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APPLICATION OF IT SOLUTIONS IN THE LABOUR MARKET TRANSFORMATION PROCESS IN POLAND

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Purpose: The primary aim of the paper is to analyse how information and communication technologies (ICT) are transforming the Polish labour market. It seeks to understand structural employment changes driven by technological advancements, such as automation, digitization, and robotization, and how these trends influence employment patterns, demand for specific skills, and socio-economic policies. A specific focus is placed on theoretical models (e.g., SBTC, RBTC, ALM) within the Polish context.
Design/methodology/approach: This study employs a qualitative-descriptive approach grounded in secondary data analysis and a literature review.
Findings: Key findings include:
- Labour market polarization: a rising demand for high- and low-skilled workers with a decline in medium-skilled jobs.
- IT sector expansion: Significant growth, particularly during the COVID-19 pandemic, due to increased digitization and remote work.
- Regional disparities: Urban centres adapt faster to technological changes, highlighting digital and economic segmentation.
- Mismatch in labour supply and demand: Particularly for mid-skilled occupations prone to automation.
- Need for reskilling and continuous learning: Rapid obsolescence of skills due to technological changes.
- Mixed evidence on routine work devaluation: Some routine manual workers in Poland saw wage increases, contradicting standard RBTC predictions.

Research limitations/implications: Generalizability may be constrained due to its Polish-centric focus. The authors identify a need for future research into longitudinal impacts of automation in post-transition economies and micro-level skill adaptation strategies.
Practical implications: The paper suggests that a proactive, system-wide policy response is needed to mitigate risks and harness technological benefits.
Social implications: The paper encourages social inclusion by bridging the urban-rural digital divide through investment in digital infrastructure and education, recommends support for NEET youth to prevent marginalization, and addresses the ethical and societal consequences of automation.

Originality/value: The paper provides a novel synthesis of international labour market theories and Polish labour dynamics, offering a localized lens on global transformations. It bridges academic theory with policy relevance, offering actionable recommendations for education, employment, and innovation systems. It is particularly valuable for policy designers, educators, economists, and those involved in regional development and ICT integration.
Keywords: Labour market transformation, technological change, ICT in employment.
Category of the paper: Research paper.

Introduction

This article explores the multidimensional impact of information and communication technologies (ICT) on the ongoing transformation of the Polish labour market. It seeks to diagnose and interpret how automation, digitization, robotization, and the rapid development of the IT sector have contributed to changes in employment structures and job polarization. The central objective is to evaluate whether these changes correspond to the dynamics predicted by dominant theoretical frameworks in labour economics—namely Skill-Biased Technological Change (SBTC), Routine-Biased Technological Change (RBTC), and the Autor-Levy-Murnane (ALM) task-based model.

Understanding labour market polarization is vital in shaping education policy, employment strategies, and social inclusion frameworks. As Poland navigates the transition to a knowledge-based economy, this research contributes to identifying the drivers of job displacement and creation, enabling more effective labour market interventions and regional development planning.

Research Hypotheses:

1. The Polish labour market exhibits a polarization trend consistent with the RBTC and ALM models.
2. Technological advancement results in the expansion of both high-skill and low-skill employment segments, accompanied by a relative decline in the demand for mid-skilled occupations.
3. The rapid growth of the ICT sector in Poland has contributed to spatial and regional disparities in the pace and nature of labour market adaptation.

Research methodology is based on a mixed-method approach combining a critical review of existing literature with empirical secondary data analysis. Data sources include reports from the OECD, WEF, Polish Central Statistical Office (GUS), and leading academic publications. Task-based classification is applied to interpret wage trends and job displacement across occupational groups. The study also draws on qualitative insights from national case studies and international comparisons.

The study categorizes employment data using the ALM task typology:

- Non-routine cognitive analytical.
- Non-routine cognitive interpersonal.
- Routine cognitive.
- Routine manual.
- Non-routine manual.

Task-based analysis enables disaggregation of wage and employment patterns to examine polarization trends. Employment data from 2010 to 2023 is utilized where available, supplemented with forecasts from OECD and WEF. Additionally, the analysis incorporates demographic variables and regional indicators to contextualize the findings.

