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Digital Capacity of Labour Markets: Regional Assessment

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Abstract: This study examines the digital capacity of labour markets amid the global digital transformation and increasing economic volatility. The aim of the article is to assess the digital capacity of labour markets as one of sustainability criteria across the world's macro-regions and to identify the structural, institutional, and human capital factors that shape regional disparities of the world. Digital capacity is conceptualized as a multidimensional construct reflecting economies' ability to generate digital jobs, develop digital skills, integrate advanced technologies, and adapt to structural change. Digital labour market capacity depends upon the ability of an economy to generate digital jobs, provide digital skills, integrate into the digital economy and adapt to technological change. The methodology is designed to assess the ability of labour markets to adapt in the context of the digital transformation of the economy, as well as to determine their potential for the implementation of innovative technologies and the development of digital skills. The study proposes a methodological framework based on the Digital Labour Capacity Index (DLCI), which combines two components: Digital Workforce & Adoption Capacity and Innovation, Research & Advanced Technologies Capacity. The methodology defines a list of key indicators, their reference (base) level values, as well as an algorithm for calculating the Digital Labour Capacity Index (DLCI). A comparative regional assessment covering eight macro-regions reveals substantial disparities in both components and the composite index. East Asia & Pacific demonstrates high levels of DLCI (93.3%), with strong performance across both components reflecting a mature digital ecosystem with rapid technological adaptability. North America (80.0%) and Europe (73.3%) show sufficient levels, formed by well-developed digital skills and innovation infrastructure, though with some internal imbalances. Latin America and the Caribbean records a medium level (46.6%), with digital progress but weak coherence between human capital and technological usage. South Asia, Sub-Saharan Africa, and Central Asia and the South Caucasus each register moderate levels (25.0%), constrained by limited digital competencies, low R&D investment, and weak integration into global innovation networks. The Middle East & North Africa shows have low level (13.3%), reflecting simultaneously weak workforce and innovation capacity and a fragmented pattern of digital transformation shaped by raw-material-oriented economic structures. The results suggest that labour market digital capacity is a crucial prerequisite for the sustainable development of global regions.

Application of the study methodology reveals pronounced interregional disparities in digital capacity levels. Regions with strong institutional foundations and sustained technology investment – East Asia & Pacific, North America, and Europe – hold clear leading positions, whereas other regions show considerably weaker capacity for digital transformation of their labour markets. These disparities point to the need for differentiated policy responses made to regional specifics, with priority given to human capital development, broader access to digital technologies, and stronger support for innovation activity. The proposed methodology thus offers a practical analytical tool for tracking digital capacity across labour markets, detecting structural imbalances, and informing policy decisions that support sustainable socio-economic development amid ongoing digitalization.

Keywords: digital capacity, digital skills, sustainable development, innovation capacity, labour market.

Introduction

In the context of the digital transformation of the global economy, labour markets are undergoing significant structural changes, necessitating a reconsideration of approaches to assessing their functioning and efficiency. Digital technologies, the expansion of remote employment, automation of production processes form new requirements for the workforce, change the nature of employment and increase the role of digital competencies. In this context, digital capacity of labour markets is a key factor in their adaptability, competitiveness and resilience to shocks.

The relevance of the study is driven by the need to analyse regional differences in the digital transformation of labour markets, which directly affects employment opportunities, labour productivity and the quality of human capital. Comparative assessment of the digital capacity of labour markets in the context of key macro-regions of the world, in particular North America (NA), Latin America and Caribbean (LAC), Europe (EUR), East Asia & Pacific (EAP), South Asia (SA), Central Asia and S. Caucasus (CASC), Sub-Saharan Africa (SSA) and Middle East & North Africa (MENA) require special attention. This approach allows to identify spatial differences in digital processes and to analyse the structural features in the process of labour markets transformation.

In the context of military challenges, economic instability, and accelerated digitalization, assessing the ability of labour markets to integrate digital tools and ensure the efficient use of labour resources is of particular importance. The regional aspect of such analysis allows not only to identify existing imbalances, but also to determine the potential for adaptation of regions of the world to new economic realities.

The topic is further relevant due to the need to develop sound state and international policies in the field of employment and digital development aimed at increasing the level of digital skills of the population, expanding access to digital infrastructure and reducing the digital divide. That is why regional assessment of the digital capacity of labour markets is an important scientific and practical task, the results of which can be used to ensure sustainable socio-economic development in the digital economy.

The aim of the article is to assess the digital capacity of labour markets as one of sustainability criteria across the world's macro-regions and to identify the structural, institutional, and human capital factors that shape regional disparities of the world.

1. To achieve this aim, the study sets out the following objectives:
2. To conceptualize digital capacity of labour markets as sustainability criteria.
3. To develop a methodological framework for calculating the level of digital capacity of labour markets.
4. To calculate and analyze Digital Workforce & Adoption Capacity of regions of the world.
5. To calculate and analyze Innovation, Research & Advanced Technologies Capacity of regions of the world.
6. To evaluate the integral index of digital capacity of labour markets, to conduct a rating assessment of the world's macro-regions, and to determine the key factors of their regional differentiation.

In the scientific discourse, the issue of digital capacity of labour markets has received wide attention, which makes it possible to generalize the approaches of various researchers and identify key areas for further development of this issue.

Fietz & Lay (2023) as well as Morgandi et.al (2026) state that online platforms generate productive employment, that is tied to local and global labour demand, having positive drawbacks on the labour market in the form of identifying and aggregating demand for services, helping to standardize products, and reducing market asymmetries. Within the study of social mobility in digital era Martindale & Lehdonvirta (2023) state that online platform workers come predominantly from privileged class backgrounds, showing some existing disparities in the access to digital positions that can be formed by social class background.

Bejaković and Mrnjavac (2020) basing on the analysis of Eurostat data establish a statistically significant positive correlation between digital skills and employment rates across EU member states. Their analysis demonstrates that individuals with high digital competence have better chances in finding a position, so the governments and employers should invest in digital inclusion and training for their personnel.

Crișan at al. (2023) extend this analysis to the post-pandemic European context. Using cluster analysis, they distinguish between high-tech, medium-tech, and low-tech economies, finding that digitalization's relationship to labour market lies in differences in labour costs, labour productivity and youth employment. Lovaglio & Riussi (2025) underline a strong labour demand polarization in post-pandemic EU with high-skill occupation saturation and

overqualification problems in labour market, particularly affecting women. Bousrih et al. (2022) contribute by suggesting that differences in employment after COVID-19 depend upon the availability of mobile subscriptions, and trademarks.

