755	5.00
Total	17,562	43.92	69,327	44.73
Other cities and regions	22,438	56.08	85,673	55.27
Total in Ukraine	40,000	100.00	155,000	100.00

Source: Own elaboration based on (Freelancehunt, 2022).

At the same time, according to the data from the Ukrainian Ministry of Finance (Minfin, 2021), more than 54% of the accruals to Ukrainian freelancers fall on the above-mentioned cities. Out of them: Kyiv – 23%, Kharkiv – 13%, Lviv – 7%, Dnipro – 7%, Odesa – 5%. Furthermore, during the period 2019–2021 (the first quarters of the respective years were compared), an increase in the average income of freelancers has been observed: Lviv – by 33%, Dnipro – by 24%, Odesa – by 20%, Kharkiv – by 6%, Kyiv – by 5%.

During the same period, the share of freelancers working for foreign clients increased by 31%, and their income by 18%. As a result, the total number of transfers from foreign customers increased by 55% (Mind, 2021). In terms of those indicated in Table 6, cities experienced an increase in the number of freelancers working with foreigners: Kharkiv – by 1.5 times, Dnipro – by 1.5 times, Odesa – by 35%, Kyiv – by 23%, Lviv – by 12%.

According to Aleksynska et al. (2018), only 26% of freelancers identify as the source of their primary income the online platform. However, 74% of the respondents have other sources of income, including work in the offline economy. So, 64% work in offline companies and they consider freelancing as an additional income.

Table 7 compares Ukrainian freelancers' average incomes with the IT sector (offline) income for the first half of 2021.

**Table 7.** The median income of Ukrainian freelancers compared to the average income in IT companies in the 5 largest IT centres of Ukraine

Places of residence	Freelancers, USD	IT companies, USD
Kyiv	1,170	1,370
Kharkiv	1,440	1,570
Odesa	3,840	1,390
Dnipro	1,460	1,340
Lviv	1,360	1,480

Source: Own elaboration based on (Palchinska, 2021).

In Technological specialties were the main ones in the global freelancing market in 2015, while design (34%) landed at first place in the Ukrainian market (Yarova, 2015). Therefore, in the section of the cities considered above, the main types of freelancing developed in 2022 are presented in Table 8.

**Table 8.** The main types of freelancing that are developing in the largest cities of Ukraine in 2022

Types of freelance work, share in %	Cities of Ukraine					Ukraine in total
	Kyiv	Kharkiv	Odesa	Dnipro	Lviv	
Writing and Translation	25.72	25.63	27.57	28.72	27.42	37.17
Design	17.10	19.45	18.39	17.52	17.97	15.05
Programming	12.04	11.46	11.06	12.63	14.90	13.59
Advertising and marketing	8.85	7.84	7.69	6.80	6.80	5.74
SEO, SMM	8.32	8.64	7.34	7.39	7.08	5.74
Web-development	7.52	9.41	7.94	8.27	7.80	5.86
Audio, Video	8.20	6.39	7.19	6.88	6.80	6.81
Others	12.25	11.18	12.82	11.79	11.23	10.04

Source: Own elaboration based on (Freelance.ua, 2022).

Thus, the general distribution across Ukraine and the five analysed cities shows that the most significant number of Ukrainian freelancers concentrates on three categories: processing texts (except for copywriting and rewriting, this category includes translation and content of sites), design (design of sites and applications, branding and logo design, print design and layout, etc.), and programming. The subsequent four categories, by relative shares, have different ranking positions in different cities and Ukraine.

To compare the results and for further analysis, consider the distribution of vacancies by category on one of the largest international online platforms for freelancers (Table 9).