Literature review

Theories such as SBTC and RBTC have framed global discourse on technological change and labour market evolution. SBTC focuses on the increasing returns to high-skilled labour, while RBTC emphasizes the vulnerability of routine-based jobs to automation. The ALM framework adds granularity by classifying work tasks into routine/non-routine and cognitive/manual dimensions. Authors such as Acemoglu, Autor, Brynjolfsson, and McAfee have provided empirical evidence of these dynamics in developed economies.

In Poland, the labour market reflects a complex post-socialist evolution, marked by the shift from full employment ideologies to flexible, market-oriented structures. Researchers like Kwiatkowski, Kryńska, Dobija, and Nowak have highlighted key transitions, including the emergence of the NEET generation, the segmentation of labour markets, and the increasing relevance of internal and territorial mobility constraints. Labour economics in this context is enriched by sociological and psychological perspectives, recognizing work not only as economic necessity but also as a form of self-realization and social inclusion.

Structural labour market analyses are conducted for various reasons, primarily due to imbalances between labour demand and supply. Gathering and analysing data on employment levels, internal migrations, and related phenomena enable research beneficial to various institutions such as regional and local employment agencies and companies. Such analyses help identify areas with concentrated human resources and potential profitable locations for investors, such as factories, warehouses, logistics centres, and other facilities. Labour market analyses also significantly impact national logistics planning. Knowledge about migration routes helps manage traffic congestion, facilitating efficient road network expansions and transport infrastructure improvements, which further assist in forecasting migration trends and unemployment levels. Labour market conditions depend on multiple factors, including political

situations, stock market dynamics, economic issues, demographic and social changes, and labour demand-supply imbalances.

Labour economics broadly explores labour-related factors, encompassing economic, sociological, statistical, and psychological aspects. Key topics include wages, employment, employer-employee relationships, and the impact of educational and social changes on labour markets (Dobija, 2016). Kryńska and Kwiatkowski (2013) define the labour market as the space for exchanging labour services between employees and employers, establishing transaction scopes, conditions, and particularly wages. Similar definitions are found in Ehrenberg and Smith's (1991) works. Additionally, Nowak (2011) emphasizes expanding the understanding of "work", acknowledging it not just as unpleasant effort but also skill development, labour utilization, and creativity. However, economic theory traditionally views labour as a difficult effort, a perspective shared by theoretical labour economics and practical human resources management.

Like other markets, labour markets are shaped by supply and demand. Labour supply encompasses all individuals able and willing to work, including both employed and job-seekers offering their services at a given wage. Sapsford and Tzannatos (1993) define labour supply differently, emphasizing "the amount of labour, measured in person-hours, offered for hire at a specific time," noting labour availability depends on workforce supply (Milewski & Kwiatkowski, 2007). Labour market imbalances carry political, economic, and social consequences, observable on two levels (Kwiatkowski, 2002):

1. Excess labour supply over demand leads to unemployment—individuals unable to find employment despite willingness to accept offered conditions.
2. Conversely, labour shortages arise when employers cannot find adequately qualified workers despite offering attractive employment conditions.

Kusideł and Gajdos (2016) highlight that labour demand-supply imbalances significantly impact education systems, requiring dynamic alignment with changing labour market needs and employee expectations. This creates challenges in curriculum selection and necessitates continuous reskilling of academic staff, involving complex cause-and-effect relationships. Labour demand-supply diversity generates relatively closed labour market segments with limited accessibility due to employers' qualifications requirements, artificially created barriers (e.g., excluding unionized workers), and cultural or other obstacles.