Shkuropadska et al. (2025) examines the level of digital resilience of the B9 countries and Ukraine based on an integrated index that takes into account cybersecurity, the quality of digital infrastructure and socio-economic factors. Significant differentiation between countries is established: most of them demonstrate a sufficient level of digital capacity, while others lag behind due to institutional and resource constraints. The authors emphasize that the key drivers of digital resilience are the development of digital skills, inclusive digital policies and overcoming the digital divide, which has direct implications for the functioning of labor markets.

Babucea (2023) assesses the relationship between digital capacity and disability inclusion, demonstrating that assistive technologies and digital skill frameworks can substantially expand employment access for workers with disabilities, but that this potential is conditioned on the availability of appropriate training and accessible platform design.

Osiyevskyy at al. (2023) substantiate the role of digital ecosystems as a new model of organizing the economic activity of enterprises, based on the integration of digital platforms, data and network interaction. The authors note that the formation of such ecosystems contributes to increasing business flexibility and transforming labor requirements, in particular with regard to digital competencies. Accordingly, this determines the need to assess the digital capacity of labour markets in the context of the platform economy expansion.

Aum and Shin (2025) by analysing regional differences in digital technology adoption by businesses in Korea, find that women's employment took a noticeable hit from this shift – a pattern most pronounced among workers in service sectors outside the IT industry. Education level did little to buffer against AI's employment effects, which showed up fairly uniformly across all education groups.

Shtunder and Shkuropadska (2024) identify demographic resilience, quality human capital, institutional stability, and social protection coverage as the primary determinants of a labour market's capacity to absorb shocks, whether from economic recession, military conflict, or technological disruption. Their analysis suggests that digital transformation is not an exogenous shock to which labour markets passively respond, but an ongoing process of co-evolution between technologies, institutions, and human capabilities.

The relationship between the functioning of labour markets and sustainable development occupies an important place in modern economic research. According to Sustainable Development Goal 8 (SDG 8), achieving sustainable and inclusive economic growth is directly linked to productive employment and decent work. The International Labor Organization emphasizes that the results of the functioning of labour markets have an intersectoral nature and are also related to overcoming poverty and inequality, developing human capital and improving the well-being of the population (ILO, 2020). Thus, the state and ability of the labour market to adapt to structural changes is an important prerequisite for sustainable development.

Cook & Rani (2023) explore digital employment and platform work in developing countries through the lens of structural transformation and sustainable development. The authors point out that digitalization can create new opportunities for employment and economic activity, but its contribution to development depends on the nature of jobs created, labour productivity, income levels and the ability of workers to move to more productive sectors. At the same time, digital transformation can also be accompanied by employment instability, weak social protection and a gap between skills, productivity and pay. Accordingly, this indicates that digitalization by itself does not determine the sustainability of development results, and its effects depend on institutional and socio-economic conditions.

Despite a significant amount of scientific and applied research in the field of digitalization of labour markets, there is currently no unified approach to quantifying their digital capacity, which complicates comparative analysis between countries and regions. Thus, the purpose of this study is to substantiate the calculation methodology of Digital Labour Capacity Index (DLCI) and its testing on the example of macroregions of the world.

The structure of the article is as follows: first, a description of the methodology for calculating the level of digital capacity of labour markets is presented; then, an analysis of the Digital Workforce & Adoption Capacity of the regions of the world is carried out; then, the Innovation, Research & Advanced Technologies Capacity of the regions of the world is analysed; finally, an assessment of Digital Labour Capacity Index (DLCI) is made and conclusions are drawn.

Methods

Digital labour market capacity depends upon the ability of an economy to generate digital jobs, provide digital skills, integrate into the digital economy and adapt to technological change. The methodology is designed to assess the ability of labour markets to adapt in the context of the digital transformation of the economy, as well as to determine their potential for the implementation of innovative technologies and the development of digital skills. The methodology defines a list of key indicators, their reference (base) level values, as well as an algorithm for calculating the Digital Labour Capacity Index (DLCI). The list of indicators is formed on the basis of the selection of indicators that most fully characterize the digital capacity of labour markets in the following areas:

1. Digital Workforce & Adoption Capacity reflects the adaptive and applied digital capacity of the labour market (readiness and use).

2. Innovation, Research & Advanced Technologies Capacity reflects the innovation and technological capacity of the economy to generate digital jobs (creation and development of technologies).

Together, they determine the region's ability not only to use digital technologies, but also to create them and transform the structure of employment. The DLCI calculation involves determining the share of indicators that reach reference (base) level values from the total number of indicators, which allows to assess the digital capacity of the labour market and its potential for innovative development. The DLCI is calculated using the formula:

$$DLCI(\%) = \frac{N_{\text{reference (base) level}}}{N_{total}} \times 100$$

where:

- $N_{\text{reference (base) level}}$ - the number of indicators that reached or exceeded the reference (base) level value;
- N_{total} - the total number of indicators in the index.

The list of indicators and sources of input information by DLCI components is given in Table 1. The calculation is based on the assessment of 15 indicators, that are based on statistical data.

Table 1. The Indicators for Assessing in Digital Labour Capacity Index (DLCI)

No.	**Indicator**	**Indicator Characteristics**	**The reference (base) level value (Global)**	**Source of input data**
1	**2**	**3**	**4**	**5**
Digital Workforce & Adoption Capacity				
1.	Digital Skills	Reflects the level of digital competencies of the workforce. Determines the ability of employees to work with digital tools, adapt to automation, and move into high-tech segments.	≥ 43	Whiteshield. The Global Labour Resilience Index 2025.
2.	AI penetration	Reflects the level of implementation of artificial intelligence technologies in the economy. Indicates structural changes in the demand for skills and the formation of new professions.	≥ 35	Whiteshield. The Global Labour Resilience Index 2025.

3.	Worker adoption of AI	Shows the actual use of AI by employees in their professional activities. Characterizes the degree of transformation of work processes and modernization of employment.	≥ 31	Whiteshield. The Global Labour Resilience Index 2025.
4.	Individuals using the internet (% of population)	Characterizes the digital inclusion of the population and potential access to remote, platform and gig employment. It is a basic condition for the digital integration of the labour market.	≥ 70	Meltwater. Global Overview Report. Digital 2025.
5.	AI and information processing technologies	Reflects the development of data processing technologies and algorithmic systems. Indicates the demand for analytical, IT and data skills in the labour market.	≥ 86	World Economic Forum. The Future of Jobs Report 2025.
6.	ICT sector in GDP (%)	Reflects the share of information and communication technologies in the economy and determines the digital capability of the labour market, showing the ability of the economy to create demand for digital competencies and integrate technologies into work processes.	≥ 6	ReportLinker. Global ICT Industry 2025-2029.
Innovation, Research & Advanced Technologies Capacity				
7 .	AI Research and Intellectual property (IP)	Reflects scientific publications and patents in the field of AI. Shows the level of formation of technological clusters and demand for highly qualified specialists.	≥ 31	Whiteshield. The Global Labour Resilience Index 2025.
8 .	Research and IP	Characterizes overall research and development activity and patenting capacity. Determines the ability of the economy to generate highly skilled jobs.	≥ 40	Whiteshield. The Global Labour Resilience Index 2025.
9 .	AI Entrepreneurs hip & Investments	Shows startup activity, venture capital investments in AI. Indicates the creation of new jobs in high-tech sectors.	≥ 28	Whiteshield. The Global Labour Resilience Index 2025.
10.	Robots and autonomous systems	Reflects the level of robotization and automation of production. Characterizes the technological modernization of labour and structural change in employment.	≥ 58	World Economic Forum. The Future of Jobs Report 2025.
11.	Sensing, laser and optical technologies	Indicates the development of advanced technological areas, showing the presence of high-tech production sectors and the demand for engineering specialties.	≥ 18	World Economic Forum. The Future of Jobs Report 2025.