**Table 9.** Ranking of vacancies for freelancers by category on the international online exchange UpWork in 2022

Categories	Number of jobs	Share of category, %
Web, Mobile & Software Development	39,087	24.74
Design & Creative	30,753	19.46
Sales & Marketing	29,716	18.81
Writing & Translation	19,467	12.32
Admin Support	12,257	7.76
Accounting and Consulting	6,134	3.88
Engineering & Architecture	6,094	3.86
Data Science & Analytics	4,543	2.88
IT & Networking	4,002	2.53
Legal	3,446	2.18
Customer Service	2,502	1.58
Total	158,001	100.00

Source: Own elaboration based on (UpWork, 2022).

According to global trends, the most sought-after freelance categories are programming, design, sales and marketing, and writing. However, all other categories are significantly inferior regarding the number of vacancies offered.

Modern world trends in freelancing development are characterised by a tendency to transfer work from home to specially equipped places (co-working spaces). The number of premises that indicated co-working as their specialisation according to Google Maps in the leading IT centres of Ukraine: Kyiv – 176; Kharkiv – 33; Dnipro – 8; Odesa – 20; Lviv – 33.

Based on the analysis results, we developed profiles of the considered cities in terms of their suitability for developing various types of freelance work. To build a profile, we suggest taking into account the following parameters for each city:

- number of freelancers

- the total share of accruals (wages)
- trends towards the growth of the total share of accruals
- an increase in the number of freelancers working for foreign clients
- share of the most popular types of freelance work (programming, design, and marketing) according to global trends
- the ratio of earnings on freelance work and in IT companies
- the number of co-working spaces.

To determine the indexes of the respective cities, we propose to apply formula 1, and interpret them – the approach outlined in clause 5.2 of this article, which is based on the use of Harrington's verbal-numerical scale. The values of the actual ( $B_A$ ), and the normalised ( $O_N$ ) parameter estimates calculated according to formula 1, are given in Table 10.

**Table 10.** Actual and normalised assessments (calculated according to formula 1) of the main IT centres of Ukraine in terms of their suitability for freelance development

Indicators	Kyiv		Dnipro		Lviv		Odesa		Kharkiv	
	$B_A$	$O_N$	$B_A$	$O_N$	$B_A$	$O_N$	$B_A$	$O_N$	$B_A$	$O_N$
Number of freelancers	31,948	1.00	8,521	0.03	7,755	0.00	9,160	0.06	11,943	0.17
Total share of accruals, %	23	1.00	7	0.11	7	0.11	5	0.00	13	0.44
Tendency to growth in the share of accruals, %	5	0.00	24	0.68	33	1.00	20	0.54	6	0.04
Growth in the number of freelancers working for foreign clients, %	23	0.28	50	0.95	12	0.00	35	0.58	52	1.00
Total share of freelancers by Top 3 categories, %	37.99	0.38	36.95	0.00	39.67	1.00	2.76	0.07	0.92	0.66
Share of freelancers specialising in programming, %	12.04	0.26	12.63	0.41	14.9	1.00	11.06	0.00	11.46	0.10
Share of freelancers specialising in design, %	17.1	0.00	17.52	0.18	17.97	0.37	18.39	0.55	19.45	1.00
Share of freelancers specialising in marketing, %	8.85	1.00	6.8	0.00	6.8	0.00	7.69	0.43	7.84	0.51
Ratio of the salary of a freelancer to the salary in the IT company	0.85	0.00	1.09	0.12	0.92	0.03	20	1.00	33	0.03
Number of co-working spaces	176	1.00	8	0.00	33	0.15	37.14	0.07	38.75	0.15

Source: Own elaboration.

Table 11 presents profiles of cities in terms of their suitability for freelancing development (in general and its types). When they were being built, the estimates of  $O_N$  from Table 10 were used, and their interpretation is made according to Harrington's approach.