According to the Regulation of the Minister of Labour and Social Policy (2014), the term "occupation" is defined as an income source involving tasks derived from social labour divisions, requiring competencies acquired through education or practice, while specialization entails additional competencies. This definition regards workers as specialists producing goods and services. From a sociological perspective, economic aspects highlight the reciprocal relationship between employer and employee, with remuneration reflecting skill levels. While theoretically fair—higher skills yielding higher wages—this approach overlooks time as a factor. Higher-skilled workers receive higher wages but at the cost of additional work and

professional development time. Continuous labour market changes and rising employee demand drive entrepreneurs to adopt flexible employment models to attract talent. Labour market flexibility encompasses employment forms, contract conditions, availability, working hours, remuneration, and work location.

Primary labour market divisions vary according to segmentation criteria. Marshall (1960) initially identified three sub-markets: occupational, local-regional, and industrial. Frequently applied criteria include economic sectors, geographical considerations, required occupational qualifications, and employee types. However, actual labour mobility within these segments is often limited, especially in sectors requiring specific qualifications, regions with restricted mobility, and industries demanding specialized skills (Kryńska, 1995). Internal labour markets relate to organizations employing unified employment and allocation rules, establishing clear criteria for organizational entry and internal advancement opportunities. Market segmentation significantly influences economic convergence, particularly in the primary, high-segment economies concentrated in major urban areas.

Results

The formation of a country’s labour market is significantly influenced by its history and culture. In Poland, consequences of a challenging past and pivotal historical events continue to be visible. For approximately 45 years following World War II, Polish economic literature regarded unemployment as a characteristic phenomenon of capitalist economies. During that period, it was believed that unemployment should not occur in socialist systems because labour market policies were based on the principle of full employment. However, similar to other socialist countries, Poland adopted a supply-side approach to the labour market, where employment planning depended on projected workforce supply, adjusting job availability accordingly. Due to inadequate institutional, economic, political, and psychological preparations, Poland was not ready for these changes. Among economic reforms in Poland, changes in ownership structures were crucial, with privatization gradually—albeit minimally—transferring employees from public to private sectors (Orczyk, 2017).

The NEET (Not in Education, Employment, or Training) generation phenomenon is significant in the context of labour market changes, as its consequences may be more severe for society's and economy’s future than unemployment alone. Besides unemployment-related costs such as benefits, lost resources, income, and unpaid taxes, Ashton (2007) highlights the increasing economic gap between NEET youth and older generations, arising from growing social marginalization and poverty among these youth. Additionally, Wąsowicz (2016) emphasizes that the NEET generation's situation can negatively affect their long-term career

prospects, including limited employment opportunities and lower wages, which may further adversely affect their physical and mental health.

Globally, increased scope and intensification of human interactions are observed, largely driven by technological advancements. Globalization raises both concerns and hopes from social and economic perspectives. Its interconnected and overlapping aspects complicate assessments, as globalization simultaneously positively and negatively affects development. Consequently, globalization has both proponents, recognizing its benefits, and hyperglobalists, viewing it as a phenomenon capable of fundamentally undermining nation-states' roles (Jurek, 2023). The necessity of implementing flexible employment forms arises from challenges presented by technological progress, increased global competition, and globalization itself. Thus, globalization and technological advancements significantly influence employees' career development (career biographies). Younger generations strive for new experiences and are open to diverse labour market opportunities. Career biographies often become longer and richer, encompassing new employment experiences (Puzio-Wacławik, 2016).

Technological progress and globalization undoubtedly impacted the IT sector, where the COVID-19 pandemic exacerbated specialist shortages. Flexible employment models have become preferred primarily due to the nature and execution of most professional tasks. IT professionals are not restricted to local labour markets, frequently able to perform tasks remotely. Rapid globalization and technological changes continuously reshape labour markets, the economy, and society. Current conditions render skills, qualifications, and knowledge quickly obsolete, necessitating continuous learning and improvement. Furthermore, this process encourages creating and utilizing knowledge and information practically, closely linked to the knowledge-based economy.