12.	Quantum and encryption	Reflects the development of advanced cybersecurity technologies and quantum computing, which are shaping the demand for highly qualified specialists in the field of cryptography, data science, and information protection.	≥ 12	World Economic Forum. The Future of Jobs Report 2025.
13.	Semiconductors and computing technologies	Characterizes the technological base of the digital economy and the level of development of the ICT sector, which creates jobs in the fields of engineering, programming, microelectronics production, and computing systems.	≥ 20	World Economic Forum. The Future of Jobs Report 2025.
14.	Energy generation, storage and distribution	Reflects the region's ability to generate, store, and distribute energy, which is a critical component of the digital workforce's capacity, as a stable energy supply ensures the continuous operation of digital technologies and infrastructure.	≥ 41	World Economic Forum. The Future of Jobs Report 2025.
15.	New materials and composites	Reflects the development and application of modern materials and composites, which determines the digital capability of the labour market through the support of innovative industries and high-tech sectors that require specialized knowledge and skills.	≥ 30	World Economic Forum. The Future of Jobs Report 2025.

Source: authors' calculations based on World Economic Forum (2025), Whiteshield (2025), We Are Social, & Meltwater. (2025), ReportLinker (2025).

The world-average value of the index is regarded not as a normative criterion, but as a relevant (baseline) reference point that characterizes the typical level of digital capacity of labour markets in the world. The use of such a reference point corresponds to the logic of comparative analysis, as it allows for assessing the relative advantages and lags of individual macro-regions, identifying the spatial unevenness of digital development, and determining directions for enhancing the digital capacity of labour markets.

The formation of the list of indicators is based on the principles of representativeness (the most significant indicators that determine the level of digital capacity of labour markets are included). A reference (base) level is determined for each indicator, which is calculated as the average global value. If the actual value of the indicator corresponds to the established reference (base) level, it is assessed as positive; if it deviates from the reference (base) level value, it is assessed as negative. The system of quantitative and qualitative levels of the Digital Labour Capacity Index is given in Table 2.

Table 2. Levels of Digital Labour Capacity Index (DLCI)

No.	Measurement, %	Quantity of positive indicators	Levels
1.	81–100	13-15	high level
2.	61–80	10-12	sufficient level
3.	41–60	7-9	medium level
4.	21–40	4-6	moderate level
5.	1–20	1-3	low level

(Source: compiled by the authors)

To minimize potential internal biases in the formation of the research information base, a unified approach to data selection and processing was applied. The information base comprised of indicators from The global labour resilience

index 2025 (Whiteshield, 2025), Digital 2025: Global overview report (We Are Social, & Meltwater, 2025), Global ICT industry 2025–2029 (ReportLinker, 2025) selected based on their theoretical and methodological relevance to assessing the digital capacity of labour markets. Consistent selection criteria were applied across all global regions, ensuring a uniform basis for comparison. Indicators with varying units of measurement and scales underwent normalization using a standardized algorithm prior to integration; this eliminated the impact of scale disparities among individual variables on their contribution to the aggregate index. Furthermore, a consistent calculation and aggregation procedure was applied to each region, ensuring the comparability of the resulting values. Thus, the construction of the DLCI minimized the influence of subjective indicator selection, differences in measurement units, and inconsistent processing procedures. At the same time, potential limitations inherent in the data sources themselves were acknowledged as factors that could affect assessment accuracy, without altering the unified calculation algorithm applied to the regions under study.

The study defines the world region as the unit of analysis. Rather than calculating regional averages from individual country data, the authors utilized pre-aggregated figures sourced from international above-mentioned reports. This approach was dictated by the study's objective: to conduct a comparative assessment of the digital capacity of labor markets specifically at the level of world regions. Consequently, the sample size was determined by the number of regions for which comparable regional indicators were available in the selected sources.

Results

1. Calculation and analysis of Digital Workforce & Adoption Capacity of regions of the world

The need to measure and analyse Digital Workforce & Adoption Capacity is explained by the transformation of the nature of employment under the influence of digitalization, the growing demand for digital skills and the ability of workers and employers to quickly adapt to technological changes, which is a determining factor in the competitiveness of the workforce, reducing structural unemployment and ensuring resilience of the labour market. The analysis is carried out in a regional context, in particular for the following macro-regions: North America (NA), Latin America and Caribbean (LAC), Europe (EUR), East Asia & Pacific (EAP), South Asia (SA), Central Asia and South Caucasus (CASC), Sub-Saharan Africa (SSA) and Middle East & North Africa (MENA) given in table 3.

Table 3: The Indicators of Digital Workforce & Adoption Capacity in 2025

No.	Indicator	The reference (base) level value (Global)	NA	EUR	CASC	LAC	EAP	MENA	SA	SSA
1.	Digital Skills	≥ 43	59.1	58.2	46.2	31.6	49.8	52.6	27.5	25.2
2.	AI penetration	≥ 35	83.4	41.7	24.5	19.9	41.0	30.0	33.1	9.2
3.	Worker adoption of AI	≥ 31	35.6	46.2	23.7	17.8	49.4	27.9	24.6	29.3
4.	Individuals using Internet (% of population)	≥ 70	93.3	93.7	80.8	76.5	78.5	45.0	53.8	77.0
5.	AI and information processing technologies (%)	≥ 86	96.0	87.0	69.0	93.0	92.0	79.0	79.0	86.0
6.	ICT sector in GDP (%)	≥ 6	8.1	5.7	3.4	4.5	10.1	5.3	6.6	3.6
Digital Workforce & Adoption Capacity(DWAC), %			100.0	83.3	33.3	33.3	100.0	16.6	16.6	33.3

