Analysis of the State of the Art on the Future of Human Workforce

Scientific Report

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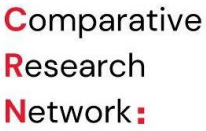

Executive Summary

Nadia Molek

This scientific report, »Analysis of the State of the Art on the Future of Human Workforce«, serves as the foundational step in the interdisciplinary CERV TRANSFORM project. This initiative explores critical aspects of the evolving labour market in the EU, such as automation, digitalization, workforce well-being, gender equality, and employment policies. Collaborating researchers and experts from nine European countries (Belgium, Germany, Greece, Italy, Malta, Poland, Portugal, Slovenia, and Sweden) aim to identify emerging trends and challenges to enhance workforce resilience and adaptability.

The objectives of the report are, first, to provide a comprehensive diagnosis of the current labour market; second, to assess transformation practices and policies among the partner countries; and finally, to lay the groundwork for future research focused on enhancing workforce resilience and adaptability across Europe.

The report is based on a narrative and integrative literature review, combining scientific studies and institutional reports to capture both key concepts and current practices in technology, emerging skills, working conditions, as well as labour policies in the EU and in partner's countries. Four key research questions were formulated to guide the investigation, related to automation, future skills, workforce well-being, and the adequacy of current policies in meeting future labour market needs. Each consortium partner analysed their national context and contributed relevant data on these thematic areas, utilizing academic sources, institutional databases, and specialized literature.

Key Findings are various. Firstly, it notably the impact Automation and Digitalization: Technologies such as artificial intelligence (AI), robotics, and automation are transforming key sectors, not only manufacture, and the labour market in Europe, particularly in all partner's countries in different levels. These technologies are improving efficiency and precision in processes but at the same time pose challenges regarding job displacement and wage inequality.

The report identifies a growing demand for digital and technological skills, along with socio-emotional and management competencies. Green and sustainability skills were also identified. Following EU directives like Lifelong learning, all the partner's countries seem to have implemented programs to develop these skills, addressing skill gaps that could hinder inclusion and economic growth.

In the last decades, but particularly after the COVID-19 pandemic, working conditions are shifting towards flexible arrangements. However, studies highlight that this flexibility poses risks especially to mental health and work-life balance. The importance of policies that promote comprehensive well-being, including mental health and workplace safety are highlighted.

On the other hand, while female participation has increased across the EU, inequalities persist in highly automated sectors and STEM roles. Malta and Slovenia are implementing policies to foster inclusion and gender equality, but challenges in female representation in leadership roles remain.

Initiatives like the European Skills Agenda aim to meet the demands of the emerging labor market by focusing on upskilling and reskilling in green and digital sectors. However, countries like Greece and Poland still face obstacles in aligning their vocational training programs with market demands.

Among the conclusions, one important to remark from our State of the Art report is the need for improvement of labour and educational policies that support an inclusive transition to a digital green, inclusive and more human economy. Collaboration between public and private sectors is essential to address inequality and skill gaps, ensuring that labour transformations benefit all segments of the population.

It has also identified the importance of a holistic approach to workforce well-being that considers both physical and mental health, and it emphasizes the role of inclusive policies that promote gender equality and social inclusion. These findings will provide a foundation for future research and discussions with key labour market stakeholders to build a resilient workforce sustainably prepared for the challenges of the future.

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FOREWORD

As we stand at the intersection of technological advancement and societal transformation, the publication of Analysis of the State of the Art on the Future of Human Workforce arrives at a pivotal moment. This collaborative research effort, bringing together insights from nine European countries, offers a crucial examination of how our relationship with work is fundamentally changing and what this means for individuals, organizations, and societies.

The convergence of the Fourth Industrial Revolution, accelerated digitalization, and the profound impact of recent global disruptions has created an urgent need to understand and shape the future of work. This volume makes a significant contribution by providing a comprehensive analysis of the complex interplay between technological innovation, human capital development, and organizational transformation across diverse European contexts.

What sets this work apart is its holistic approach to examining workforce challenges. Rather than focusing solely on technological disruption, the analysis considers the human dimension of work transformation, addressing critical aspects such as workforce well-being, gender equality, and the evolution of flexible working arrangements. The research particularly resonates with my own observations of how organizations are grappling with the need to balance technological advancement with human-centered approaches to work.

The findings presented here are particularly valuable for their practical implications. The careful examination of vocational training programs, digital skill development initiatives, and policy frameworks across different European contexts provides actionable insights for policymakers, educators, and organizational leaders. The identification of both successful practices and areas requiring improvement offers a balanced perspective that can inform strategic decision-making.

One of the most compelling aspects of this research is its recognition of the multifaceted nature of workforce transformation. The analysis demonstrates how technological changes intersect with demographic shifts, evolving workplace dynamics, and changing employee expectations. The emphasis on mental health and well-being, particularly in the context of flexible work arrangements, reflects a sophisticated understanding of the challenges facing modern organizations.

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I find the timing of this publication particularly significant. We are witnessing a fundamental reimagining of work, where traditional paradigms are being challenged by new technologies, working models, and employee expectations. This volume provides essential guidance for navigating these changes while ensuring that technological advancement serves human potential rather than diminishing it.

The collaborative nature of this research, drawing on expertise from diverse institutional perspectives across Europe, enriches its findings and recommendations. This cross-cultural, interdisciplinary approach is precisely what is needed to address the complex challenges facing the modern workforce. The insights presented here will be invaluable for academics, practitioners, and policymakers working to create more resilient, inclusive, and sustainable work environments.

As readers engage with this volume, they will find not just an identification of current challenges but also a roadmap for the future. The analysis provides crucial insights for developing adaptive strategies that can help organizations and individuals thrive in an increasingly dynamic work environment. The emphasis on lifelong learning, digital literacy, and inclusive policies is particularly relevant for ensuring that workforce transformation benefits all segments of society.

This foreword serves as an invitation to explore the rich analyses and recommendations contained within these pages. The insights provided here will undoubtedly contribute to shaping a future of work that balances technological innovation with human flourishing, ensuring that the transformations ahead lead to more equitable, sustainable, and fulfilling work experiences for all.

Annmarie Gorenc Zoran, PhD
Full Professor and Dean

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INTRODUCTION

Nadia Molek, Alexander van Biezen; Lejla Imamović Lerić, Reinhilde Pulinx

This State-of-the-Art scientific report marks the beginning of the interdisciplinary CERV TRANSFORM project, »The Future of Human Workforce«. The project unites researchers and experts from nine European countries to explore and address critical developments shaping the future of work.

Figure 1: Representation of the international consortium of CERV: – Transform project. UC Leuven-Limburg (Belgium), Comparative Research Network – CRN (Germany), Innovation Hive (Greece), Instituto di ricerche Economiche e sociali del friuli Venezia Giulia Impresa Sociale, FVG-IRES (Italy), the National comission for the promotion of Equality for men and Women -NCEP (Malta), Fundacija Fundusz Inicjatyw -FFI (Poland), the Instituto Universitario de Lisboa - ISCTE (Portugal), Fakulteta za Organizacijske študije v Novem mestu – FOŠ (Slovenia) and Sweden the WellbeingLab (Sweden). Source: Canva

The institutions that are part of the consortium are UC Leuven-Limburg (Belgium), Comparative Research Network – CRN (Germany), Innovation Hive (Greece), Instituto di ricerche Economiche e sociali del friuli Venezia Giulia Impresa Sociale, FVG-IRES (Italy), the National comission for the promotion of Equality for men and Women -NCEP (Malta), Fundacija Fundusz Inicjatyw -FFI (Poland), the Instituto Universitario de Lisboa - ISCTE (Portugal), Fakulteta za Organizacijske

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študije v Novem mestu – FOŠ (Slovenia) and Sweden the Wellbeing Lab (Sweden) (See Figure 1), each contributing their expertise in workforce development, technological innovation, and organizational transformation. Together, we aim to provide practical insights and strategies to help businesses, governments, and workers navigate the challenges and opportunities of a rapidly evolving labour market.

This report serves three main objectives. First, it aspires to identify the current and future landscape, discern the prevailing dynamics, trends and practices among the workforce and across the labour market, in order to gain a comprehensive understanding of the challenges faced by workforce, and consequently to glimpse what problems European societies are facing in this respect, focusing specifically on the countries participating in this project consortium (Belgium, Germany, Greece, Italy, Malta, Poland, Portugal, Slovenia, and Sweden).

Secondly, this State-of-the-Art report also looks to explore policies as well as good and weak practices related to the transformations in the work market and workers across partner countries. The narrative and integrative desk research aims to provide a "snapshot" of the current situation and highlight the challenges and advantages, which can be useful for proactively considering the development of human work in the future.

Finally, the gathered knowledge provides the foundation for future research by identifying key areas of focus for the upcoming *Blueprint of Tomorrow: Introducing the Future of Human Workforce Survey*, as well as the *Focus Group discussions* with the main stakeholders of the labour market. These discussions will delve deeper into these challenges and explore solutions to enhance workforce resilience and adaptability.

Our starting point is that human workforce is undergoing significant transformations. According to the PWC Report "Workforce of the future: The competing forces shaping 2030" (PWC, 2018):

> "Tremendous forces reshaping society and with it, the world of work: the economic shifts that are redistributing power, wealth, competition, and opportunity around the globe. the disruptive innovations, radical thinking, new business models and resource scarcity that are impacting every sector." (PWC, 2018, p. 6).

In this regard, the project aims to delve into these disruptions and engage different stakeholders in creating knowledge and greater discussion about how to anticipate to the upcoming and uncertain working scenarios that are arriving.

One of the drivers of the significant transformations is due to fast advancements in technology. This is not the first time in the history of mankind that technological disruption reshapes society,

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transforming both daily life and work organization. We have experienced this before: the so-called “First” Industrial Revolution, starting in the late 18th century, was a key turning point, shifting from an agrarian to an industrial economy. This transition spurred mass production, urbanization, and the rise of mechanization, which simplified tasks and led to significant employment of low-skilled workers (Chang & Phu Huynh, 2016). Advances in electricity, steel production and the use of oil and chemicals fuelled the “Second” Industrial Revolution, which led to the rise of factories, the introduction of mass assembly lines and improvements in transportation. The development of digital technology, computers, the internet and automation facilitated in the mid-20th century the shift from mechanical and analogue electronic technologies to digital systems, becoming the “Third” industrial revolution. The digital revolution of the 21st century has introduced even more advanced innovations such as artificial intelligence (AI), automation as well as robotics, the Internet of Things (IoT), quantum computing and 3D printing, becoming the so-called fourth industrial revolution. As costs fall, these technologies are advancing rapidly (International Bank for Reconstruction and Development, 2019) and are changing the labour market and society through more complex technologies, networked systems and advanced data analysis. Policies aimed at facilitating the efficient adoption of digital technologies should focus on increasing access to high-speed internet, upgrading technical and managerial skills, and implementing product and labour market reforms that enable the reallocation of resources in the economy. (Sorbe et al., 2019) This approach can help to narrow the productivity gap between the most and least productive firms, fostering inclusive growth. (Sorbe et al., 2019)

Furthermore, technological change will inevitably impact the number, quality, and distribution of jobs across the world. (Reinman, 2015). Advanced technologies are automating complex tasks, bringing significant changes to how people work, how organizations operate, and what skills are required in the labour market. This is examined in the second chapter by FOŠ (Slovenia), where a literature review was conducted on the changes in the workforce market introduced by automation, artificial intelligence (AI), and robotics within the European Union (EU) and the consortium partner countries. The desk research identifies the overall progress of these technologies in the labour market and their impact on workforce structures, job roles, wages, and the improvement of operational efficiency through the integration of technologies into work processes, among other transformations. This impact is particularly evident in developed economies with strong digital infrastructure (Chang & Phu Huynh, 2016).

Until recently, it was almost unimaginable, but currently, the digitalization and technologization of work processes not only affect industrial and manufacturing sectors; they have also enabled

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shifts in other sectors toward remote and platform-based work. This transformation was further accelerated by the COVID-19 pandemic. Remote working is increasingly recognised as a substitute for workforce mobility and allows white collars to remain productive without being physically present in the office (Smit et al., 2020, p. 41). Platform-based work, such as gig economy jobs (e.g., Uber, Deliveroo), is becoming more prevalent, and while this provides flexible employment opportunities, it also increases job insecurity for many workers, as these jobs often lack stable contracts, social benefits, and worker protections (Eurofound, 2021; WEF, 2023). ISCTE's (Portugal) State of the Art report in the Fifth Chapter examines the concept and scope of the consequences flexible work arrangements (FWA) (telecommuting, flextime, and compressed workweeks) brought, including their effects on individuals and organizations, the role of technology, and future challenges from broader economic and societal perspectives. While FWA allows employees more control over their work schedules and locations, enhances job satisfaction, work-life balance, and productivity, allows companies in expensive cities to tap into a larger talent pool, reduce the need for office space and address local labour shortages, it is found that they can also blur work-life boundaries, lead to isolation, and create access inequities. In other words, this transition raises questions about the long-term sustainability of remote working arrangements and their impact on employee productivity and wellbeing (Leal Filho et al., 2021). This rise in non-standard work arrangements creates challenges in ensuring fair working conditions and social protections, particularly for low-income and younger workers who have more probabilities to be employed in these roles. ISCTE's review identifies future challenges related to organizational flexibility needs and emphasizes the macro-level impacts of FWAs on productivity, wages, labour market participation, skills, lifestyle, migration, labour relations, and economic growth.

In the context of advancing digitalization, an emerging challenge proves to be central. The digital skills gap remains a crucial issue, particularly as the demand for digital literacy and advanced technological skills increases across sectors. Enhancing digital skills and literacy across the workforce is crucial, as the future of work will increasingly reward those with access to broadband connectivity and strong digital capabilities (Reinman, 2015). Many workers, especially those in low-skill occupations, lack the necessary competencies to adapt to emerging needs. This issue is examined and reported in the third chapter by UCLL (Belgium), specifically comparing changes in both traditional and emerging sectors. These emerging divides not only risk deepening income inequality but also hamper economic growth in regions struggling to modernize their workforce. As an innovative term in digital skills, the term digital government appears. Digital government (DG) as a phenomenon involves new styles of leadership, new

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decision-making processes, different ways of organizing and delivering services, and new concepts of citizenship. Our view of DG aligns with UNESCO's definition (2011) of e-governance., which states that the public sector leverages information and communication technologies (ICTs) to enhance the delivery of information and services, promote citizen engagement in decision-making processes, and foster greater government accountability, transparency, and efficiency.

In response to these events, as Innovation Hive (Greece) and IRES FVG (Italy) introduce in Chapters 8 and 4, in the EU level have been launched several initiatives to address these challenges, including the European Skills Agenda and the Pact for Skills, which aim to upskill and reskill workers, particularly in green and digital sectors (Cedefop, 2024). Regarding the need to train the workforce, in the 8th chapter, Innovation Hive reviews various national policies in European countries, aiming to examine how vocational education and training (VET) is aligned in the EU and in partner countries with workforce and employer demands to prepare EU citizens for the digital era. They found that proactive policies and investment in education are vital to leveraging the benefits of automation, promoting digital skills, and fostering lifelong learning for sustainable economic growth and social inclusion in Europe.

The consortium countries have the potential to collaborate and share best practices, particularly in areas such as digital training, inclusion policies, and well-being development, which can collectively contribute to the advancement of a more equitable, digitalized, and sustainable labour market. (Howson et al., 2021).

The contribution from IRES FVG (Italy) in the fourth chapter complements this perspective examining recent research at the European and OECD levels about how company training demands might shift due to digital and green transitions, demographic changes, and broader megatrends. Their analysis highlights not only the future skills that will be in demand but also the evolving workforce profiles, but it raises problematization regarding methodologies and teaching approaches that consider trainee characteristics and skill assessment methods post-training or retraining. Additionally, it emphasizes the importance of stakeholder engagement and governance among key actors in addressing these changes.

When considering the current and future scenarios of work, it is essential not to overlook the socially, economically, and politically unstable world, commonly referred to as VUCA[1], that humanity is facing (Hanini & Dinar, 2022; Roblek, Podbregar, Meško, 2023). Historically, since

[1] VUCA is an acronym that stands for: Volatily, Uncertainty, Complexity, Ambiguity. The concept has been It has been adopted from the military in business, leadership, and strategic planning to describe the challenges of operating in a fast-paced and unpredictable environment.