Labour market polarization is a complex phenomenon significantly impacting both society and individuals in the context of technological changes affecting employment. Consequently, individuals can increase their chances for relatively stable employment, considering rising automation that replaces human workers with machines, equipment, or software. This process gradually eliminates certain types of jobs or occupations susceptible to automation in favor of technological solutions. Labour market polarization became apparent in the early 21st century, visible in employment structures and labour demand. However, Skill-Biased Technological Change (SBTC) theory does not fully explain these shifts. Alongside the persistent trend where technological changes favour highly qualified individuals (increasing demand and wages for highly skilled workers), there simultaneously emerged increased demand for lower-skilled workers, accompanied by wage growth within this group. The group most adversely affected comprises mid-skilled workers, experiencing declining employment demand and wages.

Certain occupations and types of human labour are more readily subject to automation. Tasks that are repetitive, routine, and standardized can be more easily replaced by artificial intelligence, particularly routine tasks described algorithmically or automated through computer programs, machinery, or devices. This phenomenon is discussed within the context

of Routine-Biased Technological Change (RBTC), explained through the Autor-Levy-Murnane (ALM) model. According to this model, worker tasks are classified into five categories based on two criteria: the degree of routineness and the type of activities performed—manual, analytical, or interpersonal (Marinoudi, Pearson, Bochtis, 2019). Acemoglu and Autor's typology of occupational tasks includes the following categories (Acemoglu, Autor, 2011):

- Non-routine cognitive analytical tasks.
- Non-routine cognitive interpersonal tasks.
- Routine cognitive tasks.
- Routine manual tasks.
- Non-routine manual tasks.

Research by Arendt and Grabowski (2019) indicates differences between the Polish labour market and RBTC theory. Their analysis examined the extent to which labour market changes in Poland align with the ALM model and how they result from specific conditions in the Polish economy and labour market. Their primary focus was wage differentiation based on task group affiliations. According to theory, in Poland, significant wage premiums were observed among individuals performing cognitive tasks, especially non-routine cognitive interpersonal tasks. Conversely, RBTC would anticipate declining wages and demand among workers performing routine manual and cognitive tasks. Surprisingly, the researchers found a relative wage increase among Polish workers performing routine manual tasks. Examining technological changes' impact on the labour market highlights the phenomenon of technological unemployment resulting from technological advancement. Consequently, workers have opportunities for skill development and reskilling (Brynjolfsson, McAfee, 2011).

Numerous theories address future labour market transformations, particularly concerning technological advancements, artificial intelligence (AI), and medicine. Technological progress opens new opportunities, with some predictions generating concern, while others appear more optimistic. Nonetheless, all forecasts indicate that technological innovations, automation, robotization, digitization, and artificial intelligence will significantly shape the labour market in the coming years. These factors are expected to diminish occupations requiring only basic skills without specialized knowledge. Besides technological advancements, demographic changes such as an aging population, declining numbers of individuals of working age, migration, urbanization, and labour shortages are also influential.

Research institutions propose various forecasts concerning labour market transformations. According to OECD predictions, 65% of children currently starting school will eventually work in jobs that do not yet exist. OECD experts, in the report "Putting Faces to the Jobs at Risk of Automation", anticipate a stable employment-to-unemployment ratio in the coming years. Nedelkoska and Quintini (2018) indicate that in 31 countries studied, 14% of jobs face high automation risk exceeding 70%. The World Economic Forum (WEF) projects that by 2025, automation might lead to the loss of 85 million jobs globally but simultaneously create 97 million new roles involving new tasks. Consequently, reskilling and career changes will

become essential. WEF experts note that technology implementation will progress steadily, albeit faster in certain sectors. Conversely, Oxford research presents a more daring forecast, predicting complete AI dominance in employment by 2061 and full human replacement by 2136.

While forecasts from institutions like the OECD and WEF provide useful macro-level insights into potential labor market transformations, they are constrained by assumptions of technological linearity, conceptual simplification, and insufficient sensitivity to political, cultural, and ethical dimensions. A more nuanced analysis should integrate qualitative insights, regional case studies, and interdisciplinary approaches to account for the real-world complexity of how technology, work, and society co-evolve.