Source: compiled by the authors

The logic of assessing the digital capacity of labour markets involves a consistent transition from characteristics of human capital to indicators of technological penetration and structural changes in the economy. In particular, the basic element is *Digital Skills*, which forms the prerequisites for the effective use of digital technologies and determines the ability of the workforce to adapt to new requirements. The indicator reflects the degree of mastery of modern

information and communication technologies by the population, including basic, intermediate and advanced digital competencies that determine employment opportunities, professional mobility and participation in high-tech sectors of the economy. Analysis of this indicator in a regional context allows to identify disparities in the level of digital training of labour resources, identify "digital gaps" between territories and assess their economic growth potential (Gonçalves, 2025). In 2025, the global value of the Digital Skills indicator was 43 points, while regional analysis demonstrates the presence of significant disparities. The values of this indicator were lower than the global average in the regions of Latin America and the Caribbean (31.6 points), South Asia (27.5 points) and Sub-Saharan Africa (25.2 points). These results indicate the existence of a significant "digital divide" due to differences in the level of socio-economic development, access to education, digital infrastructure and technology. Developed digital skills create the basis for the spread of innovations, which is reflected in the AI penetration indicator.

The AI penetration indicator reflects the level of employment transformation under the influence of artificial intelligence technologies, in particular, the change in the structure of labour demand, an increase in the need for highly skilled personnel and a reduction in routine professions. In 2025, the global value of the indicator was 35 points. Such regions as Central Asia and South Caucasus, Latin America and Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa have values lower than the global average. Accordingly, this indicates a limited level of access to digital infrastructure, investment in technology and human capital necessary for the development and implementation of AI solutions. In contrast, the highest values of the indicator were recorded in the North America region (83.4 points), which indicates its leadership in the field of technological innovation, a high level of development of the digital economy and a significant concentration of companies that are actively implementing artificial intelligence in production and management processes. Such differentiation indicates the presence of a global technological gap and determines the different possibilities of regions to adapt labour markets to new conditions formed under the influence of digitalization and automation. At the same time, not only the level of implementation of artificial intelligence technologies is important, but also the degree of their actual use by employees, which is assessed through Worker adoption of AI and allows to determine the depth of integration of AI into work activities.

Worker adoption of AI is an indicator that reflects the degree of integration of AI tools into daily work processes and the ability of the workforce to effectively apply them (Tokar, 2026). In 2025, the global value of the indicator was 31 points, which indicates a moderate level of integration of artificial intelligence technologies into the professional activities of workers on a global scale. At the same time, significant regional differentiation is observed. In particular, values lower than the global average are observed in the Central Asia and South Caucasus, Latin America and Caribbean, Middle East & North Africa, South Asia and Sub-Saharan Africa regions. In contrast, the highest level was recorded in the East Asia & Pacific region (49.4 points), which indicates a deeper integration of artificial intelligence into work processes and the active implementation of innovative technologies in the field of employment. Further analysis should be supplemented with the Individuals using Internet indicator, which reflects the general level of digital inclusion and access of the population to information resources, which is a necessary condition for the formation of a digital economy.

Individuals using Internet is an indicator that reflects the share of the population that has access to Internet and actually uses it during a certain period. Higher values of the indicator indicate a wider coverage of the population by digital technologies, which creates the prerequisites for the development of remote employment, digital skills and the use of innovative tools in work. In 2025, the global value of the Individuals using Internet indicator was 70%, which indicates a high level of Internet penetration in the world and significant progress in the digital inclusion of the population. At the same time, the regions that had values below the global average were the Middle East & North Africa and South Asia, which indicates the presence of a digital divide between different parts of the world.

AI and information processing technology is an indicator that reflects the share of employees or enterprises that use artificial intelligence technologies and information processing systems in their activities. As part of the assessment of the digital capacity of labour markets, it characterizes the level of technological integration of work processes, in particular the expansion of AI tools, data analytics and digital information systems in professional activities. In 2025, the global value of this indicator was 86%. The regions that were characterized by a lower level than the world average were Central Asia and South Caucasus, Middle East & North Africa and South Asia. In contrast, the highest value of AI and information processing technology was recorded in North America (96%), Latin America and Caribbean (93%) and East Asia & Pacific (92%). If the specified indicator reflects the scale of integration of technologies into production and management processes, then the next indicator - ICT sector in the GDP allows to assess the extent to which this integration is transformed into the creation of added value and structural shifts in the economy.

ICT sector in the GDP is an indicator that reflects the share of value added of the information and communication technology (ICT) sector in the gross domestic product of the country. In the context of assessing the digital capacity of the labour market, it characterizes the level of development and economic weight of the ICT sector, which is a key driver of digitalization, innovation and the creation of high-tech jobs. In 2025, the global value of this indicator was 6%. Only North America, East Asia & Pacific and South Asia have values above the global average. At the same time, other regions demonstrate a lower share of ICT, which may indicate limited development of the digital industry and slower rates of structural digital transformation.

Having analysed all the indicators, we can assess the overall level of Digital Workforce & Adoption Capacity of the regions of the world. North America and East Asia & Pacific are regions in which the values of all the studied indicators exceed the world average levels, which indicates their leading positions in the formation of the digital capacity of labour markets. Accordingly, 100% of the indicators of these regions meet or exceed the established reference (base) level values, which characterizes them as the most technologically advanced and institutionally ready for the implementation of digital innovations. In the Europe region, the share of indicators that meet the reference (base) level values is 83.3%, which is equivalent to 5 out of 6 studied indicators. Accordingly, this indicates a high level of the workforce's ability to use digital technologies and adapt to innovations.

In the Central Asia and South Caucasus, Latin America and Caribbean and Sub-Saharan Africa regions, only 2 out of 6 indicators meet the reference (base) level value, which is 33.3% within the Digital Workforce & Adoption Capacity block. Such results indicate a limited ability of the workforce to use modern technologies and an insufficient level of their implementation, which necessitates the activation of digital transformation in these regions. In the Middle East & North Africa and South Asia regions, only 1 out of 6 indicators meets the reference (base) level value, which is 16.6% of the total number of indicators. Accordingly, this indicates a critically limited level of implementation of digital technologies and insufficient readiness of the workforce to use them effectively.

Calculation and analysis of Innovation, Research & Advanced Technologies Capacity of regions of the world

The need for analysis Innovation, Research & Advanced Technologies Capacity of the world's regions is explained by to the growing role of innovations, scientific research and advanced technologies in shaping the digital capacity of the labour market. This direction allows to assess the ability of regions to generate and implement innovations, develop high-tech sectors and ensure technological modernization of employment, which directly affects the level of digital transformation and competitiveness of labour markets. The results of the analysis of indicators are presented in Table 4.