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the process of industrialization, individuals would join a factory or a workplace and could expect a certain level of stability in their careers (Bauman, 2000), allowing for a structured environment in which the manager was often the most knowledgeable. Today, however, there is a recognized disruption of this scenario driven by multidimensional factors (sociological, economic, political, technological, ecological), where jobs roles are becoming obsolete, unstable, and increasingly short-term (Hanini & Dinar, 2022). As previously mentioned, one driver is the technologization of work processes. Another is the increasing dynamism of the labour market, along with a multitude of factors to address, which creates a need for distributed cognition.

We are facing scenarios of accelerated social and demographic changes (Hanini & Dinar, 2022). The generational shift in the workforce is impacting the market, working behaviours, etc. The EU is facing an aging population, the workforce is shrinking, as more workers retire without an adequate influx of younger talent to replace them (European Commission, 2023). This demographic shift exacerbates skill shortages, particularly in sectors like healthcare, education, and technology, where demand for workers continues to grow (Joint Research Centre, 2021).

While older workers often face difficulties in upskilling or adapting to technological advancements (WEF, 2023), younger employees show a different approach to work, with some of them strategically doing a bare minimum at work without fully engaging, linked to factors like dissatisfaction, burnout, and a lack of engagement (Eurofound, 2021), a phenomenon recently termed as “quiet quitting” (Pevec, 2023). Engagement levels of the employees are very low, as only 14% are actively engaged in Europe (Harter, 2022), there is a relatively challenging work-life balance in many western countries, which was even more evident during pandemic of COVID-19 due to remote work challenges, which as stressed before, blurring of boundaries between work and private life, labour shortages and workforce retain on in connection to suitable soft and hard skills of the workforce, understaffed teams are put under high productivity demands, which reflects in the fact as Abrahmson (2022), that burnout and stress levels are at alarming levels all-time highs across professions, leveraging technology (like artificial intelligence, automation etc.) effectively and all ethical dilemmas deriving from that. In this regard, the contribution of the 6th chapter, by Wellbeing Lab (Sweden), explores specifically the evolution of working conditions, focusing on employee wellbeing, stress management, and mental health in modern workplaces. Their literature review finds about the need for holistic approaches that address both physical and mental wellbeing. They highlight the importance of leadership, organizational culture, and proactive mental health strategies in creating supportive work environments.

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Another central challenge in the current and future work scenario is the discussion around gender equality. As NCPE (Malta) examines this matter in the 7th chapter in relation to evolving workplace dynamics and workforce wellbeing. While women's employment rates have increased across the European Union, gender gaps in employment and pay remain, and women often face more challenges in balancing work with caregiving responsibilities. The representation of women remains low in essential sectors such as transport, energy, and ICT, as well as in highly automated roles and STEM fields (EIGE, 2024). Their research identifies that the rise of flexible working arrangements, especially following the EU Work-Life Balance Directive in 2019, was further accelerated by the COVID-19 pandemic presented mixed effects on wellbeing, with women often finding it harder to balance work and private life due to a greater share of caregiving and household responsibilities, including home-schooling.

European Union has been deploying different kinds of efforts, with successes and gaps, in building a cohesive labour market focused on economic growth and social inclusion amidst technological, demographic, and sustainability challenges. This is addressed in the 9th chapter by the work by FFI (Poland), where key policies, such as the European Pillar of Social Rights, and EU initiatives addressing digitalization, automation, and the impact of COVID-19 through funding and targeted recommendations are highlighted. The chapter concludes with a policy framework that provides a review of current policies and initiatives addressing the challenges faced by partner countries.

Finally, in chapter 10, CRN provides an overview of best and weak practices across the European labour market, specifically in partner countries, in the context of digitalization. The focus is on shifts in employment patterns, skill requirements, socio-economic dynamics, educational policies, and more. It explores practices that either support or hinder these transformations in meeting the evolving demands of both the current and future workforce and employers.

The document is organized to address the foundational trends impacting workforce dynamics, starting with an examination of how automation and digital technologies are reshaping the labour market in chapter 2, contributed by FOŠ (Slovenia). Chapter 3, presented by UCLL (Belgium), and chapter 4 by IRES FVG delve into emerging digital skills and technological adaptation, one evaluating the competencies necessary for future roles and the other reviewing the state of training and professional training to adapt to the new demands. The subsequent chapters cover critical areas such as flexible work arrangements (chapter 5, ISCTE, Portugal) and the influence of working conditions on employee wellbeing (chapter 6, Wellbeing Lab,

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Sweden). Additional chapters address key topics like gender equality in the workforce (chapter 7 by NCPE), VER programs (chapter 8, by Innovation Hive), employment policies, and labour market guidelines at the EU level (chapter 9, FFI and all the partners), with CRN (Germany) providing in the 10th chapter a comparative analysis of effective and weak practices across Europe.

References

1. Abrahmson, A. (2022). *Trends report: Burnout and stress are everywhere*. American Association of Psychology. https://www.apa.org/monitor/2022/01/special-burnout-stress#:~:text=From%20longer%20work%20hours%20to,heightening%20everyone's%20risk%20of%20burnout
2. Bauman, Z. (2000). *Liquid Modernity*. Polity Press.
3. CPI. (n.d.). *Vocational education and training*. Retrieved September 23, 2024, from https://cpi.si/en/vocational-education/
4. European Institute for Gender Equality. (2024). *Gender Equality Index 2024*.
5. European Commission. (2023). *Press release: Europe's demographic challenges and workforce impact*. https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_23_3704/IP_23_3704_EN.pdf
6. Eurydice. (2024, February 23). *Lifelong learning strategy*. https://eurydice.eacea.ec.europa.eu/national-education-systems/slovenia/lifelong-learning-strategy
7. Hanine, S. and Dinar, B. (2022) The Challenges of Human Capital Management in the VUCA Era. *Journal of Human Resource and Sustainability Studies*,10, 503-514. doi:10.4236/jhrss.2022.103030.
8. Harter, J. (2022, September 6). *Is Quiet Quitting Real?* https://www.gallup.com/workplace/398306/quiet-quitting-real.aspx
9. Joint Research Centre. (2021, February 25). *Europe's ageing society: More labour mobility could help EU meet demand for health and long-term care*. https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/europes-ageing-society-more-labour-mobility-could-help-eu-meet-demand-health-and-long-term-care-2021-02-25_en
10. Leal Filho, W., Wall, T., Rayman-Bacchus, L., Mifsud, M., Pritchard, D. J., Lovren, V. O., Farinha, C., Petrovic, D. S., & Balogun, A.-L. (2021). *Impacts of COVID-19 and social isolation on academic staff and students at universities: A cross-sectional study*. BMC Public Health, 21(1), 1213. https://doi.org/10.1186/s12889-021-11040-z
11. Pevec, N. (2023). The concept of identifying factors of quiet quitting in organizations: An integrative literature review. *Challenges of the Future*, *8*(2). https://doi.org/10.37886/ip.2023.006

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12. PWC. (2018). *Workforce of the future: The competing forces shaping 2030*. https://www.pwc.com/gx/en/services/people-organisation/workforce-of-the-future/workforce-of-the-future-the-competing-forces-shaping-2030-pwc.pdf

13. Roblek, V., Podbregar, I. & Meško, M. (2023). Chapter 6 Challenges of European Organisations in the VUCAWorld and the Emergence of the Bani World. In C. MACHADO & J. DAVIM (Ed.), *Managerial Challenges of Industry 4.0* (pp. 107-132). Les Ulis: EDP Sciences. https://doi.org/10.1051/978-2-7598-2628-5.c008

14. WEF. (2023). *Future of Jobs Report—2023. World Economic Forum*. https://www3.weforum.org/docs/WEF_Future_of_Jobs_2023.pdf

15. Sorbe, S., et al. (2019), "*Digital Dividend: Policies to Harness the Productivity Potential of Digital Technologies*", OECD Economic Policy Papers, No. 26, OECD Publishing, Paris, https://doi.org/10.1787/273176bc-en.

16. Reinman, Suzanne L. (2015), *"Open Knowledge Repository*", Reference Reviews, Vol. 29 No. 5, pp. 21-22. https://doi.org/10.1108/RR-05-2015-0113

17. UNESCO. 2011. ICTs as Tools for Improving Local Governance; Accessed January 2017. http://portal.unesco.org/ci/en/ev.php-URL_ID=3038&URL_DO=DO_TOPIC&URL_SECTION=201.html

18. Howson K, et al.(2021), *Driving the digital value network: Economic geographies of global platform capitalism*. Global networks Journal of transnational affairs https://doi.org/10.1111/glob.12358

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STATE OF THE ART LITERATURE REVIEW METHODOLOGY

Based on the fact that literature review serves as a crucial foundation for any research (Barry et al., 2022), this State of the Art report aimed to search and analyse existing professional and scientific literature to identify current knowledge, key concepts, trends, and practices (Hart, 2018) within the topic of technological advancements as well as about current trends happening in the labour market. The review was designed to particularly focus on transformation of workforce through technology, the shift in skills and competencies, workplace dynamics, as well as in identifying current policies and good/weak practices. The final and main goal of this work is not only to provide a value-added contribution, but also to serve as the foundation for the next two milestones of the project, that is: the preparation of the "Blueprint of Tomorrow: Introducing the Future of Human Workforce Survey" (WP3) and as a basis for the Focus Group discussions involving employers, HR professionals, employees, NGOs, trade unions, ministries, youth, and other relevant labour market experts (WP4). The visual representation of literature review process can be found in Figure 2.

Following legitimated methodology about narrative and integrative literature reviews, we began the research process by selecting research questions (RQ) that would guide our investigation (Fink, 2019; Flick, 2015). Seeking a comprehensive exploration of the transformations of the current and future workforce, the RQ questions were structured around four thematic axes derived from the TRANSFORM project's goals. The questions where:

1. RQ1: How are automation, artificial intelligence, and robotics transforming the labour market in the EU and partner countries?
2. RQ2: What are the emerging skills and competencies necessary for the future workforce?
3. RQ3: How are workplace dynamics changing, and what is the importance of workforce wellbeing in this context?
4. RQ4: How do current practices and policies compare to the future needs of the labour market?

After defining the research questions, we proceeded to plan the literature review, designing both the methodology and its protocol (see Annex A). The sub-themes and research questions were subsequently assigned to partners based on their specific areas of expertise. Under RQ1,

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FOŠ was tasked with exploring how relevant technologies, such as AI, robotics and automation, impact the labour market and workforce.

RQ2 was divided between UCLL, which conducted research on emerging digital skills and adaptation to new technologies and evaluated the necessary skills in both traditional and emerging sectors. IRES FVG focused on examining training and professional retraining programs developed to adapt to the new demands of the labour market.

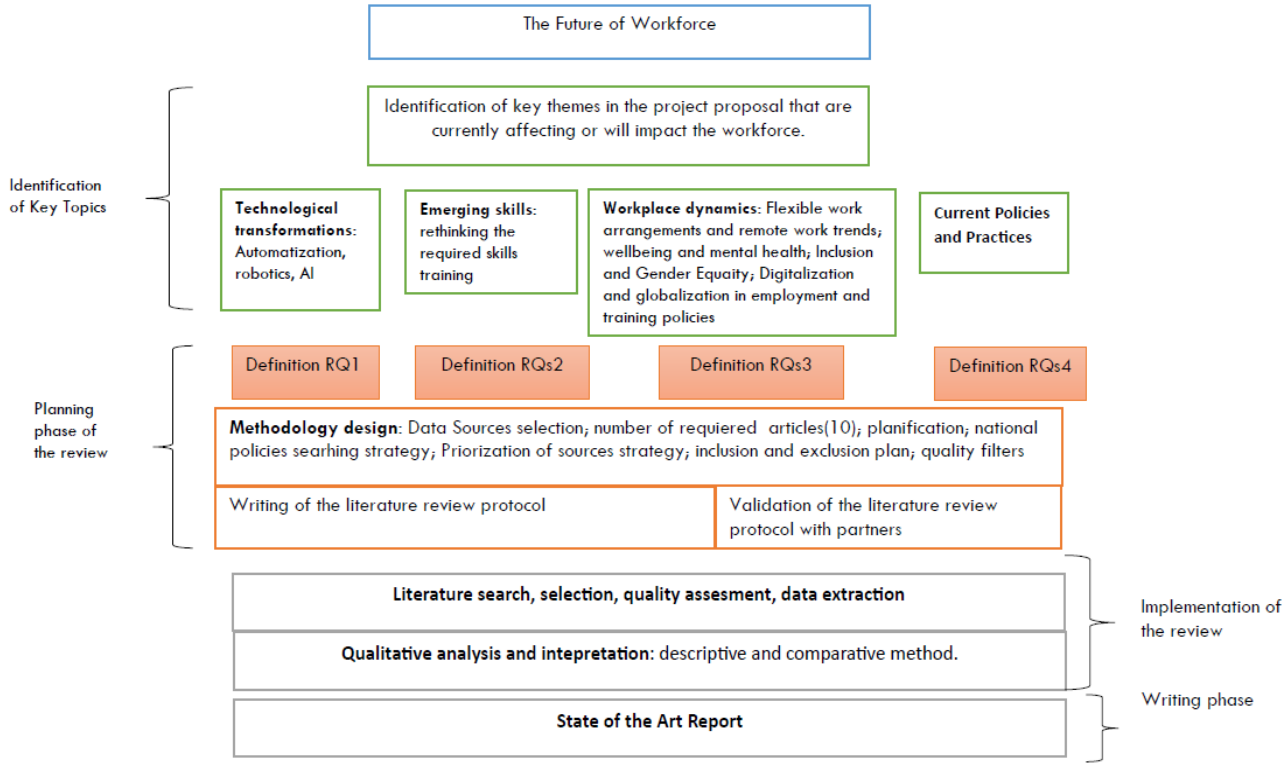

Figure 2: Visual representation of literature review process

Under RQ3, ISCTE was responsible for analysing remote work trends and flexible work arrangements. Wellbeing Lab studied the evolution of working conditions and employee wellbeing, focusing on stress management and mental health in the workplace. NCPE concentrated on analysing current practices related to inclusion and gender equality, while Innovation Hive investigated employment and vocational training policies within the context of digitalization and globalization.

Lastly, under RQ4, FFI addressed EU-level labour policies and guidelines regarding current and future labour market needs, while CRN examined good and weak practices in this area across the EU and within each partner's country. Each partner was tasked with assessing their national policies related to the identified issues.

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Using guidelines provided by Fink (2019), we selected online bibliographic scientific databases (Google Scholar, WoS, JSTOR, SpringerLink, Scopus, ScienceDirect). The scope of the literature review is primarily based on indexed journals and white papers. Since we also needed to capture practices and policies, we explored specific institutional websites such as the OECD, World Economic Forum, International Labour Organization, Eurofound, Cedefop, European Commission, and McKinsey & Company, where we searched for relevant empirical, professional and institutional, as well as governmental reports related to our research questions. While these reports may not always adhere to the same academic rigor as peer-reviewed studies, they provide valuable empirical insights into current trends, macroeconomic shifts, and forecasts concerning the issues under investigation. We integrated a variety of research methodologies in our review, encompassing theoretical, quantitative, qualitative, and mixed-method studies, alongside review papers and pertinent online resources. This approach ensures comprehensive coverage of the process of transformations among workforce and labour market both EU-wide and partner countries' data, specifically for Belgium, Slovenia, Portugal, Greece, Italy, Sweden, Germany, Poland, and Malta. In addressing these sources, we employed reflexivity and epistemological vigilance in our analysis to mitigate potential biases (Bourdieu & Wacquant, 2005).

The literature selection was primarily filtered through criteria of inclusion and exclusion (Fink, 2019). In this sense, unless it was a key work or contribution, we preferred publications from the last decade, with an emphasis on EU-focused research, including studies from member states and the UK. This targeted approach facilitated the identification of pertinent studies that address the key search terms (see examples in Table 1) included "Digital transformation AND employment," "Automation AND employment," and "Artificial Intelligence in the labour market AND Slovenia," "Robotics and job displacement"; "Skill development AND future jobs"; AND/OR "digital skills" AND "Slovenia" (or Germany, or Greece, or another partner's country), "Technological advancements in employment" AND "skills"; "Automatization" AND "Employment" AND "Skills", "Automation" OR "Digitalization of work" AND "workforce" "Slovenia" (or Germany, or Greece, or another partner's country); "Workforce wellbeing" AND "flexible work arrangements" AND/OR "remote work" AND "Slovenia" (or Germany, or Greece, etc.); "Automation" AND "employment" AND "Labour market policies" AND "EU"; "Gender" AND/OR "inclusion/exclusion" AND "Slovenia" (or Germany, or Greece, etc.); "Future of workforce" AND "Slovenia" (or Germany, or Greece, etc.). intersection of technology, workforce, and labour dynamics. Searches were also conducted in the languages of the countries to which each researcher belongs.