Institutions specializing in labour market analyses develop forecasts and present their visions of its future. Infuture Institute (2019), in collaboration with Samsung Poland, developed several future scenarios for employees considering various change probabilities. "Jobs are for robots" envisions a future where employment becomes unnecessary, introducing a basic income. Due to rapid technological advancement, automation, and AI, robots will undertake most professional tasks—a scenario already beginning to materialize. The "Hollywood work model" scenario describes work as a passion rather than merely a means to earn income. This scenario anticipates freelancing, turquoise organizations, and flexible employment forms becoming prevalent. Most individuals will independently engage in international projects within virtual reality, overcoming language and geographical barriers, emphasizing work-life balance.

"Always under control" predicts global optimization through constant analysis and enhanced efficiency, precisely assigning employees to tasks and teams. However, this scenario anticipates increased interpersonal tensions and cybercrime resulting from excessive surveillance and monitoring. Privacy would become a luxury, coupled with challenges like overpopulation, growing social inequalities, consumerism, and corporate dominance. "Social workers for planet and nature", one of the most alarming scenarios, assumes that overpopulation, urbanization, environmental degradation, climate change, and lack of potable water will necessitate searching for new living spaces. This scenario emphasizes minimalism, zero waste philosophy, sustainability, and operational transparency.

The Polish Economic Institute (PIE), in the "Foresight of Future Competencies" report, forecasts the impact of virtualization on labour markets by 2035, including distributed teamwork development. The Institute proposes four scenarios: "in the cloud", "smart formula", "offline mode", and "digital detox" (Dębkowska et al., 2022).

The "in the cloud" scenario anticipates advanced labour market virtualization, increasing professional mobility and real-time data accessibility. Effective collaboration within distributed teams will be highly developed. The "smart formula" scenario also foresees virtualization but with lower distributed team capability, highlighting technical, digital, creative, and collaborative skills in human-machine contexts. The "offline mode" scenario predicts low

virtualization and distributed team collaboration levels, potentially reverting to traditional employment forms, reducing occupational mobility, innovation, and international collaboration. The "digital detox" scenario assumes low virtualization but high distributed teamwork capacity, potentially creating a skills gap as highly qualified individuals adjust to traditional working conditions. This scenario emphasizes skills necessary for both stationary and distributed teamwork, focusing particularly on work-life balance.

Labour market transformation occurs rapidly, primarily driven by IT developments and the emergence of new technology-related fields. Kusideł and Antczak (2021) note these processes span all economic sectors. The COVID-19 pandemic notably accelerated labour market transformations, highlighting structural rather than merely quantitative job changes. Generally gradual technological shifts accelerated unexpectedly due to events like the pandemic.

Technological progress continues to critically influence professional life, business, and daily activities. The contemporary world is inconceivable without technology's extensive impacts across various sectors. Technological changes transforming the labour market were accelerated by the pandemic, especially digitization, emphasizing competencies required for non-routine interpersonal and analytical tasks. Although automation often relates to job reductions, it does not invariably lead to employment loss—robots become collaborators, not competitors. Technological transformations generally gradual accelerated due to unexpected events such as COVID-19.

The analysis demonstrates technological development substantially reshapes the labour market, notably increasing demand in the IT sector and elevating the significance of soft and interpersonal skills. Automation, flexible employment forms, and remote work became permanent labour market features. Poland’s economy shows quicker adoption of technology-driven employment models in specific sectors.

Secondary data and empirical research confirm labour market polarization, observing increased employment in highly qualified professions and declining significance for medium-skilled occupations. The IT sector exhibits significant growth, accelerated by remote work, digitization, and digital platform development during COVID-19, demonstrating resilience to external shocks.

Analyses also reveal significant regional disparities—developed urban agglomerations adapt faster to technological changes, intensifying territorial segmentation. Studies emphasize the necessity for enhancing digital competencies among high-risk occupations and reforming continuous education systems. Technological shifts redefine employment structures, leading to hybrid models, gig economy growth, and elevated importance of soft and analytical skills.

The contemporary labor market is undergoing a profound transformation shaped by digitization, globalization, and changing social expectations. At the heart of this shift lies the emergence of hybrid job market models, which blend elements of traditional employment with the flexibility and technological underpinnings of the gig economy. This evolving ecosystem challenges long-established notions of work, career trajectories, and professional development,

while simultaneously placing new demands on the skills workers must possess to remain competitive.