Table 4: Indicators of Innovation, Research & Advanced Technologies Capacity in 2025

No.	Indicator	The reference (base) level value Global	NA	EUR	CASC	LAC	EAP	MENA	SA	SSA
1.	AI Research and intellectual property (IP)	≥ 31	84.8	31.8	14.2	14.2	39.1	26.3	24.5	14.5
2.	Research and IP	≥ 40	79.8	44.2	28.0	30.4	54.6	38.0	29.0	21.8
3.	AI Entrepreneurship & Investments	≥ 28	86.3	45.8	6.9	10.6	31.9	21.9	11.1	10.5
4.	Robots and autonomous systems (%)	≥ 58	61.0	62.0	45.0	63.0	61.0	44.0	53.0	39.0
5.	Sensing, laser and optical technologies (%)	≥ 18	16.0	15.0	10.0	28.0	31.0	14.0	29.0	8.0
6.	Quantum and encryption (%)	≥ 12	28.0	9.0	10.0	13.0	27.0	6.0	11.0	13.0

7.	Semiconductors and computing technologies (%)	≥ 20	36.0	17.0	14.0	20.0	39.0	20.0	24.0	8.0
8.	Energy generation, storage and distribution	≥ 41	33.0	44.0	50.0	38.0	39.0	31.0	26.0	49.0
9.	New materials and composites	≥ 30	22.0	30.0	36.0	34.0	34.0	25.0	34.0	18.0
Innovation, Research & Advanced Technologies Capacity (IRATC), %			66.6	66.6	22.2	55.5	88.8	11.1	33.3	22.2

Source: compiled by the authors

Further analysis is aimed at assessing the technological capacity of the economy through the system of interrelated indicators. First of all, the following are considered: AI Research and IP and Research and IP, which reflect the level of knowledge generation, innovative activity, and intellectual property formation. These indicators allow to determine the scientific and technological foundation of development.

AI Research and IP is an indicator that characterizes the innovative capacity of the labour market, in particular the ability of the economy to generate and commercialize knowledge in the field of AI, which, in turn, determines the demand for researchers, engineers, data analysts and other specialists in the digital economy. Higher values of the indicator show a more developed segment of high-tech employment and a strengthening of the role of innovation in the structure of the labour market. In 2025, the global value of the AI Research and IP indicator was 31 points, which indicates a generally moderate level of development of research and intellectual property in the field of artificial intelligence on a global scale. At the same time, only three regions exceeded the global average level of this indicator - North America, Europe and East Asia & Pacific. The dominance of these regions is explained by the active participation of leading technology companies and universities in the creation and commercialization of AI solutions, which provides them with sustainable competitive advantages at the global level, while other regions lag behind due to limited financial resources, insufficient digital infrastructure and institutional barriers to innovation development.

Research and IP is an indicator that reflects the level of research activity and the intensity of intellectual property creation. In 2025, the global value of this indicator was 40 points, which indicates a slightly higher level of its development compared to the previous indicator. As in the case of the previous indicator, only three regions exceeded the world average level - North America, Europe and East Asia & Pacific. Next, it is advisable to move from assessing research potential to analysing the level of commercialization of innovations and investment activity, which reflects the practical implementation of research results in the economy.

AI Entrepreneurship & Investments is an indicator that reflects the level of entrepreneurial activity in the field of artificial intelligence and the volume of investments in AI startups and innovative companies. It characterizes the dynamics of creating new businesses based on artificial intelligence technologies, as well as the degree of involvement of financial capital (venture investments, private financing) in the development of the AI ecosystem (Shkuropadska, D., Lebedeva, L., 2025). In 2025, the global value of this indicator was 28 points. The global leaders in this area are North America, Europe and East Asia & Pacific, and all other regions have a value below the world average. Accordingly, the level of AI Entrepreneurship & Investments forms an innovation and investment base that ensures the development and practical implementation of Robots and autonomous systems.

Robots and autonomous systems is an indicator that reflects the degree of use of robotic technologies and autonomous systems in production and service processes. The indicator characterizes the level of automation and replacement of routine work by machine systems, which directly affects the employment structure, demand for technical professions and a reduction in the share of low-skilled labour. Higher values of the indicator show a high level of technological modernization of the labour market and an increase in demand for specialists in servicing, programming and managing robotic systems. In 2025, the global value of the Robots and Autonomous Systems indicator was 58%. At the same time, a number of regions demonstrated values lower than the global average, in particular South Asia (53%), Central Asia and South Caucasus (45%), Sub-Saharan Africa (39%) and Middle East & North Africa (44%). This lag is explained by limited access to investment, as well as institutional barriers to innovation, which hinders the integration of robotics and autonomous systems into the production and socio-economic processes of these regions. The

development of Robots and autonomous systems is directly related to the use of Sensing, laser and optical technologies, which provide perception of the environment, navigation accuracy and efficiency of operations.

Sensing, laser and optical technologies is an indicator that reflects the degree of use of sensor, laser and optical technologies in production and technological processes. It characterizes the level of technological complexity and automation of the economy, in particular the implementation of advanced measurement, monitoring and data processing systems in real time. Higher values of the indicator show an increase in demand for highly qualified engineers, technical specialists and specialists in servicing high-tech equipment, as well as a structural complication of employment towards knowledge-intensive activities. In 2025, the global value of the Sensing, laser and optical technologies indicator was 18%, which shows a relatively limited level of development and dissemination of relevant technologies on a global scale. At the same time, only three regions exceeded the world average value of this indicator - Latin America and Caribbean, East Asia & Pacific and South Asia. Such results indicate the formation of separate centres of specialization in these regions and the presence of niche competitive advantages in the field of sensor, laser and optical technologies. The further development of Sensing, laser and optical technologies is leading to an increasing role in data protection and complex signal processing, which is making the use of solutions in the field of Quantum and encryption more relevant.

The Quantum and encryption indicator reflects the level of development and implementation of quantum technologies and cryptographic solutions in the digital economy. It characterizes the degree of technological maturity in the field of data protection, cybersecurity and computational innovations, which determines the demand for highly qualified specialists in the fields of quantum computing, cryptography and information security. Higher values of the indicator show an increased role of advanced technologies in the employment structure, the development of knowledge-intensive professions and the growing importance of information protection in the context of digitalization. In 2025, the global value of the Quantum and encryption indicator stood at 12%, indicating an early stage in the global development of quantum and encryption technologies and their limited diffusion across the world economy. At the same time, levels above the global average were observed in regions such as North America (28%), Latin America and the Caribbean (13%), East Asia & Pacific (27%), and Sub-Saharan Africa (13%). Such results indicate the formation of an uneven, but gradually expanding geography of the development of quantum technologies. The development of Quantum and encryption technologies directly depends on progress in Semiconductors and computing technologies, which provide the necessary computing power and hardware basis for their implementation.