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The implementation phase of our research involved a meticulous review of titles and abstracts to assess the relevance and quality of the information (Flick, 2015). We carefully evaluated the material and selected only around ten relevant works for inclusion, rigorously considering their relevance to the research question and sub-topics as well as quality. In the next phase, we conducted an analysis of the assigned topics, synthesizing the review descriptively as well as comparatively. Initially, we created a table for each country, and ultimately consolidated all the data into a comprehensive literature overview (see Annex B)[2]. Once the analysis was completed, each partner proceeded to write their report according to their respective research question.

Table 1

Examples of key search terms

KEY SEARCH TERMS	FOCUS AREAS
"Digital transformation" and "employment"	Employment impact of digital transformation
"Automation" and "employment"	Impact of automation on jobs
"Artificial intelligence" and "labour market" and "Slovenia"	Ai's role in labour market
"Robotics" and "job displacement"	Robotics effects on job displacement
"Skill development" and "future jobs"	Developing skills for future jobs
"Digital skills" and "Slovenia" (or Germany, Greece, etc.)	Digital skills in specific countries
"Technological advancements in employment" and "skills"	Technological changes and skills needs
"Automatization" and "Employment" and "skills"	Automation's impact on skills and employment
"Automation" or "digitalization of work" and "workforce" (Slovenia, Malta, Greece, etc.)	Digitalization in workforce dynamics
"Workforce wellbeing" and "flexible work arrangements" and/or "remote work"	Wellbeing and flexible work practices
"Automation" and "employment" and "labour market policies" and "Eu"	Eu policies on automation and employment
"Gender" and/or "inclusion/exclusion" and e.g. "Slovenia" (or Germany, Italy, etc.)	Gender inclusion and exclusion
"Future of workforce" and "Slovenia" (or Poland, Portugal, etc.)	Future workforce trends

[2] See Annexes B

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References

1. Barry, E. S., Merkebu, J., & Varpio, L. (2022). State-of-the-art literature review methodology: six-step approach for knowledge synthesis. *Perspectives on Medical Education*, *11*(5), 1–8. https://doi.org/10.1007/S40037-022-00725-9
2. Bourdieu, P., & Wacquant, L. (2005). *Una invitación a a sociología reflexiva*. Siglo XXI Editores.
3. Fink, A. (2019). *Conducting Research Literature Reviews From the Internet to Paper*. UCLA.
4. Flick, U. (2015). *Introducing research methodology*. SAGE.
5. Hart, C. (2018). *Doing a literature review: Releasing the research imagination* (2nd edition). SAGE Publications Inc.

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CHAPTER 2

The future of labour: how ai, robotics, and automation are redefining EU labour markets

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Abstract:

The article discusses the profound impact of technological revolutions, particularly automation, artificial intelligence (AI), and robotics, on the labour market. Beginning with the First Industrial Revolution, it highlights the shifts in productivity, organizational structures, and employment opportunities. The current wave, often referred to as the Fourth Industrial Revolution, is marked by the integration of AI, automation, and digital systems. These technologies are reshaping labour markets globally, automating complex tasks, and transforming the nature of work.

Industrial robots, especially in sectors like manufacturing, are becoming more prevalent, with countries like Germany and Sweden leading in robot density. Additionally, AI systems and smart factories are enhancing efficiency and sustainability in industries through automation and data analysis. Service sectors such as finance and healthcare are also experiencing transformations due to AI's role in cognitive automation.

The adoption of these technologies, however, presents challenges such as job displacement, labour market polarization, and wage inequality. Despite fears that automation might eliminate more jobs than it creates, there is optimism about new job opportunities in areas like programming, maintenance, and AI system management.

The article stresses the need for policy measures to address skill shortages, workforce reskilling, and the growing demand for technological and socio-emotional skills. It concludes by emphasizing the dual nature of technological advancements: they offer immense potential but require proactive adaptation by governments, businesses, and workers to ensure equitable growth and reduce the negative consequences of automation.

Keywords: Automatization, Artificial Intelligence, Robotics, Labour Market Transformation, Job Displacement, Polarization of the Labour market, Technological Innovation, Job Creation.

Introduction

In the course of human history, mankind has triggered various so-called technological revolutions (see Figure 3). This transformations have continuously reshaped labour markets, from the mechanization of the First Industrial Revolution to the digitalization of the 20th century. Today, the Fourth Industrial Revolution, driven by artificial intelligence (AI), robotics and automation[3], is

[3] In in academic discussions, automation and robotization are two different concepts. While both involve the use of technology. They operate on different principles. The focus of automation is primarily on mechanization, where machines replace human labour in routine tasks, thereby optimizing operational workflows (Sadiku et al., 2023) In contrast, robotization entails the use of more sophisticated machines—robots—that can interact with their surroundings, make decisions based on sensor data, and adjust to environmental changes. Robots can perform tasks that are more complex, and often involve human-like actions, such as navigating, recognizing objects, or even

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redefining the nature of work across multiple sectors, including manufacturing, healthcare, education, and services. These technologies enhance productivity and operational efficiency but also pose challenges such as job displacement, wage inequality, and ethical dilemmas in algorithmic decision-making. Digitalization, by decoupling hardware from software, allows for greater flexibility and adaptability in automated systems, accelerating labour market transformation and increasing the need for new skill development strategies.

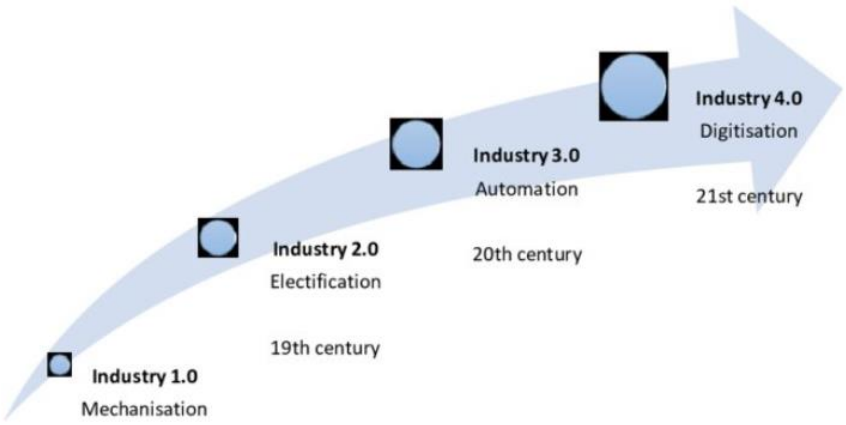

Figure 3: Industrial Revolutions. Adapted from "A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development" by A. Nayyar and A. Kumar. Copyright 2019 by Springer Nature. Source: Żabińska (2020)

The primary purpose of this chapter is to explore and examine how automation, artificial intelligence (AI), and robotics are transforming the labour markets within the European Union (EU) and the consortium partner countries. Based on findings from academic and professional literature, our goal is to identify the overall progress of these technologies and how they are impacting workforce structures, job roles, and the demand for specific skills.

We firstly aim to contextualize the research problem by first describing the general advancements in AI, automation, and robotics across various sectors. We will then assess the sector-specific transformations their implications and perceptions about it, for both workers and

learning new tasks (Bock & Linner, 2015). Automation has been linked to job displacement as machines take over tasks previously performed by humans (Acemoglu & Restrepo, 2018b). In contrast, robotization can create new job opportunities by necessitating skills in programming, maintenance, and oversight of robotic systems, thus reshaping the labour landscape (Huang & Rust, 2018).

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organizations. Finally, this chapter will summarize and analyse the key findings about the impact of technology on the workforce, focusing on the associated challenges and opportunities.

Technological advances in the labour market

The scientific literature on the advance of automation, robotics and artificial intelligence agrees that the technology is changing the labour market. A common thought that emerged from the review of the state of the art is that we are currently experiencing rapid progress in the technologization of work processes compared to the past (D. M. Acemoglu & Restrepo, 2018; D. Acemoglu & Restrepo, 2018b, 2019; Chang & Phu Huynh, 2016; Cséfalvay, 2020; International Bank for Reconstruction and Development, 2019; OECD, 2024; Rydzik & Kissoon, 2022; Siemon & Kedziora, 2023; Żabińska, 2020, among others). The COVID-19 crisis has accelerated the adoption of automation even more (Smit et al., 2020). Even though research suggests that the future is still unclear, it is estimated that this new wave of technical innovation could result for example in shifts in job roles, a reduction in workforce size, and significant advancements in organizational design, management practices, and operational processes (Dave et al., 2023, p. 700).

Advance of Industrial and service robots in labour market

Since the 1980s, advanced robotic technology has been a feature in Western industrial settings (Sjörsted, 1987 in Fernández-Macías, 2016), with the integration of digital functions in the early 1990s. (Fernández-Macías et al., 2021). Growing technological possibilities and falling costs are opening up new applications for robots (Frey & Osborne, 2017, p. 22).

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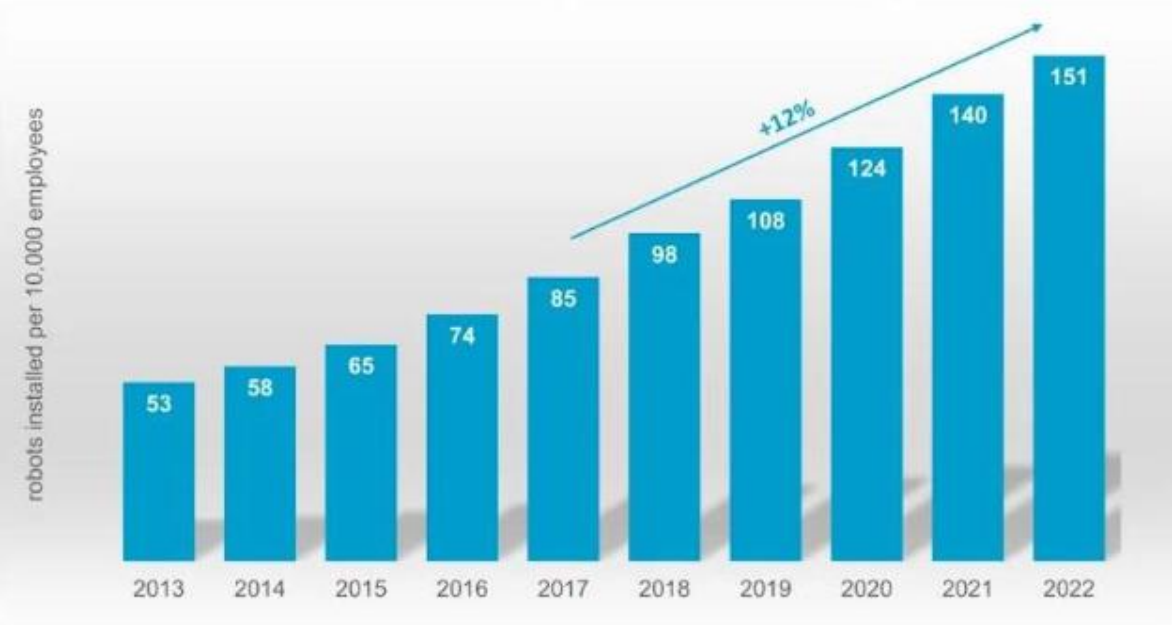

Figure 4: Robot density 2013-2022 – World average. Source: International Federation of Robotics

Data from the International Federation of Robotic (IFR, 2024) shows that global robot density[4] in the manufacturing industry (See Figure 4), the sector in which the majority of robotisation still takes place, is steadily increasing. In 2022, it reached a new high of 151 robots per 10,000 employees worldwide (see Figure 5). Unlike traditional machinery, industrial robots[5] an carry out tasks usually completed by humans, including welding, bending, and molding (Klenert et al., 2023).

[4] The robot density metric is a crucial indicator for evaluating and comparing the level of automation across various countries worldwide (IFR, 2024). It serves as a standardized measure to assess how extensively robots are integrated into the workforce in different regions, providing insights into automation trends and technological advancements.

[5] Industrial robots are defined as machines that are controlled digitally and designed to manipulate physical objects (Klenert et al., 2023).

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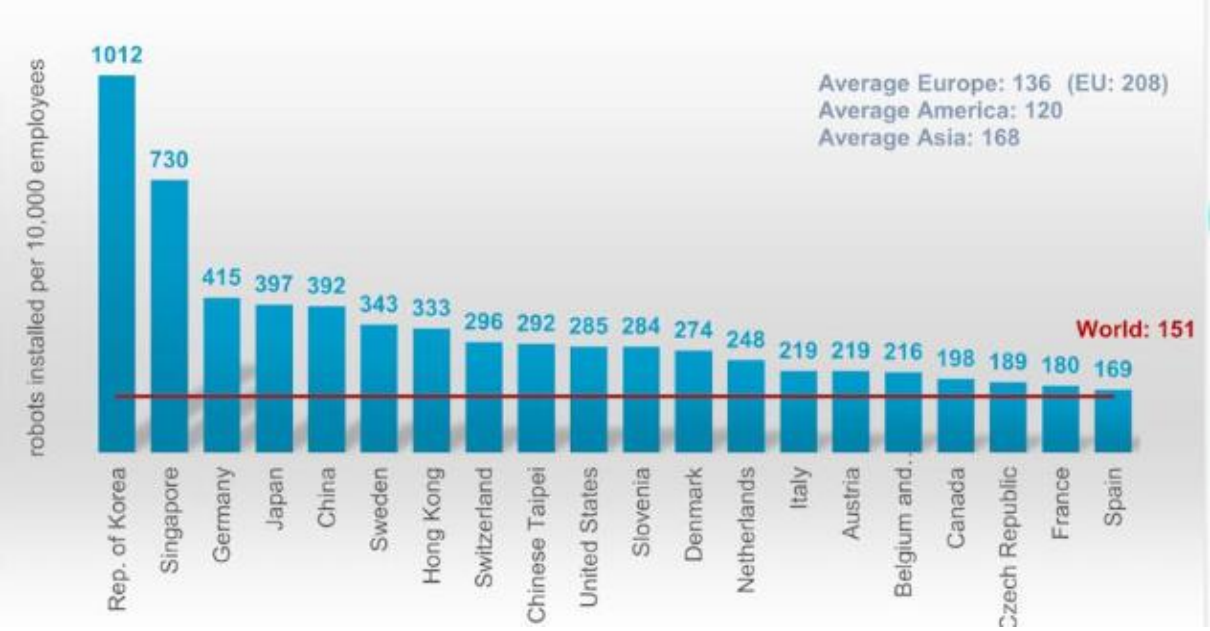

Figure 5: Robot density in the manufacturing industry 2022. Source: International Federation of Robotics

According to statistical data from Eurofound, the EU leads the world with an average of 208 industrial robots per 10,000 employees (see Figure 5). Germany, Sweden and Switzerland are in the global top ten. In Europe, Germany is in third place with 415 industrial robots per 10,000 employees. The automotive industry in particular accounts for a large proportion of robot use in this country (Eurofound, 2024). It is closely followed by Sweden (6th place; 343 units) and Switzerland (8th place, 292 units). In Sweeden the use of industrial and service robots[6] is widespread in large companies, with applications extending to manufacturing and warehouse management (Eurofound, 2024). Collaborative robots or "cobots" [7] are being used for example in medical facilities to support the handling of clinical samples, improving ergonomics for staff and counteracting the increased workload during the pandemic. Slovenia ranks 11th with 284 robots per 10,000 employees. The country has shown a strong propensity to introduce robots, especially in the manufacturing sector (Eurofound, 2024). Italy, in 14th place (219 units), is characterised by an above-average use of industrial and service robots, especially in medium-sized and large companies. Belgium is currently in 16th place (216 units).

[6] Service robot technologies include autonomous mobile robots (AMRs), storage and retrieval systems, packing robots, and articulated robot arms Eurofound, 2024, p. 13). In 2020, service robots were most frequently used in warehouse management systems, accounting for just over 40% of their deployment.