The gig economy, often described as a labor market driven by short-term, flexible, and task-based work, is a central component of this transformation. Enabled by digital platforms such as Uber, Fiverr, Upwork, or Glovo, the gig economy reconfigures how labor is organized and compensated. Workers, no longer tethered to a single employer, instead operate as independent contractors, freelancers, or self-employed professionals who navigate multiple income streams. This model appeals to those seeking autonomy and flexibility but also exposes them to precarious conditions, including income instability, lack of social protections, and algorithmic control by platform providers.

As the gig economy matures, it increasingly intersects with more traditional employment structures, resulting in hybrid employment models. In these arrangements, individuals often hold a conventional job—such as a salaried position in a company or institution—while simultaneously engaging in freelance, remote, or platform-based work. An educator might teach full-time at a university while offering courses through online learning platforms. A software engineer employed by a firm may also take on contract work for clients abroad. Organizations, in turn, are adapting by constructing hybrid workforce ecosystems, composed of permanent staff, freelance collaborators, gig workers, and digital tools such as AI and data analytics platforms. This modular and fluid approach to labor allows firms to respond more rapidly to market demands, optimize costs, and access a broader pool of global talent.

However, the growing complexity of hybrid work and gig-based engagement brings to the forefront a crucial issue: the skillsets required to navigate this environment successfully. While technical competencies remain essential, particularly in data analysis, IT, or digital marketing, the hybrid-gig economy strongly privileges a combination of soft and analytical skills—a dual competence model that increasingly defines employability.

Soft skills—such as communication, adaptability, emotional intelligence, teamwork, and problem-solving—are indispensable in settings where individuals must manage multiple roles, collaborate across digital platforms, or deliver services to diverse clients without direct supervision. In a fragmented and highly personalized work environment, success often depends not only on what one can do, but on how one relates to others, builds trust, and adapts to shifting expectations. Freelancers working through gig platforms, for example, must establish rapport quickly, manage feedback loops, and maintain reputations across projects, often without institutional support.

At the same time, analytical skills are critical in a labor market shaped by data, automation, and decision-making under uncertainty. Whether it's understanding performance metrics, interpreting client requirements, navigating platform algorithms, or leveraging insights from user data, workers must be capable of critically engaging with information and applying it to solve complex problems. The gig and hybrid economy reward those who can work

independently, manage risk, and think strategically—traits associated with high levels of cognitive and analytical ability.

Furthermore, the very structure of hybrid and gig work often requires individuals to function as entrepreneurs of the self. This means not only delivering a specific task or service but also managing one's personal brand, portfolio, pricing, contracts, time, and professional development. The ability to self-assess, identify emerging trends, and invest in continuous upskilling becomes a vital form of labor capital. Soft and analytical skills intersect here: workers must not only acquire knowledge but also communicate its value, form networks, and negotiate ever-changing work arrangements.

In this new landscape, educational systems and labor policies face the challenge of adaptation. Traditional models of vocational preparation, based on clear occupational roles and hierarchical advancement, no longer suffice. There is a growing need for integrated skill development approaches that combine technical knowledge with interpersonal competencies and data literacy. Likewise, policy frameworks must evolve to offer social protections that are portable and inclusive, recognizing the legitimacy of hybrid and gig-based labor arrangements. This includes rethinking access to healthcare, pensions, and unemployment insurance for those working across multiple platforms or combining employment types (see more: De Stefano, Aloisi, 2022).

Concerning new technologies' labour market impacts, the analysis identifies increased IT specialist demand, especially in developed regions. Research confirms the rising trend in IT-related occupations and technology-driven job creation despite potential traditional sector job losses. This article validates the thesis of increasing IT influence on Poland's labour market transformation, highlighting critical IT sector changes and the imperative of aligning workforce competencies with knowledge-based economy demands. Technological transformation is ongoing, necessitating actions in education, continuous learning, and labour market policy areas.