Semiconductors and computing technologies is an indicator that reflects the level of development and implementation of semiconductor and computing technologies in the economy. It characterizes the technological basis of digital transformation, in particular the ability to develop and use hardware, microelectronics and computing systems. In the context of the labour market, the indicator determines the demand for highly qualified specialists in the field of engineering, programming, electronics and computer sciences, and also reflects the level of development of high-tech industries. In 2025, the global value of the Semiconductors and computing technologies indicator was 20%. Lower than the world average values were in the regions such as Europe, Central Asia and South Caucasus and Sub-Saharan Africa, which reflects the presence of structural imbalances in global technological development. However, the area of Energy generation, storage and distribution is no less important, which ensures the continuity and efficiency of modern technologies.

Energy generation, storage and distribution is an indicator that reflects the level of development of energy production, storage and distribution technologies in the economy. It characterizes the energy and technological basis of the functioning of the labour market, in particular the ability to ensure the stable operation of enterprises, digital infrastructure and innovative sectors. In the context of employment, the indicator determines the demand for specialists in the field of energy, engineering, renewable energy sources and energy management, and also reflects the level of modernization of energy systems. Higher values of the indicator show the development of an energy-efficient economy that supports the functioning of the digital labour market. In 2025, the global value of the Energy generation, storage and distribution indicator was 41%, which indicates a relatively higher level of development of energy technologies compared to other high-tech areas. At the same time, only three regions exceeded the world average value of this indicator - Europe, Central Asia and South Caucasus, Sub-Saharan Africa, which reflects the specifics of the regional structure of the energy sector. This situation is due to the active development of renewable energy, the modernization of energy storage and distribution infrastructure, as well as the need to increase energy security in the face of global challenges. An important direction of further technological development is New materials and composites, which ensure increased efficiency and sustainability of energy systems.

New materials and composites in the context of the labour market is an indicator that reflects the level of development and implementation of new materials and composites in production and technological processes. The indicator characterizes the innovative and knowledge-intensive component of the economy, in particular the ability to create and use modern materials with improved properties (strength, lightness, stability, etc.). In the context of the labour market, the indicator determines the demand for highly qualified specialists in the field of materials science, engineering and high-tech production, and also reflects the level of development of advanced industrial sectors. In 2025, the global value of the New materials and composites indicator was 30%, while in the North America, Middle East & North Africa and Sub-Saharan Africa regions it was lower than the world average, reflecting the different degrees of development and implementation of relevant technologies.

Having analysed all the indicators, the overall level of Innovation, Research & Advanced Technologies Capacity of the regions of the world can be assessed. The East Asia & Pacific region stands out with the highest positions, since 8 out of 9 studied indicators exceed the world average, which is 88.8%, and indicates its leading role in global innovation and technological development. In the regions of North America and Europe, the share of indicators that meet or exceed the reference (base) level values is 66.6%, which is equivalent to 6 out of 9 indicators studied, and indicates a sufficient, but less balanced level of innovative and technological development.

In the Latin America and Caribbean region, 5 out of 9 indicators meet the reference (base) level values (55.5%), indicating the presence of individual points of technological development, but overall indicating uneven innovation progress and limited capacity for large-scale implementation of advanced technologies. In South Asia, only 3 out of 9 indicators (33.3%) reach the reference (base) level values, reflecting the initial stage of the formation of the innovation ecosystem and significant dependence on external technological solutions.

Even lower results are demonstrated by Central Asia and S. Caucasus and Sub-Saharan Africa, where only 2 out of 9 indicators (22.2%) meet the established reference (base) levels. Accordingly, this indicates structural constraints to innovative development, in particular insufficient level of investment in research and development, limited institutional capacity and weak integration into global technology chains.

The lowest values were recorded in the Middle East & North Africa region – 1 out of 9 indicators (11.1%), which indicates the fragmented nature of innovation activity and the predominance of raw material-oriented economic models that hinder the development of high-tech sectors. Overall, the results obtained indicate significant inter-regional asymmetry in the development of Innovation, Research & Advanced Technologies Capacity, where the gap between leading and lagging regions remains significant and is determined by the level of institutional maturity, investment activity and integration into global innovation processes.

Evaluating the Digital Labour Capacity Index

Taking into account the analysis of indicators, it becomes possible to determine the level of Digital Labour Capacity Index by regions of the world, reflecting the degree of readiness and ability to adapt to the conditions of digital transformation of the labour market (table 5).

Table 5: Digital Labour Capacity Index (DLCI) of macro-regions of the world in 2025

Regions	Levels	Number of positive indicators	Digital Labour Capacity Index (DLCI), %
East Asia & Pacific (EAP)	high	14	93.3
North America (NA)	sufficient	12	80.0
Europe (EUR)	sufficient	11	73.3
Latin America and the Caribbean (LAC)	medium	7	46.6
South Asia (SA)	moderate	4	25.0
Central Asia and S. Caucasus (CASC)	moderate	4	25.0
Sub-Saharan Africa (SSA)	moderate	4	25.0
Middle East & North Africa (MENA)	low	2	13.3
Global	medium	-	47.7

Source: compiled by the authors

According to the calculation results, it was established that the global value of the Digital Labour Capacity Index (DLCI) amounts to 47.7%, which corresponds to a medium level of digital capacity.

A high level of DLCI is demonstrated only by the East Asia & Pacific region (93.3%), which is due to synergistically high values of both the Digital Workforce & Adoption Capacity component and Innovation, Research & Advanced Technologies Capacity, that indicates a developed digital ecosystem and the ability to quickly adapt to technology changes. At the same time, North America (80.0%) and Europe (73.3%) are characterized by a sufficient level of digital capacity of labour markets, which reflects a high level of digital skills of the population, developed innovation infrastructure and active implementation of advanced technologies, although with certain imbalances between individual indicators.

The Latin America and Caribbean region (46.6%) shows a medium DLCI level, indicating some positive developments in digitalization, but at the same time - a lack of coherence between the development of human capital and the technological base. Moderate levels are recorded in three regions of the world – South Asia (25.0%), Sub-Saharan Africa (25.0%) and Central Asia and S. Caucasus (25.0%), reflecting limited ability of labour markets to adapt to digital transformations, due to structural barriers, in particular, insufficient level of digital competencies, investment in research and development, as well as insufficient integration into global innovation processes.

The lowest DLCI level is demonstrated by the Middle East & North Africa region (13.3%). This result is explained by simultaneously low values for both key components Digital Workforce & Adoption Capacity and Innovation, Research & Advanced Technologies Capacity, and indicates the fragmented nature of digital transformation and limited institutional and technological capacity of labour markets.