**Table 11.** Profiles of the largest cities of Ukraine from the standpoint of freelance development

Indicators		The level of development by indicators				
		Kyiv	Dnipro	Lviv	Odesa	Kharkiv
Number of freelancers		very high	very low	very low	very low	very low
Total share of accruals		very high	very low	very low	very low	medium
Tendency to growth in the share of accruals		very low	high	very high	medium	very low
Growth in the number of freelancers working for foreign clients		low	very high	very low	medium	very high
Total share of freelancers by Top 3 categories, %		medium	very low	very high	very low	high
Incl.	Programming	low	medium	very high	very low	very low
	Design	very low	very low	medium	medium	very high
	Marketing	very high	very low	very low	medium	medium
Ratio of the salary		very low	very low	very low	very high	very low
Number of co-working spaces		very high	very low	very low	very low	very low

Source: Own elaboration.

The parameters indicated in Table 11 testify to:

- the number of freelancers – the power (scale) of the freelance market;
- the financing share, and the financing growth – the financial attractiveness of the market for customers and the prospects for its growth;
- the increase in the number of freelancers focused on foreign customers – the increase in recognition by foreign customers (possibility of reorientation on foreign customers);
- the share of freelancers in the TOP 3 categories (in general and by main types) – market orientation (specialisation of freelancers);
- the salary ratio – the financial attractiveness of the market for freelancers;
- the number of co-working spaces – the availability of freelancing for employees, since not each can independently purchase expensive equipment and software (or its purchase is impractical for several reasons).

Table 11 reveals a significant difference in the development potential of digital freelance in the analysed cities (representatives of the regions of Ukraine). Kyiv is distinguished by the high power of the freelance market and, accordingly, a high share of funding in the total amount. It is due to the attractiveness of the capital given the opportunities for professional development and self-realisation for both young specialists who want to gain professional experience and “make a name for themselves” by working on freelance terms, as well as for experienced professionals who consider freelancing as an opportunity for self-realisation without bureaucratic and others restrictions. The particular market saturation explains the low financing growth level and foreign customers’ share. The market is oriented towards such a type of digital activity on freelance terms as marketing. It is attractive for young professionals (high level of saturation with co-working spaces).

The activities of freelancers in the city of Dnipro arouse the growing interest of domestic and foreign customers. The most exciting type of activities on freelance terms for them is programming.

The activities of Lviv freelancers are in growing demand among domestic customers. They specialise mainly in programming and, to a lesser extent, in design. The slight increase in demand from foreign customers is explained by the fact that specialists of the specified profiles have long been working under traditional forms of employment in the EU, with which the Lviv region directly borders.

The activities of Odessa freelancers are of interest to domestic and foreign customers. The priority types of freelance activities are design and marketing. The Odessa freelance market is quite attractive for freelancers, in particular, given the significantly higher salary in the freelance field compared to the IT field as a whole. We can explain this situation by a larger share of highly qualified freelancers than in other analysed cities. So, naturally, they claim a higher salary.



Freelancers in Kharkiv are in demand, especially among foreign customers. It is attractive for developing all types of digital freelancing from the TOP-3 category. Moreover, it is not by chance since Kharkiv is the second centre of education and science in Ukraine after the capital, indicating high-level specialists' presence.

Findings from Table 11 gives a view of the freelance development level in the largest cities of Ukraine, which are typical representatives of its regions. It can be used as an information base for substantiating the feasibility of developing specific types of freelance work in specified cities. It becomes especially relevant in the war and post-war periods (Russia caused the war by the attack on Ukraine) in the conditions of forced limitation and curtailment of many branches of economic activity and, accordingly, traditional labour markets (Belovolchenko, 2022; Lviv IT Cluster, 2022). The proposed approach and the formed information and analytical base can be used to assess the prospects for developing the digital labour market to compensate for losses in the traditional one. The increase in the share and number of freelancers working for foreign customers, as noted at the beginning of paragraph 5.4, as well as the increase in transfers from foreign customers, indicate the prospects for the freelancing development even in the event of a forced drop in demand from domestic customers.