[7] Cobots offer key benefits such as low costs, compact design, mobility, space efficiency, and versatility (Eurofound, 2024, p. 16). Their straightforward installation and programming make these robots well-suited for small and medium-sized enterprises, which often have limited resources and a smaller pool of workers trained in robotic applications.

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One of the EU countries with the least robotised industries is Portugal, which will have a robot density of around 88 robots per 10,000 employees in 2022 (Eurofound, 2024, p. 12). Poland is lagging behind, with 42 robots per 10,000 workers in 2020 (Żabińska, 2020). In Greece, the prevalence of industrial and service robots is relatively low. Only around 1.7 % of companies use industrial robots (Eurofound, 2024). Robot density in industry was lower in the past and was in 36th place last year (17 robots / 10,000 employees) (Helenic Foundation of Enterprises, 2022). In Malta, the integration of robots is relatively low, with service robots being more widespread than industrial robots (Eurofound, 2024, p. 11).

AI Systems

When talking about the future of work, the literature mentions the idea of smart factories[8], in which AI systems, the Internet of Things (IoT)[9] and cyber-physical systems (CPS)[10], among other technologies, are integrated into the production framework to enhance efficiency, productivity, and sustainability (Benotsmane et al., 2019; S. Dave et al., 2023). Benotsmane et al. (2019)'s study observes that smart factories can indeed significantly increase production efficiency through the automation of processes and the use of data analyses, resulting in higher output and lower operating costs. Dave et al. (2023, p. 700) find that Big data solutions can be applied to automate production control, perform predictive maintenance, and identify and prevent potential issues. These technologies can also support functions such as research and development, sales, transportation, inventory management, and various other general services, enhancing operations and decision-making during the production phase. According to Chowdhary et al. (2024), automation technologies enriched with AI are able to increase productivity and efficiency through hyper-personalised customer interactions, customer data analysis and customer-centric design. According to expert opinions, such as that of Erik Brynjolfsson of Harvard University, highlighted by McKinsey (Yee, 2024), the disruptive issue of this newest technologies, particularly generative AI, lies in its rapid spread compared to previous technologies, due to its capacity to transform work processes. Unlike previous innovations that

[8] According to Lucke et al. (2008), a smart factory is a facility that is context-aware and supports both humans and machines in performing their tasks effectively.

[9] The Internet of Things (IoT) encompasses a large network of connected physical devices that communicate and share data via the internet (Atzori et al., 2017). These devices—ranging from household appliances to industrial equipment—are equipped with sensors, software, and various technologies that allow them to gather and send data, creating a smooth interaction between the physical and digital realms.

[10] CPS refers to integrations of computation, networking, and physical processes (Wang et al., 2015). These systems combine physical components (such as sensors, actuators, and mechanical systems) with computational elements (software and algorithms) to create a cohesive system that can monitor and control physical processes in real-time.

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required significant reorganisation and retraining, generative AI is easier to implement and quickly adopted thanks to the digital infrastructure developed in recent decades.

AI encompasses a broad array of technologies designed to collect, integrate, and analyse data, which in turn enhances or automates decision-making for individuals and organizations (Mikalef et al., 2022)[11]. As far as AI-controlled robots are concerned, our research finds that they are not yet widespread, but that they have the potential to cause even greater disruption in the industry in the future (Klenert et al., 2023).

On the other hand, AI systems have been increasingly integrated for example in the way of chatbots and virtual assistants into the field of services, finances (such as insurance claims processing, fraud detection) and human resources (Achakzai & Peng, 2023). AI-driven recommendation systems are prevalent in sectors like e-commerce (e.g., Amazon), entertainment (e.g., Netflix) (Gomez-Uribe & Hunt, 2016), and online content platforms, using machine learning algorithms to analyse user preferences and behaviours to offer personalized recommendations. AI-powered diagnostic tools are increasingly used in healthcare services for diagnosing diseases, managing patient data, and assisting in clinical decisions (Chowdhary et al., 2024; Topol, 2019). AI-driven platforms are employed to enhance logistics operations by forecasting demand, overseeing inventory, and streamlining delivery routes within logistics and supply chain management (Ivanov & Dolgui, 2021). Generative AI has become increasingly integrated into different sectors for Content Creation and Personalization (e.g. ChatGPT, Claude, or DALL-E, etc.), for Automated Code Generation (e.g. GitHub's) (Barke et al., 2023), for generating patient care summaries in health, in Creative Industries (it can create new pieces of art, music compositions, or even entire stories for entertainment and media purposes) (Colton, 2012), as well as in Education, Research and Training (Bearman et al., 2022).

According to Eurostat (2023) (See Table 6), the most common AI technology used by companies is AI-based process automation software, which is used by around 4% of companies in the EU. This technology focuses on the automation of repetitive tasks and the support of decision-making processes, particularly through software-based robotic process automation. Almost 3.5% of companies use AI for text mining, i.e. analysing written language to extract meaningful information, which is particularly useful for analysing customer feedback, legal documents and other large volumes of text. Around 3.5% also use machine learning for data analysis tasks, where algorithms learn from data to make predictions, identify trends or optimise business

[11] In this State-of-the-Art we will address this technology in a general way, giving some concrete examples, based on scientific research and reports from non-governmental organisations.

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processes. Around 3% of companies use speech recognition technologies, e.g. to convert spoken language into text for applications in customer service, transcription and virtual assistants. Around 2.5% of organisations use image recognition technology to identify objects or people from images, which is common in industries such as security, manufacturing and retail. Around 2% of companies use natural language generation (NLG) to generate human-like text or speech, which is useful in content creation, chatbots and customer communication. The least common AI technology is autonomous robots and drones, which are only used by just over 1% of companies.

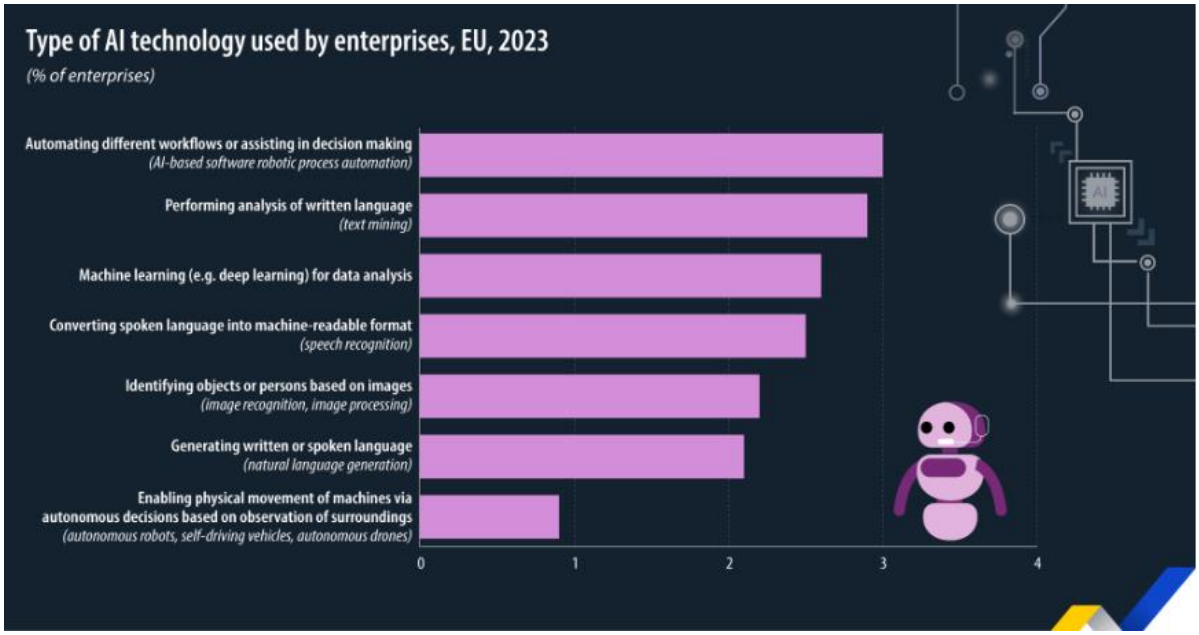

Figure 6: Type of AI technology used by enterprises, EU, 2023. Source: Eurostat

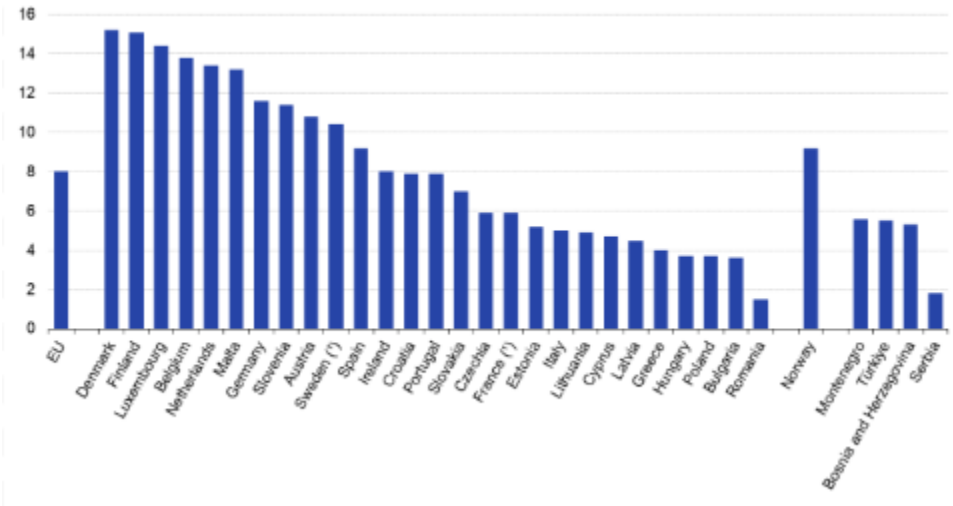

Figure 7: Enterprises using AI, 2023 data. Source: Eurostat

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Regarding the situation of AI integration in the countries that are part of this project, as seen in Figure 7, in 2023, Belgium's AI adoption reached around 14% of enterprises, indicating strong integration across multiple sectors. For example, 31% of Belgian companies already use artificial intelligence in their recruitment processes (ManpowerGroup, 2023). While AI adoption in the manufacturing sector decreased from 2018 to 2023, it grew within professional services between 2019 and 2021 and remained stable in health and social care, financial services, and construction sectors (PWC, 2024).

Malta (13%) has one of the highest AI usage rates among the consortium partners[12], reflecting its strategic push to become a hub for AI and blockchain technologies (Malta.ai, n.d.). In Slovenia, AI technologies are used by 12% of companies, though almost a third of companies lack the necessary staff or skills for digital transformation[13]. The 2021 data shows AI adoption was lower among small companies (9%), compared to medium (20%) and large companies (36%). In terms of industry activity, 9% of manufacturing companies and 14% of service companies use AI technologies (AI4SI, 2021).

Sweden continues to demonstrate a comprehensive approach to AI integration across multiple sectors, with over 10% of enterprises utilizing AI, making one of the leaders in this field (AI Sweden, n.d.). AI adoption is significant in manufacturing, public administration, and services. In Germany, where 7% of enterprises use AI, priority sectors include healthcare, environment and climate, aerospace, and mobility (European Commission - AI Watch, 2021). Italy shows moderate AI adoption, with about 6%, reflecting steady progress, particularly in manufacturing, banking, finance, and insurance sectors. Recent data also shows a 25% increase in the number of AI startups in Italy over the last two years (Dave, 2024).

Portugal shows 5-6% AI adoption, with significant use in sectors like defence and intelligence (100%), technology (92.2%), retail (89.5%), and industry (87.5%). However, AI usage is lower in the public sector (57.1%) and healthcare (46.2%) (Ferreira, 2024).

Greece has made significant progress in AI integration, especially in industries like tourism and shipping (Tsekeris & Karkaletsis, 2023). However, both Greece and Poland lag behind, with approximately 4% AI adoption, signalling slower adoption rates compared to their Western

[12] Nevertheless, in comparison to 2020, where Malta was a leader in AI adoption, the landscape has shifted. Many of the northern and central European countries now lead the adoption curve, while countries in southern and eastern Europe are still catching up.

[13] Slovenia has a long tradition of AI research dating back to the late 1970s. Currently, there are around 200 researchers and 10 commercial companies developing AI technology in Slovenia (Gov.si, 2020). Lately it established an International Research Centre on Artificial Intelligence under the auspices of UNESCO (IRCAI).

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European neighbours. In Poland, AI continues to be the primary technology employed in the development of products or services. Polish AI companies most frequently serve the IT and telecommunications sector (58%), followed by finance and banking (41%), and trade, including e-commerce (34%) (PAIH, 2021).

The OECD report "Using AI in the workplace" finds that countries such as Germany, Belgium and Sweden are pursuing policies that promote the use of AI in sectors with high skill requirements, while countries such as Greece, Poland and Slovenia are more exposed to risks in labour-intensive sectors with low skill requirements (OECD, 2024, pp. 7; 16). These countries are leading the way in the introduction of AI, particularly in highly skilled sectors such as manufacturing and services. They focus on upskilling workers to adapt to AI tools and have strong labour protection laws aimed at reducing inequalities (OECD, 2024, p. 5;7;16). Greece, Poland and Slovenia have more labour-intensive industries and face significant challenges from the introduction of AI. Workers in lower-skilled occupations are more vulnerable and these countries have weaker social safety nets, which exacerbates wage inequality (OECD, 2024, p. 16).

Key drivers of technological transformation

The trend towards increasing automation varies from country to country and is driven by different factors. In general, the main reasons cited in the literature are labour shortages, the need to increase productivity and the desire to improve human skills. In 2022, 2.2% of companies in the EU stated that labour shortages, primarily due to factors such as demographic ageing, the skills mismatch and the low quality of jobs in critical sectors, are a key driver for the adoption of robotics (EUROFOND, 2024, p. 16) (see Table 2). These long-term challenges continue to drive companies towards automation as a solution to maintaining productivity (Fernández-Macías et al., 2021).

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Table 2

Main reasons enterprises use robots, 2022 (%)

	High cost of labour	Difficulties in recruiting personnel	To enhance safety at work	To ensure high precision of outputs and processes	To expand the range of goods or services
Belgium	5,1	4,0	6,7	8,4	4,8
Germany	3,6	2,3	3,0	4,1	2,2
Greece	0,8	0,5	1,0	1,7	1,3
Italy	3,4	2,4	6,2	7,8	4,9
Malta	2,4	2,7	3,5	5,8	5,6
Poland	1,9	1,7	2,4	3,6	2,3
Portugal	1,6	2,3	5,8	6,0	4,4
Slovenia	3,9	3,1	4,9	6,2	3,9

Source: Eurostat in Eurofound (2024, p.15)

We will now present an analysis of the driver review by country, focussing on the nations that are part of our project consortium. According to data provided by Eurofound (2024, p. 15), the main factors driving the introduction of robots in Belgium are the high cost of labour, the need for precision in results and processes and the focus on safety in the workplace. In Germany, automation is being accelerated by the difficulty of finding qualified staff, so companies are relying on robots to maintain productivity and accuracy in various areas. In Greece, robotisation contributes to precision and expands the range of goods and services, but the slow uptake can be attributed to the fact that there is no significant labour shortage, which reduces the urgency of automation. In Italy, automation is being driven primarily by the demand for precision in manufacturing and greater safety, especially in medium-sized and large companies. In addition, service robots are indispensable in warehouse management and healthcare, as they help with tasks such as cleaning and logistics. In Malta, the main motivators for the use of robots are precision and the expansion of the range of services, similar to Poland, where precision is still the main driver. Portugal shares these factors, along with the additional pressures of labour costs and labour shortages. In Slovenia, labour shortages, the need for precision and safety in the workplace are common reasons for the introduction of robots. Finally, in Sweden, the focus is on safety and ergonomics in the workplace (Eurofound, 2024, p. 23-24).

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Regarding the integration of AI into work processes across Europe, the ILO (International Labour Organization, 2024) emphasises that there are two different ways of applying AI technology in the workplace. The first aims to automate tasks that workers perform. The second aims to use AI-based analyses and algorithms to automate management functions – or what is commonly referred to as "algorithmic management" (Gmyrek et al., 2023).