Discussion

The findings affirm the partial applicability of the RBTC and ALM frameworks to the Polish context. While employment polarization aligns with theoretical expectations, unique national conditions—including delayed digitalization in rural areas and cultural-political legacies—moderate the scale and pace of change. Comparative analysis with Arendt and Grabowski's task-based wage assessments confirms these deviations.

Technological advancement presents a paradox: while displacing some forms of labour, it simultaneously creates new roles that require continuous upskilling. The growing importance of soft skills, adaptability, and digital literacy underscores the urgency of reforming educational and vocational systems.

Poland's situation mirrors broader global trends, yet local institutional responses—particularly in lifelong learning, labour market flexibility, and social protections—remain underdeveloped. Addressing the NEET phenomenon and ensuring equitable access to reskilling opportunities are among the most pressing priorities

Conclusions

- Polarization is clearly evident, with an increasing concentration of employment in high-skill analytical and interpersonal tasks and a stable demand for certain low-skill manual roles.
- Routine jobs—especially mid-skilled clerical and production occupations—have declined in relative share, although wage data reveal anomalies such as rising incomes among certain routine manual workers, likely reflecting labour shortages or collective bargaining outcomes.
- The IT sector has been the principal engine of job creation, particularly in urban areas, driven by remote work possibilities and increasing digital service demands accelerated by the COVID-19 pandemic.
- Disparities across regions are growing; large agglomerations like Warsaw, Kraków, and Wrocław exhibit greater adaptability and technological absorption compared to smaller towns and rural areas.
- Labour market polarization in Poland reflects global structural trends but manifests uniquely across task categories and regions.
- Technological transformation enhances the demand for IT and digital skills, increases work flexibility, and elevates the role of non-routine cognitive tasks.
- Regional labour market segmentation intensifies due to unequal access to digital infrastructure and educational resources.
- Policymaking must integrate flexible, inclusive, and forward-looking strategies to manage the disruptions and opportunities arising from digital transformation.

In response to the labour market transformation driven by digital and information technologies, policymakers, educational institutions, and employers in Poland should consider the following targeted strategies:

1. Reform of Lifelong Learning and Education:
   - Curriculum Modernization: Integrate digital skills, coding, data literacy, and AI awareness into all levels of education.
   - Task-based Learning: Align vocational and higher education more closely with the typology of tasks (e.g., cognitive vs. routine) based on ALM and RBTC models.
   - Teacher Reskilling: Provide ongoing training for educators to adapt to rapidly changing workforce skill needs.
2. Labour Market Adaptation Policies:
   - National Upskilling Programs: Launch publicly funded, modular training initiatives targeting workers in mid-skilled routine occupations at risk of automation.
   - Incentivize Flexible Work: Encourage flexible and remote work practices, especially in regions with poor access to high-skill jobs.
   - Support for NEET Youth: Develop specialized interventions to reintegrate NEET populations, combining employment pathways with digital competency development.
3. Regional Digital Inclusion:
   - Bridge the Urban-Rural Divide: Invest in digital infrastructure and mobile training units in rural areas and small towns.
   - Smart Specialization Strategies: Align regional development plans with high-demand ICT-related sectors (e.g., cybersecurity, green tech).
4. Labour Market Forecasting and Monitoring:
   - Data-Driven Policy Design: Establish a real-time labour market observatory using data analytics and AI to track skills shortages, job displacement risks, and emerging occupations.
   - Public-Private Collaboration: Foster partnerships between government, universities, and employers to pilot innovation labs, job transition schemes, and internship networks.
5. Social Protection and Worker Transition:
   - Reform Unemployment Insurance: Link benefits more closely with mandatory retraining programs.
   - Support Transitional Careers: Provide counseling, digital portfolios, and mobility grants for workers switching sectors.

By contextualizing Poland's labour market evolution within global technological shifts, this article underscores the importance of proactive policy design and institutional agility. A digitally inclusive future demands strategic foresight, cross-sector collaboration, and continuous investment in human capital.

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