## 6. Conclusions

1. We identified the main problems in the labour market of Ukraine caused by the Industry 4.0. Approaches to their solution are defined. It is shown that most of these problems can be solved by formatting and developing the digital market in Ukraine. Based on the analysis of literature sources and the generalisation of business practices in the conditions of the Industry 4.0, we concluded that the development of the digital market allows for reconciling the divergent interests of employers and employees.

2. We propose a methodical approach to assessing the country's level of readiness for developing the digital economy on a verbal and numerical scale. It is based on applying generally recognised indicators of the Index of readiness for the network (digital) economy. We propose to perform the normalised values of indicators of the Index of readiness for the network (digital) economy. They consider the point scores of the analysed country's indicators and the countries with the most significant and minor values of the corresponding indicator. It makes to evaluate the readiness level for each indicator on a single numerical scale (in the range of 0–1), increasing the assessment's validity and objectivity. The numerical values of the evaluation indicators, which correspond to the verbal assessments of the level of readiness for digitalisation and associated risk, are highlighted on the Harrington scale. In contrast to the existing ones, the proposed approach allows determining the level (and not the rating position) of the analysed country's readiness (relative to other countries) to the development of the digital economy and the associated with it risk, and reasonably developing measures aimed at reducing it.

The assessment results based on the proposed approach showed that Ukraine has an average level of readiness for developing digital economy according to each of the complex indicators of the NRI. Building a digital economy in these conditions is associated with increased risk. Considering the peculiarities of Ukraine's development in the conditions of the Industry 4.0, this is quite acceptable.

3. We propose an approach to the modification of the SWOT analysis, the application of which makes it possible to assess market opportunities and threats, as well as the strengths and weaknesses of specific types of activities in the digital market, quantitatively more accurately than in existing approaches. It is based on an expert assessment of the vector of influence of the strengths and weaknesses of the analysed types of digital activities in the digital market on the realisation of existing market opportunities and countering existing threats. According to formalised procedures, it provides an opportunity to determine the most feasible market opportunities, the most significant market threats, and the strongest and weakest aspects of the analysed types of digital activities in the existing conditions. It makes it possible to detail the analysis and increase its validity.

The analysis carried out with the help of the proposed approach showed the prospects for developing digital freelancing and digital outsourcing as the main types of digital activity and directions

for forming and developing the digital labour market in Ukraine. The conditions of the Industry 4.0 allow for solving many identified problems in the labour market. In particular, those that require the application of new forms of labour organisation and labour relations, and others, for their solution.

4. The regional features of the development of the digital labour market, in particular, digital freelancing as the primary type of digital employment in the largest cities of Ukraine, representing its regions, are determined. We formed a complex of evaluation indicators. They also built profiles of the main cities in terms of the state, trends, and development prospects of the most popular digital freelancing types. The profile construction is based on the normalised values of the estimated indicators of the state and dynamics of the digital freelance market development and their interpretation according to the Harrington scale. The constructed profiles allow for assessing the prospects for developing the main types of digital freelancing in the regions. Also, they allow for evaluating the contribution of freelancing to the socio-economic development indicators of the regions of Ukraine in the war and post-war periods in the conditions of the forced collapse of traditional labour markets. It is essential for the regions most affected by the war conducted by Russia.

5. The obtained results form the methodological basis of the organisational and economic management mechanism for forming and developing the digital labour market in Ukraine and its regions to solve the problems caused by implementing the Industry 4.0 technologies and ensure the conditions for innovative growth. Furthermore, the analysis results of Ukraine's and its cities' readiness for digital economy development and the analysis of the feasibility of the development of the main types of activities in the digital market can be used as an information and analytical base for the decision-making system regarding the determination of priority directions for the development of the digital labour market.

The presented methodological developments can be recommended for use not only in the conditions of Ukraine, but also in developing countries, as well as in countries with a transition economy, to substantiate the digitalisation strategies of their labour markets. Further research should form the foundations of the organisational and economic management mechanism for developing the national and regional digital markets in developing countries and countries with transition economies.

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