Technological transformation by sectors

For most of the 20th century, technological progress in the manufacturing industry was much faster than in the service sector (Klenert et al., 2023). The mechanization and automation of industry over the past two centuries stem not only from technological advancements but also from a thorough restructuring of industrial production processes (Fernández-Macías & Hurley, 2021). These technical and organisational changes are interdependent. Automation technologies enable a reorganisation of production, while this reorganisation drives the advance of new automation technologies.

Figure 8 highlights the variety in how different sectors are incorporating automation technologies (Eurofound, 2024, p. 14). According to Eurofound (2024) data, Industrial robots dominate the manufacturing sector with a remarkable utilisation rate of 16%, reflecting the industry's heavy reliance on automation for tasks such as assembly, packaging and material handling. In construction, both service robots and industrial robots are used sparingly, with usage rates of just 1% and 2% respectively. This suggests that although the industry is beginning to automate certain processes, it is still lagging behind other industries in the adoption of robots. In wholesale and retail, the use of robots is more balanced. Industrial robots account for 2%, while service robots make up 3% of usage, likely due to their role in inventory management and customer service. Both types of robots are also used equally in transport and warehousing, at 2% each. These technologies are likely to be used for tasks such as sorting, packing and stock management. In the accommodation and food service industry, both types of robots are used, likely due to the automation of food preparation, cleaning and basic customer service functions in the hospitality industry. Chang & Phu Huynh (2016) emphasise that, particularly in the food industry, technology is very important in terms of quality and safety. In the information and communication industry, service robots and industrial robots are used in 2% each, possibly in data centres, telecommunication infrastructures and in the automation of customer support. The study by Rydzik and Kissoon (2022) mentions how automation is impacting various areas in tourism, from reception to kitchen staff, and discusses how intelligent systems can displace human

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labour in these areas. Certain technologies, such as AI-driven quality control cameras and real-time location tracking systems, are highlighted as examples of increasing digital surveillance in the tourism industry.

Other sectors that have integrated automation and digital tools are aerospace (Squicciarini & Staccioli, 2022), agriculture forestry and fishing (Smit et al., 2020), education; construction; mining and quarrying; electricity, gas, and water; food, drink, and tobacco; textiles; wood, paper, and printing; chemicals and pharmaceuticals; fossil fuels; rubber, plastic, and mineral products; metal products (excluding machines); computer, electronic, and electrical equipment; machinery and equipment; and automotive (Klenert et al., 2023) (See Figure 9).

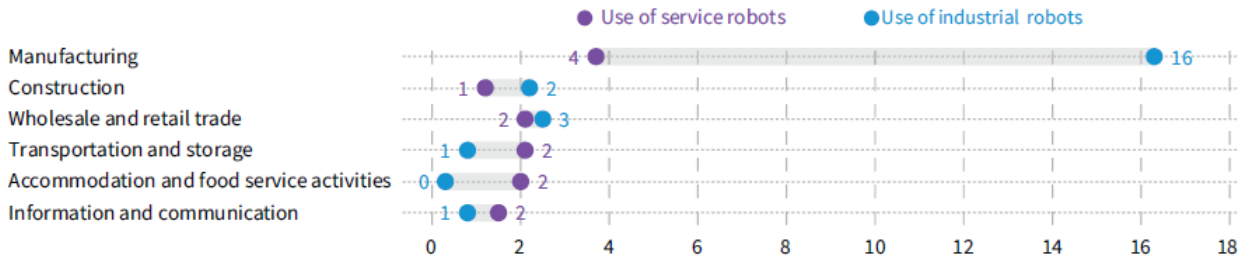

Figure 8: Share of enterprises using industrial and service robots in EU. Source: Eurostat

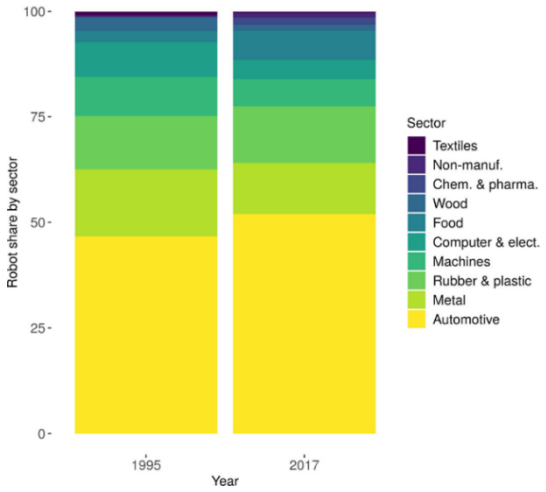

Figure 9: Robots in 28 EU countries by sector, in the years 1995 and 2017 in Europe. Source: Klenert et al. (2023)

In the manufacturing industry, for example, automation technologies have been used extensively to increase productivity and efficiency, which has an unequal impact on different types of work (Brynjolfsson & McAfee, 2014). For example, the introduction of cobots enables better

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interaction between humans and robots, facilitating more efficient workflows and allowing employees to focus on complex tasks that require human judgement and creativity (Mattsson & Hattinger, 2022). The use of robots in manufacturing, in assembly lines, has rationalised processes and enables faster production times and lower labour costs. A notable example is the automotive industry, where companies such as Volkswagen and BMW use advanced robots to automate repetitive tasks, resulting in higher production and improved quality control (Doorley et al., 2023). In agriculture, the introduction of automation technologies is driven by the need for efficiency and productivity (Lowenberg-DeBoer et al., 2021; Smit et al., 2020), as well as for management of food security (Popescu & Popescu, 2022). Cobotic technology has been introduced in hospital laboratories and restaurants to help clean tables and deliver food to customers (Eurofound, 2024, pp. 23–24)

As far as AI technology is concerned, AI's current landscape includes diverse applications, from online shopping to digital assistants and social networks, with data being a crucial resource for innovation (Fischer et al., 2023). In business, AI personalizes services based on customer data analysis (Kazak et al., 2020; Sampaio et al., 2021). In tourism, AI, particularly through chatbots, streamlines bookings and user requests (Dias Braga Lino, 2018). In the healthcare sector, AI is being integrated into diagnostic processes and patient management systems. For example, AI algorithms are being used to analyse medical images and assist in diagnosis, which can improve accuracy and speed (Doorley et al., 2023). Engel et al. (2022) note that companies are using AI to streamline processes, e.g. through the use of chatbots in customer service and the automation of contract assessments in legal departments.

Impacts of robotization, automatization and ai in labour market

When we talk about the impact of automation, robotics, or artificial intelligence, there is generally concern about the real effects these technologies will have on society and the workforce. The prevailing idea is that this technological revolution could be different from previous ones, as there is increasing anxiety that automation may destroy more jobs than it creates (Frey & Osborne, 2017). The prevailing idea is that this technological revolution could be different from previous ones, as there is increasing anxiety that automation may destroy more jobs than it creates (Klenert et al., 2023). A recent Eurobarometer survey found that 72% of respondents agreed that robots and AI are taking jobs away from people (European Comission, 2017). This concern arises from the belief that automation technologies could

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significantly disrupt the economy, making many existing jobs obsolete (Fernández-Macías et al., 2021).

The scientific literature on automation and robotics, AI and the future of work presents a variety of perspectives, many of which would be impossible to fully address in this state of the art[14]. A considerable body of research examines the broader impact of technological change on the labour market and focuses on how automation affects different work tasks and workforce segments (Autor, 2015; Fernández-Macías et al., 2021). In general, numerous productions examine the mechanisms by which automation affects the broader labour market (Acemoglu & Autor, 2011; Acemoglu & Restrepo, 2018a, 2018b). Some studies focus exclusively on employment (Carbonero et al., 2018; De Backer, et al., 2018).

In general terms, we have identified two dominant perspectives. Firstly, a group of research focuses on the positive outcomes of integrating technology into the workforce and work processes. (Klenert et al. 2023), which highlights that the productivity effect is achieved through the use of cheaper capital in production processes (Acemoglu & Restrepo, 2018b). It also highlights that technology leads to the creation of new tasks and employment opportunities (Fernández-Macías et al., 2021), as well as emphasize the effects of complementation and augmentation. Secondly, another group of studies focus on the negative impact of technologization, analysing the displacement effect, where technology directly replaces labour for certain tasks, the polarization of the labour market, the produced inequalities, wage effects, and ethical dimensions. We will take a closer look at the knowledge gained so far in the following section.

Optimistic perspectives

By analysing data on the use of industrial robots in different sectors and EU countries together with employment data by skill level, of Klenert et al. (2023) conclude that the presence of industrial robots is positively associated with overall employment. De Backer, et al. (2018) also find a positive and varied relationship between the use of robots and employment in the period from 2000 to 2014 and in developed countries. Chiacchio et al. (2018, p. 23) find that ICT capital has a positive impact on employment, suggesting that different automated technologies have different effects. An important aspect considered regarding workforce is that AI and robots can improve physical safety by automating dangerous tasks (OECD, 2024, p. 7).

[14] In this report I will focus only on the most significant works that align with the objectives of the project.

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Other research finds that although industrial robots have a negative impact on employment, particularly in sectors like German manufacturing, there is a positive and significant spillover effect (Dauth et al., 2017). In other words, employment in non-manufacturing sectors increases, which offsets the negative effects in manufacturing

Positive effect on productivity

Kromann et al. (2019) as well as Acemoglu and Restrepo (2018b) find that technologization has a significant positive effect on productivity, and that these effects can extend to the broader economy. Meanwhile, European Commission (2015) finds a neutral effect of automatization on employment.

On the other hand, a difference has been found between the impact of artificial intelligence on the productivity of high and low performers. AI systems are trained to predict accurate outcomes, often based on the practices of high performers, which they tend to embody. As a result, low performers may have more to gain from using these systems (Georgieff , 2024, p. 14).

Creation of new jobs

Based on historical trends, such as previous technological revolutions, many researchers conclude that although some jobs will be displaced, entirely new job categories will be created simultaneously. For example, experts from the International Bank for Reconstruction and Development (2019, p. 24) predict that AI will drive the creation of new roles and expand job opportunities by 2030. Additionally, they expect that some labour may shift from skilled to administrative or unskilled production workers, especially in developing countries.

This view is also supported by research, which emphasizes that jobs involving non-routine tasks and cognitive-creative intensive roles, such as landscapers, home health aides, security personnel, doctors, lawyers, educators, and managers, face a lower risk of automation, as their roles require complex decision-making and problem-solving abilities, which are harder for machines to replicate (see for example: Brynjolfsson & McAfee, 2014; Chang & Phu Huynh, 2016; Eurofound, 2024; Klenert et al., 2023; Rydzik & Kissoon, 2022; Squicciarini & Staccioli, 2022).

Regarding the creation of new jobs, Siemon and Kedziora (2023) argue that these technologies will lead to new roles in areas such as programming, maintenance and management of automated systems. The International Bank for Reconstruction and Development (2019, p. 20) predicts that sectors such as technology development, the gig economy and platform-based

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online services, including mobile app development and virtual reality design, will also see a transformation of jobs. Similarly, Chang and Phu Huynh (2016) emphasise that new roles are likely to emerge in areas that require cognitive and social intelligence, such as education, healthcare and IT services. In addition, Brynjolfsson and McAfee (2014, pp. 120–122) observe that automation has led to the enhancement of certain roles, requiring higher skills, such as data analysis, creativity, and design. They stress that this phenomenon, conceptualized as skill-biased technical change, has resulted in increased wages for educated workers, particularly those with college degrees, while wages for less-educated workers have stagnated or declined.

From a market forecasting paradigm, the McKinsey Global Institute predicts that certain types of jobs — both high and low-skilled — will experience growth, especially in areas with growing populations and increased demand for services (Smit et al., 2020, p. 7). They emphasise that by 2030, many occupations will be reshaped rather than abolished, with significant growth expected in STEM-related occupations and in commercial/legal occupations, which could create around 4 million jobs in Europe. There could also be growth of over 30 in creative industries and arts management, although this category will remain smaller. Remarkably, occupations such as software developers, nurses and marketing professionals, account for almost 30% of the projected net job growth (Smit et al., 2020, p. 19).

Complementation/Augmentation of human capabilities

Another idea that stands out is about the complementarity between human workers and robots, usually denominated as “complementation” (Klenert et al., 2023) or “augmentation” (ILO, 2024;) of human capabilities or “augmentation of human skills” (Gmyrek et al., 2023). Both concepts highlight the importance of human expertise in the working process. For example, research based on microdata shows a neutral or positive relationship between the use of robots and low-skilled employment, suggesting that robots often complement, rather than replace, low-skilled jobs (Klenert et al., 2023). A study by the European Commission (2015) also underlines the complementarity between employment and robots, stating that the introduction of automation primarily improves labour and human productivity (Kromann et al., 2019). Also Brynjolfsson notes that the use of AI systems complements jobs rather than replacing them entirely (in Yee, 2024). He stresses that as AI becomes more prevalent, organisations will need to rethink their operating models, invest in retraining their workforce and place more emphasis on creative and interpersonal skills that AI cannot fully replicate.

A report by the International Bank for Reconstruction and Development (2019, p. 23) concludes that robots are particularly effective at complementing workers who perform non-routine tasks

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that require advanced analytical, interpersonal or manual skills, such as teamwork, relationship management, caregiving and people management.

Development of different skills

Many researchers believe that what will significantly change is the need of workforce of new skills and competences to remain relevant. McKinsey Global Institute forecast that by 2030 around 94 million workers, that is the 40% of the labour force, will need to upskill, even within their current roles, as technology takes over more than 20% of their daily tasks (Smit et al., 2020). McKinsey also predicts that by 2030, tasks requiring physical and manual labour will decline by 18%, while tasks requiring basic cognitive skills will decline by 28% across Europe. Meanwhile, demand for technological skills will increase by 39% and for socio-emotional skills by 30% as workers move into areas that require interaction, care, teaching and leadership, areas where machines have their limitations (Smit et al., 2020, p. 22).

In addition, for the International Bank for Reconstruction and Development (2019, p. 24) higher-order cognitive and socio-behavioural skills, such as problem solving, teamwork and adaptability, are becoming increasingly important as they are less susceptible to automation. An OECD study involving 10 countries, including Germany, Belgium and Sweden, emphasises the increasing demand for management, business and digital skills in occupations affected by AI. In Germany, AI is transforming highly skilled occupations, while in Belgium there is a growing need for resource management and digital skills. In Sweden, the trend is also moving towards cognitive, social and management skills due to the widespread adoption of AI (OECD, 2024).

On the other hand, it is emphasized that exposure to AI has led to a growing demand for digital literacy, creativity, and collaboration (Georgieff, 2024, p. 29). In countries like Germany, Sweden, and Belgium, the demand for creativity and originality—particularly the ability to develop new ideas—has surged, with job vacancies requiring these skills rising between 2012 and 2022.

Pessimistic perspectives

Concerns about job displacement

A recurring concept in the analysed literature is “displacement of jobs” (see e.g.: Stephany, 2021), meaning that occupations requiring routine and repetitive tasks are more vulnerable to being replaced by technology, leading to their gradual elimination. This issue is expected to particularly affect developing economies (Frey & Osborne, 2017; Chiacchio et al., 2018),

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especially in sectors that rely on low-skilled and inexpensive labour, such as customer service, office support, and production jobs (International Bank for Reconstruction and Development, 2019, p. 18; Smit et al., 2020, p. 21). Research by Lordan and Neumark (2018), cited by Eurofound (2024, p. 15), further suggests that increasing the minimum wage could accelerate worker replacement by robots, particularly in low-skilled roles. Frey and Osborne (2017) reinforce this finding, noting that the displacement of low-skilled jobs disproportionately affects lower-income workers, exacerbating income inequality. Automation is expected to deepen regional inequalities, as peripheral regions such as Central and Eastern Europe (CEE), where there will be a major relocation of jobs, remain highly dependent on industries such as car manufacturing, making them vulnerable to changes in global production patterns (Cséfalvay, 2020).

In this sense, the study by Chang & Phu Huynh (2016) finds that jobs that require few manual skills, such as cashiers, typists and machine operators, are at higher risk of automation due to their repetitive nature. Similarly vulnerable are cognitive-intensive jobs such as accountants, proofreaders and office workers, as many of their tasks can be easily automated. Doorley et al. (2023) also note that while the integration of AI in healthcare improves job skills, it also raises concerns about decreasing demand for roles such as radiology and pathology, where AI can take over tasks traditionally done by human specialists. Gastronomy and construction occupations are also among those most affected by automation (Smit et al., 2020). For Frey & Osborne (2017), the manufacturing and transport industries are particularly at risk. In addition, young workers face the highest risk of displacement (25%) due to the automation of entry-level jobs such as cashiers and waiters, a risk that is exacerbated by the COVID-19 pandemic (Smit et al., 2020, p. 22).