Discussion

Overall, the DLCI results are consistent with the conclusions of international studies, in particular, reports of the World Economic Forum (2025). Relevant international organizations state that there are significant interregional gaps in the level of digitalization of labour potential and the ability of economies to adapt to global technological changes.

The obtained results are consistent with the conclusions of the OECD (2022), according to which digital transformation is accompanied by uneven demand for digital skills and significant regional differences in the readiness of labour markets to adopt digital technologies. Accordingly, this confirms the feasibility of a comprehensive assessment of digital capacity, which takes into account human capital, innovation development and the technological capabilities of regions.

Similar conclusions are presented in the study of the International Labour Organization (2020), which emphasizes that digitalization is changing the structure of demand for skills regardless of a country's level of economic development. At the same time, the speed of digital transformation is determined not only by the level of technological development, but also by the effectiveness of education systems, vocational training, workforce retraining and lifelong learning.

The identified leadership of East Asia & Pacific, North America and Europe is also consistent with recent World Bank (2026) assessments, according to which the greatest opportunities for the effective implementation of digital technologies and artificial intelligence belong to economies characterized by a high level of digital infrastructure development, access to quality education, digital competencies of the population and institutional capacity to support digital transformation. At the same time, for developing regions, the main barriers remain an insufficient level of digital infrastructure, digital literacy and access to modern technologies.

The obtained results are also consistent with the conclusions of the Global Labour Resilience Index (Whiteshield, 2025), according to which the digital capacity and resilience of labour markets are determined by the level of development of human capital, digital skills, the innovation ecosystem and institutional capacity. Accordingly, this confirms the findings of the study, according to which East Asia & Pacific, North America and Europe demonstrate better results in the digital capacity of labour markets, while other macro-regions need to strengthen investments in the development of digital competencies, innovation and digital infrastructure.

The results suggest that labour market digital capacity is a crucial prerequisite for the sustainable development of global regions. Its significance lies not merely in the proliferation of digital technologies, but also in the labour market's ability to adapt to structural changes, align worker competencies with new demands, and foster conditions for productive and accessible employment. This approach aligns with the findings of the International Labour Organization (ILO), which indicate that digital transformation alters employment structures, skill requirements, and working conditions, and that the development of digital competencies is a crucial factor in workforce readiness for future transformations (Charles, Xia & Coutts, 2022); ILO, 2025). Consequently, the observed interregional disparities in DLCI levels reflect the unequal capacity of regions to leverage digital transformation for fostering economic development and social inclusion. This directly links the study’s findings to Sustainable Development Goal (SDG) 8

("Decent Work and Economic Growth"), as well as to SDG 9 ("Industry, Innovation and Infrastructure") and SDG 10 ("Reduced Inequalities") (United Nations, 2024). This interconnection is supported by contemporary empirical research that views digitalization as a structural driver of employment and inclusive economic development (Ivashko et al., 2026).

At the same time, the results demonstrate that digital transformation is not a uniform process. Disparities across regions and specific DLCI components suggest a potential mismatch between the adoption of digital technologies, digital capabilities, and the ability of labour markets to adapt to technological change. This aligns with ILO findings indicating that while digitalization can generate new opportunities for employment and productivity, it can also exacerbate inequalities where access to digital infrastructure, education, and skills is uneven. Thus, a high level of digitalization does not in itself ensure sustainable development unless digital capabilities are accompanied by the development of digital competencies, technology accessibility, and labour market adaptation. Therefore, it is appropriate to view digital capacity as a prerequisite determining the ability of labour markets to support the economic and social dimensions of sustainable development.

Conclusions

The digital capacity of the global labour market should be considered as a multidimensional characteristic that reflects not only the level of development of digital skills of the workforce, but also the technological and investment prerequisites for the implementation of innovations. At the same time, such capacity is significantly differentiated in the global dimension, which necessitates the use of a regional approach to its analysis. Regional assessment allows to identify asymmetries in the development of digital competencies, access to technologies, the intensity of the implementation of artificial intelligence and the level of digital entrepreneurship, which forms the uneven transformation of labour markets in different parts of the world.

The conducted research made it possible to develop a methodology for assessing the digital capacity of labour markets, which is based on the integration of key indicators characterizing both Digital Workforce & Adoption Capacity and the level of Innovation, Research & Advanced Technologies Capacity. The results confirmed the presence of significant interregional disparities. The leading positions are occupied by economies with a high level of institutional capacity and investment in technology - East Asia & Pacific, North America, Europe, while other regions demonstrating limited ability to digital transformation of the labour market. Accordingly, such results indicate the need to form differentiated policies aimed at developing human capital, expanding access to digital technologies and stimulating innovative activity, taking into account the specifics of each region.

Thus, the proposed methodology can be used as an analytical tool for monitoring the level of digital capacity of labour markets, identifying structural imbalances, and substantiating effective management decisions thus ensuring sustainable socio-economic development in the context of digitalization.

The use of the world-average value of the integral index as a relevant (baseline) level made it possible to conduct a comparative assessment of the digital capacity of labour markets across the world's macro-regions. The obtained results made it possible to distinguish regions whose level of digital capacity coincides with or exceeds the world-average value (East Asia & Pacific, North America, Europe, Latin America and the Caribbean), as well as regions characterized by lower indicators (South Asia, Central Asia and South Caucasus, Sub-Saharan Africa, Middle East & North Africa). At the same time, the proposed relevant (baseline) level is not a static value, but reflects the current world-average level of digital capacity of labour markets. As digital technologies develop, labour markets transform, and global trends change, its value will change accordingly, which ensures the possibility of using this indicator for dynamic monitoring and intertemporal comparison of the digital development of the world's macro-regions.

When interpreting the study's results, the potential for inherent biases, coming from methodological nuances and differing approaches to data compilation in the international reports used, was taken into account. Consequently, the findings are best viewed in a comparative context, focusing on the nature and scale of inter-regional disparities rather than on the absolute value of any single indicator. Accordingly, DLCI values were used to benchmark regional positions against the relevant global level and to identify regions with higher or lower labour market digital capacity. These disparities helped reveal general regional trends and the trajectories of labour market digital transformation. At the same time, the results should not be viewed as a static or absolute characterization of the regions, given that the underlying data in international reports are subject to updates and methodological approaches may evolve. Thus, the conclusions were drawn by considering both the quantitative findings and the potential limitations of the source data, ensuring a more robust interpretation of regional differences in labour market digital capacity.

A promising avenue for future research is to deepen the analysis of the relationship between labour market digital capacity and specific sustainable development outcomes. In particular, it is worth examining the interdependence of the DLCI with labour productivity, employment levels, job quality, income inequality, and access to digital economy opportunities. Future research could also focus on analysing the dynamics of labour market digital capacity over time and determining the contribution of its individual components to shaping economic and social outcomes.