Regarding gender, although women are highly concentrated in occupations with a high potential for automation, such as office support, they have a slightly lower displacement rate (21%) compared to men (23%), as they are more strongly represented in healthcare and service sector occupations, which are less susceptible to automation (Chiacchio et al., 2018).

Nevertheless, there are studies that challenge the concept of job displacement. Dauth et al. (2017) in Germany as well as Doorley et al. (2023), show that current employment losses due to automation are minimal.

Polarization of the labour market

Another important concept is the “polarisation of the labour market”, which refers to the growing gap between skilled and unskilled workers due to the technologization of work processes.

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Researchers (Carbonero et al., 2018, pp. 9–10; Chang & Phu Huynh, 2016) note that this polarisation is particularly evident in developed countries, where robotisation has led to a decrease in off-shoring and an increase in re-shoring — the return of production to developed countries. As a result, emerging economies are facing higher job losses due to this shift in production patterns.

Market studies also observe the tendence increasing polarisation of the labour market (Smit et al., 2020). According to the McKinsey report "The Future of Work in Europe: Automation, Workforce Transitions, and the Shifting Geography of Employment" (Smit, 2020), employment growth is concentrated in highly skilled cognitive occupations such as lawyers, doctors and technicians, while manual occupations with lower qualifications, such as in the service sector, are also on the rise. In contrast, middle-skilled jobs, which once formed the backbone of the economy, are shrinking, further exacerbating this divide.

Regional and productive inequalities

Several studies emphasise that automation and robotisation tend to reproduce and exacerbate pre-existing regional and productive inequalities (Chang & Phu Huynh, 2016; Frey & Osborne, 2017). This inequality has been observed, for example, in the relocation of automobile production from Western to Eastern European countries, such as Poland and Slovenia, increasing their dependence by economically and industrially stronger nations such as Germany or Sweden (Cséfalvay, 2020) Such overdependence on a single industry makes these economies vulnerable to disruptions in the sector.

Regarding the dispersion of AI adoption, it is observed that access to advanced technology is unequal, with low-skilled workers benefiting less than their higher-skilled counterparts. In this regard, OECD (2024, pp. 5–6) also finds that while AI can increase productivity for some, it also risks increasing income inequality among those who do not have access to AI tools, due to infrastructure limitations, technological advancements, skills shortages, or high costs, a concern which has been basically discussed in the Global Forum on the Ethics of AI this year in Slovenia (UNESCO, 2024).

ILO (International Labour Organization, 2024) also points out that differences in access to AI systems can widen productivity gaps between large companies and small or micro enterprises. These differences in infrastructure and economic capacity exacerbate the problems of competitiveness between different sectors, reinforcing the inequalities (Gmyrek et al., 2023).

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Wage Effects of Automation and Industrial Robots

Studies on the impact of industrial robots and AI on wage inequality show mixed effects. Some studies suggest that AI exposure is associated with wage increases for higher-income workers, although others find no significant relationship between AI exposure and wage increases at the occupation or industry level (Georgieff, 2024, pp. 14–15). The integration of industrial robots has been shown to negatively impact wages for those engaged in routine tasks, exacerbating economic inequality by favouring highly skilled workers (Acemoglu & Restrepo, 2019; Doorley et al., 2023). Chiacchio et al. (2018) reinforce this finding, demonstrating that robotization has negatively affected both employment and wages in six European countries—Finland, France, Germany, Italy, Spain, and Sweden—which accounted for 85.5% of the EU robot market in 2007. However, Chiacchio et al. (2018, p. 22) also note that the evidence remains inconclusive.

Regarding AI, the OECD (2024, p. 7) evaluated that the use of these systems has been linked to wage inequality in countries with weaker social safety nets. As the demand for skilled labour increases, income inequality worsens, further devaluing low-skilled jobs. However, the report "Artificial intelligence and wage inequality" (Georgieff's, 2024, pp. 9; 27) emphasizes that there is no strong evidence suggesting that AI has had a significant effect on wage inequality. In fact, the report highlights that this impact is more pronounced within occupations rather than between them, as AI tends to reduce productivity differentials among workers. Additionally, it is observed that from 2014 to 2018, wage inequality decreased in Central and Eastern European countries like Poland (-17%), while countries such as Greece saw an increase (+34%) (Georgieff, 2024, p. 17), pointing to the complexity of these processes.

Implications on mental health

According to the OECD report (OECD, 2024, p. 7), the use of AI harbours risks to mental health, including stress due to constant monitoring and limited worker autonomy. In response, Germany and other EU countries have begun to integrate AI-specific health and safety assessments, while nations with less developed labour laws are lagging behind in addressing these new risks (OECD, 2024, pp. 7–8). This discrepancy highlights again the inequalities in the EU labour market during the process of integrating technology into it.

Ethical dimensions

The literature on automatization, AI and robotics frequently highlights ethical concerns, especially when applied to the world of work. Technological advancements are not only about increasing efficiency but also raise important ethical and social considerations. This is particularly relevant in sectors such as education, tourism, or hospitality, where the interaction between

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technology and human engagement remains critical (Bearman et al., 2022; Tussyadiah, 2020). For instance, while robots can improve operational capabilities in customer-facing roles, they cannot entirely replace the value of human interaction in sectors like hospitality, where personal service plays a key role (Rydzik & Kissoon, 2022).

Automation can negatively impact workplace dynamics by increasing pressure and reducing employee autonomy. Rydzik and Kissoon (2022) observe that automated systems often exacerbate these issues, criticizing the neoliberal focus on efficiency and cost reduction, which tends to overlook workers' rights and wellbeing.

According to Gmyrek et al. (2023), women, particularly in office and administrative roles, are affected by automation, with 8.5% of female jobs in high-income countries being at risk, compared to only 3.9% of male jobs. This highlights how automation can exacerbate gender-based income inequality, particularly in more developed economies.

One of the major issues with AI systems is their collection of vast amounts of personal and biometric data, raising significant concerns about data privacy and the potential reinforcement of biases (Hijmans & Raab, 2022). As research already demonstrated, while AI has the potential to reduce human bias, it can also replicate or even exacerbate it when trained on skewed or unrepresentative datasets (Akter et al., 2021; OECD, 2024). Although the EU's General Data Protection Regulation (GDPR) (European Union, 2018) provides strong protections, gaps remain, particularly concerning the use of personal data by AI systems. Closing these regulatory gaps is essential to ensure that workers retain control over their data and have the right to refuse its use (OECD, 2024, pp. 8–9).

Conclusions

This report highlights the complex impact that technological advancements such as automation, AI, and robotics have on the workforce. While there are positive effects, such as the creation of new jobs, increased productivity, and the enhancement of human capabilities, there are also significant challenges to address. These include growing concerns about job displacement, wage inequality, the widening of regional and socio-economic divides, and ethical issues associated with these technologies. Studies from international organizations like the OECD and World Bank forecast long-term gains in productivity and employment, particularly in high-skilled sectors, while research from institutions like the ILO underscores the risks of widening inequalities and workforce displacement, especially in low-skilled, routine jobs.

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Technological advancements offer tremendous opportunities, but their impact will largely depend on proactive policy measures like upskilling, reskilling, and supporting workforce adaptability (Gmyrek et al., 2023; OECD, 2024; Squicciarini & Staccioli, 2022). The need for social protection and education reforms is critical to ensuring that the benefits of these technologies are distributed equitably across different regions and sectors (International Labour Organization, 2024; Georgieff, 2024). As automation progresses, countries with stronger social safety nets and educational systems will be better positioned to mitigate the negative effects of job displacement and wage inequality (Acemoglu & Restrepo, 2019; Doorley et al., 2023).

The future will depend on how governments, businesses, and workers adapt to these changes, ensuring that automation drives growth without leaving parts of the workforce behind (OECD, 2024; International Bank for Reconstruction and Development, 2019). This will require collaboration across stakeholders to implement forward-thinking policies that protect vulnerable workers while fostering innovation and productivity growth.

References

1. Acemoglu, D., & Autor, D. (2011). Skills, tasks and technologies: Implications for employment and earnings. In *Handbook of labor economics* (Vol. 4B, pp. 1043–1171). Elsevier. https://doi.org/10.1016/B978-0-444-53452-3.00012-5
2. Acemoglu, D., & Restrepo, P. (2018). Artificial intelligence, automation and work. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3098384
3. Acemoglu, D., & Restrepo, P. (2018a). Low-skill and high-skill automation. *Journal of Human Capital, 12*(2), 204–232. https://doi.org/10.1086/697242
4. Acemoglu, D., & Restrepo, P. (2018b). The race between man and machine: Implications of technology for growth, factor shares, and employment. *American Economic Review, 108*(6), 1488–1542. https://doi.org/10.1257/aer.20160696
5. Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labor. *Journal of Economic Perspectives, 33*(2), 3–30. https://doi.org/10.1257/jep.33.2.3
6. Achakzai, M. A. K., & Peng, J. (2023). Detecting financial statement fraud using dynamic ensemble machine learning. *International Review of Financial Analysis, 89*, 102827. https://doi.org/10.1016/j.irfa.2023.102827
7. AI4SI. (2021, October 13). Poročilo SURS: Težave pri digitalni preobrazbi poslovanja in uporaba tehnologij umetne inteligence v podjetjih. https://ai4si.gzs.si/b/porocilo-surs-tezave-pri-digitalni-preobrazbi-poslovanja-in-uporaba-tehnologij-umetne-inteligence-v-podjetjih
8. AI Sweden. (n.d.). *AI Sweden: The Swedish National Center for Applied Artificial Intelligence*. https://www.ai.se/en
9. Akter, S., McCarthy, G., Sajib, S., Michael, K., Dwivedi, Y. K., D'Ambra, J., & Shen, K. N. (2021). Algorithmic bias in data-driven innovation in the age of AI. *International Journal*

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

of *Information Management, 60*, 102387. https://doi.org/10.1016/j.ijinfomgt.2021.102387

10. Atesci, K., Bhagwatwar, A., Deo, T., Desouza, K. C., & Baloh, P. (2010). Business process outsourcing: A case study of Satyam Computers. *International Journal of Information Management, 30*(3), 277–282. https://doi.org/10.1016/j.ijinfomgt.2010.01.009
11. Atzori, L., Iera, A., & Morabito, G. (2017). Understanding the Internet of Things: Definition, potentials, and societal role of a fast evolving paradigm. *Ad Hoc Networks, 56*, 122–140. https://doi.org/10.1016/j.adhoc.2016.12.004
12. Autor, D. H. (2015). Why are there still so many jobs? The history and future of workplace automation. *Journal of Economic Perspectives, 29*(3), 3–30. https://doi.org/10.1257/jep.29.3.3
13. Barke, S., James, M. B., & Polikarpova, N. (2023). Grounded Copilot: How programmers interact with code-generating models. *Proceedings of the ACM on Programming Languages, 7*(OOPSLA1), 85–111. https://doi.org/10.1145/3586030
14. Bearman, M., Ryan, J., & Ajjawi, R. (2022). Discourses of artificial intelligence in higher education: A critical literature review. *Higher Education*. https://doi.org/10.1007/s10734-022-00937-2
15. Benotsmane, R., Kovács, G., & Dudás, L. (2019). Economic, social impacts and operation of smart factories in Industry 4.0 focusing on simulation and artificial intelligence of collaborating robots. *Social Sciences, 8*(5), 143. https://doi.org/10.3390/socsci8050143
16. Bock, T., & Linner, T. (2015). *Robotic industrialization: Automation and robotic technologies for customized component, module, and building prefabrication* (1st ed.). Cambridge University Press. https://doi.org/10.1017/CBO9781139924153
17. Brown, D., & Wilson, S. (2005). *The black book of outsourcing: How to manage the changes, challenges, and opportunities*. John Wiley & Sons.
18. Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies* (First Edition). W. W. Norton & Company.
19. Carbonero, F., Ernst, E., & Weber, E. (2018). Robots worldwide: The impact of automation on employment and trade. https://www.ilo.org/media/414251/download
20. Chang, J.-H., & Phu Huynh. (2016). *The future of jobs at risk of automation*. International Labour Office Bureau for Employers Activities Regional Office for Asia and the Pacific.
21. Chiacchio, F., Petropoulos, G., & Pichler, D. (2018). *The impact of industrial robots on EU employment and wages: A local labour market approach* (Working Paper). https://www.bruegel.org/sites/default/files/wp-content/uploads/2018/04/Working-Paper_02_2018.pdf
22. Chowdhary, S., Kaushik, A., Sagar, S., & Gupta, V. (2024, September 19). *Improving consumer experience with AI in healthcare service operations*. McKinsey & Company. https://www.mckinsey.com/industries/healthcare/our-insights/reimagining-healthcare-industry-service-operations-in-the-age-of-ai?stcr=F775ECA299B442069F83C418F8794C00&cid=other-eml-alt-mip-mck&hlkid=92203f81a264405c9f9f55231dee2047&hctky=15798594&hdpid=197dd2a6-e65d-483c-b39c-3f1d0581070f
23. Colton, S. (2012). The Painting Fool: Stories from Building an Automated Painter. In J. McCormack & M. d'Inverno (Eds.), *Computers and creativity* (pp. 3–38). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-31727-9_1

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

24. Cséfalvay, Z. (2020). Robotization in Central and Eastern Europe: Catching up or dependence? *European Planning Studies, 28*(8), 1534–1553. https://doi.org/10.1080/09654313.2019.1694647

25. Dauth, W., Findeisen, S., Suedekum, J., & Woessner, N. (2017). German Robots—The Impact of Industrial Robots on Workers. *CEPR Discussion Paper*, DP12306. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3039031

26. Dave, A. (2024, April 28). *AI Statistics in Italy: Key Metrics and Predictions for 2024*. AllAboutAI. https://www.allaboutai.com/it/resources/ai-statistics/

27. Dave, S., Desai, D., Shah, S., Savalia, A., & Kiran, M. B. (2023, June 15). Smart Factories - An Important Component of Industry 4.0. In *Proceedings of the International Conference on Industrial Engineering and Operations Management*. 8th North American Conference on Industrial Engineering and Operations Management, Houston, USA. https://doi.org/10.46254/NA8.20230198

28. De Backer, K., DeStefano, T., Menon, C., & Ran Suh, J. (2018). Industrial robotics and the global organisation of production. *OECD Science, Technology and Industry Working Papers, 2018/03*. https://doi.org/10.1787/dd98ff58-en

29. Dias Braga Lino, P. M. (2018). *Travel Booking Chatbot* [Master's thesis, Facultade de Enghenaria da Universidad do Porto]. https://core.ac.uk/download/pdf/160610061.pdf

30. Doorley, K., Gromadzki, J., Lewandowski, P., Tuda, D., & Kerm, P. V. (2023). Automation and income inequality in Europe. *IBS Working Papers*, Article 06/2023. https://ideas.repec.org//p/ibt/wpaper/wp062023.html

31. Engel, C., Ebel, P., & Leimeister, J. M. (2022). Cognitive automation. *Electronic Markets, 32*(1), 339–350. https://doi.org/10.1007/s12525-021-00519-7

32. Eurofound. (2024). *Human–robot interaction: What changes in the workplace?* Publications Office. https://data.europa.eu/doi/10.2806/601796

33. European Comission. (2017). *Attitudes towards the impact of digitisation and automation on daily life*. https://europa.eu/eurobarometer/surveys/detail/2160

34. European Comission - AI Watch. (2021). *Germany AI Strategy Report*. https://ai-watch.ec.europa.eu/countries/germany/germany-ai-strategy-report_en#:~:text=The%20German%20Federal%20Government%20also%20has%20research%20and%20innovation%20support,climate%2C%20aerospace%2C%20and%20mobility

35. European Commission. (2015). *Analysis of the impact of robotic systems on employment in the European Union: Final report*. Publications Office. https://data.europa.eu/doi/10.2759/516348

36. European Union. (2018). *General Data Protection RegulationGDPR*. https://gdpr-info.eu/

37. Fernández-Macías, E., Klenert, D., & Antón, J.-I. (2021). Not so disruptive yet? Characteristics, distribution and determinants of robots in Europe. *Structural Change and Economic Dynamics, 58*, 76–89. https://doi.org/10.1016/j.strueco.2021.03.010

38. Ferreira, C. (2024, mai). *Maioria das empresas em Portugal já usam IA generativa*. https://tek.sapo.pt/noticias/negocios/artigos/maioria-das-empresas-em-portugal-ja-usam-ia-generativa

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

39. Fischer, M., Foord, D., Frecè, J., Hillebrand, K., Kissling-Näf, I., Meili, R., Peskova, M., Risi, D., Schmidpeter, R., & Stucki, T. (2023). Sustainability in a Digital Context. In M. Fischer, D. Foord, J. Frecè, K. Hillebrand, I. Kissling-Näf, R. Meili, M. Peskova, D. Risi, R. Schmidpeter, & T. Stucki, *Sustainable Business* (pp. 117–128). Springer International Publishing. https://doi.org/10.1007/978-3-031-25397-3_8

40. Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, *114*, 254–280. https://doi.org/10.1016/j.techfore.2016.08.019

41. Georgieff, A. (2024). Artificial intelligence and wage inequality (OECD Artificial Intelligence Papers 13; OECD Artificial Intelligence Papers, Vol. 13). https://doi.org/10.1787/bf98a45c-en

42. Gmyrek, P., Berg, J., & Bescond, D. (2023). Generative AI and jobs: A global analysis of potential effects on job quantity and quality. *International Labour Organization*.