References

1. Fietz, K., & Lay, J. (2023). Digitalisation and labour markets in developing countries (GIGA Working Paper No. 335). German Institute for Global and Area Studies. https://www.giga-hamburg.de/assets/pure/45024740/WP_335.pdf
2. Morgandi, M., Alzate, D., Hatayama, M. (2026) Regulating Platform-based Work in Low and Middle-income Countries : Towards a Context-Appropriate Approach (English). Social Protection Discussion Paper Series Washington, DC : World Bank Group. http://documents.worldbank.org/curated/en/099122325142526447
3. Martindale, N., & Lehdonvirta, V. (2023). Labour market digitalization and social class: Evidence of mobility and reproduction from a European survey of online platform workers. Socio-Economic Review, 21(4), 1945–1965. https://doi.org/10.1093/ser/mwad049
4. Bejaković, P., & Mrnjavac, Ž. (2020). The importance of digital literacy on the labour market. Employee Relations: The International Journal, 42(4), 921–932. https://doi.org/10.1108/ER-07-2019-0274
5. Crișan, G.-A., Popescu, ME, Militaru, E., & Cristescu, A. (2023). EU diversity in terms of digitalization on the labour market in the post-COVID-19 context. Economies, 11(12), Article 293. https://doi.org/10.3390/economies11120293
6. Lovaglio, P. G., & Riussi, M. (2025). How is labour demand changing across European regions in the post-COVID-19 era. International Regional Science Review, 48(5–6), 524–575. https://doi.org/10.1177/01600176251327985
7. Bousrih, J., Elhaj, M., & Hassan, F. (2022). The labour market in the digital era: What matters for the Gulf Cooperation Council countries? Frontiers in Sociology, 7, Article 959091. https://doi.org/10.3389/fsoc.2022.959091
8. Shkuropadska, D., Tokar, V., Purdenko, O., Lotariev, A., & Savchuk, K. (2025). Digital Resilience of the Bucharest Nine and Ukraine. International Journal of Economics and Financial Issues, 15(1), 24–31. https://doi.org/10.32479/ijefi.17233
9. Babucea, A.-G. (2023). Digital labour market – Digital skills and assistive technology required for people with disabilities accessibility. Annals - Economy Series, 6, 61–70. https://ideas.repec.org/a/cbu/jrnlec/y2023v6p61-70.html
10. Osiyevskyy, O., Umantsiv, Y., & Biliavska, Y. (2023). Digital ecosystem: A mechanism of economic organization of enterprises of the future. Rutgers Business Review, 8(2), 175–194. https://rbr.business.rutgers.edu/sites/default/files/documents/rbr-080205.pdf
11. Aum, S., & Shin, Y. (2025). The labour market impact of digital technologies. Federal Reserve Bank of St. Louis Review, 107(5), 1–10. https://doi.org/10.20955/r.2025.05
12. Shtunder, I., & Shkuropadska, D. (2024). Determinants of labour market resilience. Scientia Fructuosa, 156(4), 41–57. https://doi.org/10.31617/1.2024(156)03
13. International Labour Organization. (2020). Delivering on SDG 8: Integrated pathways to economic transformation and inclusive labour markets. https://www.ilo.org/publications/delivering-sdg8-%E2%80%93-integrated-pathways-economic-transformation-and-inclusive
14. Cook, S., & Rani, U. (2023). Platform work in developing economies: Can digitalisation drive structural transformation? (SCIS Working Paper No. 63). Southern Centre for Inequality Studies, University of the Witwatersrand. https://www.ilo.org/sites/default/files/2024-06/Cook%20and%20Rani%20SCIS%20WP%202023.pdf
15. World Economic Forum. (2025). New economy skills: Building AI, data and digital capabilities for growth. https://www.weforum.org/publications/new-economy-skills-building-ai-data-and-digital-capabilities-for-growth/
16. World Economic Forum. (2025). The future of jobs report 2025. https://reports.weforum.org/docs/WEF_Future_of_Jobs_Report_2025.pdf
17. We Are Social, & Meltwater. (2025). Digital 2025: Global overview report. https://wearesocial.com/wp-content/uploads/2025/02/GDR-2025-v2.pdf
18. Whiteshield. (2025). The global labour resilience index 2025. https://www.whiteshield.ai/article-glri-2025

19. ReportLinker. (2025). Global ICT industry 2025–2029. https://www.reportlinker.com/market-report/ICT/597055/ICT
20. Gonçalves J., Spolaor S. and Lebedeva L. (2025) Institutional resilience and crisis governance in the EU: insights from the Lisbon Metropolitan Experience. Front. Polit. Sci. 7:1700468. https://doi.org/10.3389/fpos.2025.1700468
21. Tokar, V., Shkuropadska, D. (2026) Social Resilience in Central-Eastern Europe: Comparing Bucharest Nine and Ukraine, Periodica Polytechnica Social and Management Sciences. 34(1), pp. 94–103. https://doi.org/10.3311/PPso.37037
22. Shkuropadska, D., Lebedeva, L. (2025) Resilience of public administration in the Bucharest Nine Countries and Ukraine. Eastern Journal of European Studies, 16, 119-142. DOI: https://doi.org/10.47743/ejes-2025-SI07
23. International Labour Organization. (2020). *The digitization of TVET and skills systems*. ILO. https://www.ilo.org/publications/digitization-tvet-and-skills-systems
24. OECD. (2022). *Skills for the digital transition: Assessing recent trends using big data*. OECD Publishing. https://www.oecd.org/en/publications/skills-for-the-digital-transition_38c36777-en/full-report.html
25. World Bank. (2026). *World development report 2026: The promise of artificial intelligence*. World Bank Group. https://www.worldbank.org/en/news/press-release/2026/08/04/ai-offers-lifeline-to-developing-economies-in-an-era-of-weak-growth
26. Charles, L., Xia, S., & Coutts, A. P. (2022). Digitalization and employment: A review. International Labour Organization. https://www.ilo.org/publications/digitalization-and-employment-review
27. International Labour Organization. (2025). Workforce 2030: Skills for thriving in the green and digital transition. https://www.ilo.org/publications/workforce-2030-skills-thriving-green-and-digital-transition
28. United Nations. (2024). Global Digital Compact. https://www.un.org/pact-for-the-future/en/annex-i-global-digital-compact
29. Ivashko, O., Tsymbaliuk, I., Pavlikha, N., Ćwik, K., & Czarnecki, P. (2026). Determinants of employment in the digital economy: Evidence from EU countries with implications for inclusive labour market and sustainable development. *Sustainability, 18*(11), 5246. https://doi.org/10.3390/su18115246

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