43. Gomez-Uribe, C. A., & Hunt, N. (2016). The Netflix Recommender System: Algorithms, Business Value, and Innovation. *ACM Transactions on Management Information Systems, 6*(4), 1–19. https://doi.org/10.1145/2843948

44. Gov.si. (2020, December). Mednarodni raziskovalni center za umetno inteligenco doma v Ljubljani. https://www.gov.si/novice/2020-12-20-mednarodni-raziskovalni-center-za-umetno-inteligenco-doma-v-ljubljani/

45. Hijmans, H., & Raab, C. (2022). Ethical Dimensions of the GDPR, AI Regulation, and Beyond. *Direito Público, 18*(100). https://doi.org/10.11117/rdp.v18i100.6197

46. Hoffmann, S. (2003). America Goes Backward. *The New York Review of Books, 50*(10). http://www.nybooks.com/articles/16350

47. Huang, M.-H., & Rust, R. T. (2018). Artificial Intelligence in Service. *Journal of Service Research, 21*(2), 155–172. https://doi.org/10.1177/1094670517752459

48. IFR. (2024). World Robotics Report. https://ifr.org/worldrobotics

49. International Bank for Reconstruction and Development. (2019). *The changing nature of work*. The World Bank.

50. International Labour Organization. (2024). Artificial intelligence—Topic Portal. *ILO*. https://www.ilo.org/artificial-intelligence

51. Ivanov, D., & Dolgui, A. (2021). A digital supply chain twin for managing the disruption risks and resilience in the era of Industry 4.0. *Production Planning & Control, 32*(9), 775–788. https://doi.org/10.1080/09537287.2020.1768450

52. Kazak, A. N., Chetyrbok, P. V., & Oleinikov, N. N. (2020). Artificial intelligence in the tourism sphere. *IOP Conference Series: Earth and Environmental Science, 421*(4), 042020. https://doi.org/10.1088/1755-1315/421/4/042020

53. Klenert, D., Fernández-Macías, E., & Antón, J.-I. (2023). Do robots really destroy jobs? Evidence from Europe. *Economic and Industrial Democracy, 44*(1), 280–316. https://doi.org/10.1177/0143831X211068891

54. Kromann, L., Malchow-Møller, N., Skaksen, J. R., & Sørensen, A. (2019). Automation and productivity—A cross-country, cross-industry comparison. *Industrial and Corporate Change*, dtz039. https://doi.org/10.1093/icc/dtz039

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

55. Lowenberg-DeBoer, J., Franklin, K., Behrendt, K., & Godwin, R. (2021). Economics of autonomous equipment for arable farms. *Precision Agriculture*, *22*(6), 1992–2006. https://doi.org/10.1007/s11119-021-09822-x

56. Lucke, D., Constantinescu, C., & Westkämper, E. (2008). Smart Factory—A Step towards the Next Generation of Manufacturing. In M. Mitsuishi, K. Ueda, & F. Kimura (Eds.), *Manufacturing Systems and Technologies for the New Frontier* (pp. 115–118). Springer London. https://doi.org/10.1007/978-1-84800-267-8_23

57. Malta.ai. (n.d.). *Malta National AI Strategy: Our vision*. https://malta.ai/malta-ai/our-vision/

58. ManpowerGroup. (2023, July 17). *31% of Belgian companies already use artificial intelligence within their recruitment process*. https://www.manpowergroup.be/2023/07/17/31-of-belgian-companies-already-use-artificial-intelligence-within-their-recruitment-process/

59. Mattsson, S., & Hattinger, M. (2022). *Designing digital support for operator and maintenance personnel cognition and future skills in manufacturing industry*. 9665–9673. https://doi.org/10.21125/inted.2022.2537

60. Mikalef, P., Conboy, K., Lundström, J. E., & Popovič, A. (2022). Thinking responsibly about responsible AI and 'the dark side' of AI. *European Journal of Information Systems*, *31*(3), 257–268. https://doi.org/10.1080/0960085X.2022.2026621

61. OECD. (2024). *Using AI in the workplace* (OECD Artificial Intelligence Papers 11; OECD Artificial Intelligence Papers, Vol. 11). https://doi.org/10.1787/73d417f9-en

62. PAIH. (2021). *AI ecosystem in Poland. The Digital Poland foundation's latest report*. https://www.paih.gov.pl/en/news/20210419-ai_ecosystem_in_poland/

63. Popescu, G. C., & Popescu, M. (2022). COVID-19 pandemic and agriculture in Romania: Effects on agricultural systems, compliance with restrictions and relations with authorities. *Food Security*, *14*(2), 557–567. https://doi.org/10.1007/s12571-021-01239-8

64. PWC. (2024). *AI Jobs Barometer—Belgium findings*. PWC. https://www.pwc.com/gx/en/issues/artificial-intelligence/job-barometer/countries/pwc-ai-jobs-barometer-belgium.pdf

65. Rydzik, A., & Kissoon, C. S. (2022). Decent work and tourism workers in the age of intelligent automation and digital surveillance. *Journal of Sustainable Tourism*, *30*(12), 2860–2877. https://doi.org/10.1080/09669582.2021.1928680

66. Sadiku, M. N. O., Ajayi-Majebi, A. J., & Adebo, P. O. (2023). Robotic Automation in Manufacturing. In M. N. O. Sadiku, A. J. Ajayi-Majebi, & P. O. Adebo, *Emerging Technologies in Manufacturing* (pp. 33–47). Springer International Publishing. https://doi.org/10.1007/978-3-031-23156-8_3

67. Sampaio, H. A., Correia, A. I., Melo, C., Brazão, L., & Shehada, S. (2021). Analyzing Tourism Agents' Perceptions of the Use of Artificial Intelligence. In J. V. de Carvalho, Á. Rocha, P. Liberato, & A. Peña (Eds.), *Advances in Tourism, Technology and Systems* (pp. 245–254). Springer. https://doi.org/10.1007/978-981-33-4256-9_22

68. Siemon, D., & Kedziora, D. (2023). *From Accountant to Software Developer – Transforming Employees with Robotic Process Automation (RPA): Vol. January 3-6, 2023* (T. X. Bui, Ed.). University of Hawaii at Manoa.

69. Smit, S., Tacke, T., Lund, S., Manyika, J., & Thiel, L. (2020). *The future of work in Europe: Automation, workforce transitions, and the shifting geography of employment*. McKinsey

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Global Institute. https://www.mckinsey.com/~/media/mckinsey/featured%20insights/future%20of%20organizations/the%20future%20of%20work%20in%20europe/mgi-the-future-of-work-in-europe-discussion-paper.pdf

70. Squicciarini, M., & Staccioli, L. (2022). Labour-saving technologies and employment levels: Are robots really making workers redundant? (OECD Science, Technology and Industry Policy Papers 124; OECD Science, Technology and Industry Policy Papers, Vol. 124). https://doi.org/10.1787/9ce86ca5-en
71. Stephany, F. (2021). One size does not fit all: Constructing complementary digital reskilling strategies using online labour market data. *Big Data & Society, 8*(1), 205395172110031. https://doi.org/10.1177/20539517211003120
72. Topol, E. J. (2019). High-performance medicine: The convergence of human and artificial intelligence. *Nature Medicine, 25*(1), 44–56. https://doi.org/10.1038/s41591-018-0300-7
73. Tsekeris, X., & Karkaletsis, V. (2023). Generative AI Greece 2030: Possible Futures of Generative Artificial Intelligence in Greece. *Special Secretariat of Foresight*.
74. Tussyadiah, I. (2020). A review of research into automation in tourism: Launching the Annals of Tourism Research Curated Collection on Artificial Intelligence and Robotics in Tourism. *Annals of Tourism Research, 81*, 102883. https://doi.org/10.1016/j.annals.2020.102883
75. UNESCO (Producer). (2024). *Global Forum on the Ethics of AI* [Video recording].
76. Wang, L., Törngren, M., & Onori, M. (2015). Current status and advancement of cyber-physical systems in manufacturing. *Journal of Manufacturing Systems, 37*, 517–527. https://doi.org/10.1016/j.jmsy.2015.04.008
77. Yee, L. (n.d.). Technology alone not enough for true productivity [Broadcast]. Retrieved 24 September 2024, from https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/technology-alone-is-never-enough-for-true-productivity?stcr=664CA76090DA4A0F8DF61126EE9F6C9D&cid=other-eml-alt-mip-mck&hlkid=bb19308a9753428e8c7e4d3941d0f30c&hctky=15798594&hdpid=45106fd1-5384-4d48-9699-75cc93850a12
78. Żabińska, I. (2020). Development opportunities for automation and robotization in Poland. *Scientific Papers of Silesian University of Technology – Organization and Management Series, 2020*(148), 861–870. https://doi.org/10.29119/1641-3466.2020.148.63

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CHAPTER 3

Emerging skills for the future workforce

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Abstract:

This State-of-the-art report of UCLL (Belgium) focuses on research question RQ2: "What are the emerging skills and competencies necessary for the future workforce?". The central thread in the examined research results boils down to the conclusion that both *analytical thinking* and *creative thinking* turn out to be considered the most important core skills to face the future of work, next to resilience, flexibility, agility, and lifelong learning.

The research center *Inclusive Society* at UCLL attaches a lot of importance to the aspect of inclusion. Our joined investigations into the future of the human workforce should shed light on the question under what conditions the human workforce can be supported towards a new equilibrium in the division of labour between the human workforce, robots and AI algorithms.

Keywords: artificial intelligence, digitalization, labour, workforce, future, skills, competencies, inclusion.

Introduction

At the risk of stating the obvious, economic success, individual wellbeing and societal cohesion depend heavily on the development and enhancement of human skills through education and learning, paving the way for meaningful work. Only recently, breakthroughs in the development of artificial intelligence (AI) have reached a critical threshold of visibility (especially since the public release of ChatGPT on 30 November 2022), bringing the level of awareness of the general public as to its potential impact on the future of the human workforce to a whole new level.

The fact that the 2024 Nobel Prize in Physics has been awarded to John Hopfield and Geoffrey Hinton for their groundbreaking discoveries and inventions in neural networks and machine learning that paved the way for the ensuing boom in the development of artificial intelligence is indicative of the general awareness that we have reached a tipping point in this rapidly accelerating evolution which is about to transform our society in a far-reaching way.

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We can discern an analogous development in current research on the subject matter at hand, which tends to focus increasingly on the growing impact of AI and automation on the future of work. Hence, an analysis of the skills required for the future of the human workforce seems to narrow down on the question of which skills are needed to handle the rise of AI in the near future, as we will demonstrate in our analysis of a paradigmatic selection of recent research.

Technological advances and the rise of AI

The central thread in the papers which we have selected as exemplary for our research subject at hand is that artificial intelligence, more in particular *generative AI* (i.e., AI capable of generating texts, images, videos or other data using generative models, like ChatGPT), becomes increasingly important and subsequently raises the question on what kind of skills we will need in the next years to come in view of this evolution (see Haase, 2024; Bankins, Hu and Yuan, 2024; Imram and Torralba, 2024).

It goes without saying that the sudden advent of ChatGPT, publicly released on November 30, 2022, was nothing less than a real gamechanger in this respect, marking nothing less than a tipping point. Less than two years after its entrance in the public domain, ChatGPT turns out to be widely used by in increasing numbers by both students and the human workforce alike. One predominant feature in the current research is that this rapidly increasing use of generative AI like ChatGPT is not seen as a threat at all, but as a welcome source of opportunities, "reshaping the landscape of education by offering new methods for enhancing critical thinking and cognitive skills development" (Imram and Torralba, 2024). Overall, to take an example, Imram and Torralba discern great benefits in the use of generative AI with regard to personalized learning, interactive experiences, adaptive feedback and collaborative support, fostering a growth mindset and enhancing essential cognitive skills such as analysis, evaluation and reasoning:

- Generative AI enhances *personalized learning* by tailoring educational content to individual student needs. AI tools like ChatGPT enable the analysis of student performance and the adaptation of instructional materials to address specific strengths, weaknesses and learning styles.
- *Interactive learning* is a second significant benefit of integrating AI into education, as it allows for the creation of dynamic, scenario-based experiences that can immerse students in practical problem-solving and decision-making tasks.
- AI is also supportive for *collaborative learning* as it facilitates effective group interactions.

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Necessary skills and competencies for the future

Although we can endorse the overall gist of the selected scientific studies that AI, especially generative AI, is becoming increasingly important, the key question remains: what kind of skills and competencies will individuals need in the next years to come, especially when keeping in mind that it is of primordial importance to learn to use AI tools appropriately, as we can foresee that we will become more and more dependent on these tools. Exemplary in this respect is the recent study of Sarah Haase (2024) who takes a closer look at two competency models which have been developed specifically with a focus on the competence elements for non-technical learners: the *Digital Competence Framework for Citizens* (DigComp 2.2) and the *Artificial Intelligence Competences* framework (AIComp).

Complementary to focussing on the more imminent impact of the advent of generative AI tools as ChatGpt and the ensuing shift in required skills for the near future (like Haase, 2024), other researchers tend to a broader perspective with a more encompassing range of skills in mind. For instance, Bankins, Hu and Yuan (2024) point out that in order to understand how AI is impacting human workers, we first need to understand its current capabilities and limitations, as AI is an umbrella term that captures many different, although related, technologies. As a result of their investigation, they come to the conclusion that both *AI literacy* and other *human-centered skills* will gain in importance in future workplaces. They consider AI literacy as the "human proficiency in different subject areas of AI that enable purposeful, efficient, and ethical usage of AI technologies" (Bankins, Hu and Yuan, 2024, p. 3). In this respect, AI literacy pertains to:

- *Technology-related capabilities*: roughly speaking, some degree of technical understanding;
- *Human-machine capabilities*: i.e. understanding how to work effectively with AI (e.g. using appropriate task delegation);
- *Work-related capabilities*: by this they mean understanding ethical issues associated with the use of AI.

Save for AI literacy as such, Bankins, Hu and Yuan (2024) point out the importance of so-called soft skills such as *empathy* and *social and emotional intelligence*, as they foresee that the human workforce of the future will need to become more and more comfortable working in multi-disciplinary teams, working together to extract value from AI-driven insights.

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Changing workplace dynamics

On an even broader level, some researchers focus on the changing workplace dynamics of the foreseeable future, not only as a result of the growing impact of AI, robotics and automation, but also of sociological and economic factors as well. Illustrative in this respect is the research of Olaisen and Jevnaker (2022) who come to the conclusion that, although AI and robotics will be more advanced, the main changes as to the future of the human workforce must be sought in management and organizational structures. To give but a few examples:

- Work will be done more as distance work and through virtual teams;
- Irrespective of technological innovations, they point out the predicted lack of professionals and all types of employees in the years to come, which will lead to an increased competition for talent and an increased concern for keeping the employed knowledge workers through internal career pipelines.
- They stress the conclusion that AI and robotics will not reduce the need for professionals and employees. Instead, integrated digitalization will create new opportunities for collaboration, communication, and knowledge work.

Hence, according to Olaisen and Jevnaker (2022), the skills needed for the future workforce must be situated in a broad kaleidoscope of both technical skills, information management, knowledge management, and so on, and human-centered skills like collaboration, communication, creativity etc. "We may summarize the requirements as creative, sustainable, social and perception manipulation intelligence" (Olaisen and Jevnaker, 2022, p. 568).

Core skills for the future of work: analytical thinking and creative thinking

On the most global scale, the most recent version of *The Future of Jobs Report* of the World Economic Forum (2023)[15] indicates that "analytical thinking and creative thinking remain the most important skills for workers in 2023" (World Economic Forum, 2023, p. 6). More in particular: "Analytical thinking is considered a core skill by more companies than any other skill (…)" (World Economic Forum, 2023, p. 6). The skill which ranks second is another cognitive skill,

[15] As the version of 2024 is not available as yet (at the moment of writing this report).

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viz. creative thinking. After analytical and creative thinking come three self-efficacy skills: resilience, flexibility and agility, followed by motivation and self-awareness, curiosity and life-long learning. Next come dependability and attention to detail, behind technological literacy. The top 10 list of skills is completed by two attitudes which are related to working with others: empathy and active listening and leadership and social influence.

Interestingly enough, the World Economic Forum foresees that "44% of workers' skills will be disrupted in the next five years" (World Economic Forum, 2023, p. 7). They identify the root cause of this development as the rapidly increasing importance of complex problem-solving in the workplace which sees itself reflected in a fast-growing need for cognitive skills. "The highest priority for skills training from 2023-2027 is analytical thinking" – "The second priority for workforce development is to promote creative thinking," – "Training workers to utilize AI and big data ranks third among company skills-training priorities in the next five years" (World Economic Forum, 2023, p. 7).

The need for an inclusive approach

The European labour market sees itself confronted with substantial challenges, at present and in the near future. As researchers from *Research & Expertise Inclusive Society* at UCLL (Belgium), we attach a lot of importance to the aspect of inclusion with regard to the future of the human workforce. From the perspective of inclusion, our focus should not be on the extent to which automation and the rise of AI will affect current employment numbers. Instead, our joined investigations into the future of the human workforce should shed light on the question *under what conditions the human workforce can be supported towards a new equilibrium in the division of labour between the human workforce, robots and AI algorithms*.

We foster an increasing awareness of the urgency of scaffolding social protection and support for workers at risk with regard to the 'jobs of tomorrow'. We express the willingness to counter the dominant narrative of unequal opportunity and widening inequality. With societal unrest on the rise, with labour markets in flux because of technological disruption and the pressing need for the green transition, reinforced by climate change, we equally want to focus on the question: *how can we contribute to building a more inclusive and fairer world that will deliver benefits to economy and society through better skills and education for generations to come?*

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Addressing Emerging Skills: Insights from European partner's Countries

Germany's national implementation plan focuses (amongst others) on the expansion of the European education and training area in a globalized economy and emphasizes the high importance of the green and digital transition (Cedefop (2024b). Since 2020, several measures have been set up to facilitate the adaptation and modernization of competences and qualifications to support the digital transformation of education and the development of the digital infrastructure in education Cedefop (2024b, pp. 8-9). The report concludes that Germany has progressed relatively well over the last five years, but that "further progress with digital transformation in the coming years will be crucial and may improve its position in the Digital economy and society index (DESI)" (Cedefop, 2024b, pp. 13-14). The *Digital Economy and Society Index* (DESI) monitors Europe's overall digital performance and tracks the progress of EU countries in their digital competitiveness (DESI, 2022)[16]. The key factor turns out to be education. The need is recognized for a strong emphasis on improving the digital and pedagogical skills of teachers.

Greece faces specific issues with regard to a high level of youth unemployment rates. More precisely, the unemployment rate of young Greeks aged 20-34 years old was 18.9% in 2022, among the highest in the EU, against the EU average of 8.9% (Cedefop, 2024c, p. 5). In face of these particular challenges, Greece has taken steps to improve VET (vocational education and training) labour market relevance and quality and to modernize it in terms of digitalization and infrastructure. The 2023 skills forecast Greece report (Cedefop, 2024c) states that the number of jobs requiring a high qualification is expected to rise, as in other EU countries for that matter. Although references are made to the increase of automation and digitalization, moving Greece towards a more service-oriented economy, and resulting in a greater use of higher-level occupations at the expense of some medium and low-level occupations, there is no particular focus on the need of increasing digital competencies in this report.

According to the European report on the educational policies of Italy (Cedefop, 2024d), the main challenges that Italy faced between 2020 and 2023 include labour market shortages and mismatches, poor educational outcomes, with evident regional and local disparities, and low adult participation, especially of young adults, in education and training despite the range of training possibilities that are offered. The Italian adult population is also characterized by an insufficient level of basic digital skills. This problem is further intensified by an increasingly ageing population and by the international and internal/domestic migration which hinder short

[16] See further in Desi (2022)

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and long-term economic growth and affect the skills levels of the population. Apparently, the so-called "brain drain" is a phenomenon that has been the case for Italy for many years (Cedefop, 2024d, p. 5).

In 2021 the *Italian Recovery and Resilience Plan* (Italia Domani, n.d.)[17] has been approved, focusing on education in general. A specific *National Plan for Digital Education* (PNSD) outlines the main strategy for improving learner digital skills (National Strategy for Digital Skills, 2020). This strategy aims at transforming schools to innovative learning environments based on new digital technologies and at promoting and improving students' digital skills. Two committees work to monitor and improve the implementation and to support innovation and coordination among governmental organizations dealing with digital and technological developments Cedefop (2024d, p. 11).

Malta's Ministry for the Environment, Sustainable Development and Climate Change regards it as an important spearhead to transform the country into a digitally empowered society and knowledge economy. It is stated that: "[…] we are well positioned on the digital superhighway. We are accelerating in the fast lane of technology and don't intend to take our foot off the pedal." (Caruana, 2019, p. 21). Malta is very much aware that the crucial key to keep up with the rapidly accelerating rate of industry, technology and AI is through education and training, recognizing at the same time that education and educational change is a slow process. Inevitably, it is near to impossible for the education sector to develop at the same rate as that of technology and AI. Although, according to this report (Caruana, 2019), there are still "considerable tech-skills shortages within the Maltese labour force that are being compensated for by foreign nationals" (Caruana, 2019, pp. 21-22), Malta focuses all of its efforts on education and vocational training programs.

Poland's national policies on education imply a clear commitment to a lifelong learning strategy and a human capital development strategy, promoting key competences and creativity in education, aiming on "readiness to meet ecological, economic and social challenges that have an impact on the labour market needs" (Siekiera, 2016, p. 4).

Over the forecast period of the *2023 Skills Forecast Report* (Cedefop, 2023), 2022-2035, Poland is expected to shift towards a much higher share of highly qualified workers, consistent with an increasing demand for higher level occupations. Both competences in mathematics, science and technology and digital competence are recognized as crucial in this respect

[17] See further in Italia Domani (n.d.)

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(Siekiera, 2016, pp. 8-10). The focus on these particular competences is clearly reflected in Poland's national policy documents and include in the national core curriculum for general educational subjects.

The European Centre for Development of Vocational Training report for Portugal (Cedefop, 2024a) states that the main challenges that Portugal has faced during 2020-23 include the low level of qualification of the population, new skills demand created by the green and digital transitions, and the new dynamics emerging after the COVID-19 pandemic and Industry 4.0. The root cause, according to the report, is the fact that Portugal traditionally has a lower level of education than the EU average, resulting in a significant skills deficit. The emergence of a new industrial era has increased the challenge of raising the skills level of the population (Cedefop, 2024a, p. 5). In order to meet these particular challenges, the Portuguese government has set up *The Portugal 2030 Strategy*, a national strategic reference framework which sets the basis for the national recovery and resilience plan and the *National Implementation Plan* (NIP). We can highlight the following main priorities of the Portuguese NIP:

- raising the qualification levels of the population;
- increasing the quality, transparency, coherence and internationalization of the VET system;
- making VET more flexible and responsive to labour market needs, focusing on ecological, climate and digital transitions;
- promoting equal opportunities and social inclusion.

In March 2022 the *Portugal Digital Academy* was launched "with the aim of improving the digital skills of citizens of all ages" (Cedefop, 2024a, p. 8).

On the overall, Portugal is making great efforts to increase the skill levels of the population, and to develop a VET system of greater quality, transparency and coherence. Of particular interest is the creation of specialized technology centres to develop new courses related to green and digital transitions (Cedefop (2024a, p. 11), recognizing the need for adaptation to new ways of working as a result of the transition to a sustainable and digital economy.

The European Centre for Development of Vocational Training report for Slovenia (Hergan & Šlander, 2020) shows that there is a high awareness in Slovenia of the importance of the

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challenges of the information age and the so-called Industry 4.0 and their ensuing impact on the new digital competencies needed to address these challenges accordingly:

- In recent years, many events focusing on digitalization have been organized; additionally, quite a lot of various institutions have dedicated their regular events to this particular topic;
- On the overall, digitalization of society and digital competencies are generally recognized as crucial for the economic development of and competitiveness of Slovenia. As a result, many top-down and bottom-up activities are striving to incorporate digital competencies into the school system (including vocational education and training schools).

The European Centre for Development of Vocational Training report for Sweden (Cedefop and Gadji, 2024) pinpoints Sweden's main challenges the country has faced in 2022 to a skills mismatch and labour shortages, educational disparities and teachers shortages (Cedefop and Gadji, 2024, p- 5). The report identifies an increased risk of skills mismatch between graduate qualifications and labour market needs, due to the decentralized provision of education and competition among very small providers for students. Additionally, the report indicates that since the early 21st century many asylum seekers have come to Sweden, as a result of which about 20% of the Swedish population were born outside of Sweden (2022). Therefore, the Swedish labour market had to take targeted policy measures facilitating their integration, such as fast-track labour market training for newly arrived immigrants. The report recognizes that, despite having one of the EU's highest percentages of employed ICT specialists, Sweden continues to face shortages of ICT specialists in its economy.

Since 2020, Sweden has taken various actions to address the policy priorities outlined in the national implementation plan: strengthen VET (Vocational Education and Training) quality and attractiveness, alignment to labour market needs, integration to the labour market and increasing VET flexibility.

The Swedish government "aims to be the world leader in harnessing the opportunities offered by digital transformation" (Government Offices of Sweden, 2019, p. 4), identifying artificial intelligence as one of the rapidly evolving fields of digital technology (Government Offices of Sweden, 2019, p. 6). The government assesses that Swedish higher education institutions need to provide a sufficient number of people with AI education and training, particularly in continuing and further education for professionals with a university degree or equivalent. Moreover, it is

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recognized that Sweden needs a strong AI component in non-technical programs to create the conditions for broad and responsible application of the technology. As a result, Sweden focuses on a strong link between research, higher education and innovation in AI (Government Offices of Sweden, 2019, p. 6).

Conclusion

According to *The Future of Jobs Report* (World Economic Forum, 2023), both analytical thinking and creative thinking are considered as the most needed core skills by more companies in the world than any other skill, in order to face the challenges of the oncoming transformation of the labour market through increasing digitalization and the rapid rise of Artificial Intelligence. By stressing the importance of these premium top-level cognitive skills, we can deduce that companies see high-level occupations requiring high-level, abstract cognitive skills as absolutely critical for facing these challenges of the imminent transition to the future. However true that might be, this observation unavoidably raises the question of what this implies for the continuation and sustainability of the medium-level and low-level occupations. Although national labour policies of the participating EU member states clearly show an increasing focus on *vocational educational training* (VET), reflecting a growing awareness of the urgency of supporting workers at risk for the 'jobs of tomorrow', it remains to be seen how we can support the human workforce towards a new equilibrium in the division of labour between the human workforce, robots and AI algorithms, contributing to building a more inclusive and fairer world.

References

1. Adalet McGowan, M., et al. (2020). *Addressing labour market challenges in Belgium*, OECD Economics Department Working Papers, No. 1602, OECD Publishing, Paris, Retrieved from https://doi.org/10.1787/8a542d68-en
2. Bankins, S., Hu, X., Yuan, Y. (2024). *Artificial Intelligence, workers, and future of work skills*. In *Current Opinion in Psychology*, Volume 58, August 2024, 101828, Retrieved on 20.09.2024 from https://www.sciencedirect.com/science/article/pii/S2352250X24000411?via%3Dihub
3. Borms, L. (2024). *Out with jobs and in with skills: measuring current circular jobs and analyzing future necessary skills*. Doctoral Dissertation, University of Antwerp, Retrieved on 23.09.2024 from, https://repository.uantwerpen.be/docman/irua/e9dd26motoM68
4. Caruana, H. (2019). *Vocational education and training for the future of work: Malta*. Cedefop ReferNet thematic perspectives series. Retrieved from

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http://libserver.cedefop.europa.eu/vetelib/2020/vocational_education_training_future_work_Malta_Cedefop_ReferNet.pdf

5. Cedefop (2023), *2023 skills forecast Poland*, European Centre for the Development of Vocational Training. Retrieved from https://www.cedefop.europa.eu/files/skills_forecast_2023_poland.pdf
6. Cedefop (2024a). Vocational education and training - Policy briefs 2023 – Portugal. Retrieved from https://data.europa.eu/doi/10.2801/269580
7. Cedefop (2024b). *Vocational education and training - Policy briefs 2023 – Germany*. Cedefop monitoring and analysis of vocational education and training policies. Retrieved from http://data.europa.eu/doi/10.2801/035346
8. Cedefop (2024c). *Vocational education and training - Policy briefs 2023 – Greece*. Cedefop monitoring and analysis of vocational education and training policies. Retrieved from http://data.europa.eu/doi/10.2801/298409
9. Cedefop (2024d). *Vocational education and training - Policy briefs 2023 – Italy*. Cedefop monitoring and analysis of vocational education and training policies. Retrieved from http://data.europa.eu/doi/10.2801/35508
10. Cedefop and Gadji, S. (2024). Vocational education and training - Policy briefs 2023 – Sweden. Retrieved from https://data.europa.eu/doi/10.2801/809416
11. Digital economy and society index (DESI) 2022 (2022). Retrieved from https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022
12. Diependaele, M. (2024). *Samen werken aan een warm en welvarend Vlaanderen. Vlaams regeerakkoord 2024-2029*. Brussels, responsible publisher: Flemisch Government, Matthias Diependaele. Retrieved from https://publicaties.vlaanderen.be/view-file/69476
13. Government Offices of Sweden (2019). *National approach to artificial intelligence*. National Implementation Plan: Sweden (2023). Retrieved from https://wp.oecd.ai/app/uploads/2021/12/Sweden_National_Approach_to_Artificial_Intelligence_2018.pdf
14. Haase, S. (2024). *Future Skills and (generative) AI – new era, new competencies?*. In Leitner, C., Nägele, R., Bassano, C. & Satterfield, D. (eds.) (2024). *The Human Side of Service Engineering*. AHFE (2024), International Conference. AHFE Open Access, vol 143. AHFE International, USA. http://doi.org/10.54941/ahfe1005096 (Retrieved on 20.09.2024).
15. Hergan, M; Šlander, M. (2020). *Vocational education and training for the future of work: Slovenia*. Cedefop ReferNet thematic perspectives series. Retrieved from http://libserver.cedefop.europa.eu/vetelib/2020/vocational_education_training_future_work_Slovenia_Cedefop_ReferNet.pdf
16. Imram, M. & Torralba, A. (2024). *Future Learning with Generative AI: Critical Thinking and Cognitive Skills Development in Education*. Retrieved on 20.09.2024) from https://www.researchgate.net/publication/382400154_Future_Learning_with_Generative_AI_Critical_Thinking_and_Cognitive_Skills_Development_in_Education?channel=doi&linkId=669bab2e02e9686cd1109d4f&showFulltext=true
17. Italia Domani, the National Recovery and Resilience Plan, in Italia Domani, Piano Nazionale di Ripresa e Resilienze, Retrieved from https://www.italiadomani.gov.it/content/sogei-ng/it/en/home.html

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18. OECD (2024). *OECD Economic Surveys: Belgium 2024*, OECD Publishing, Paris, Retrieved from https://doi.org/10.1787/c671124e-en
19. Olaisen, J. & Jevnaker, B. H. (2022). *The Knowledge Work of the Future and the Future of Knowledge Work*. In *Proceedings of the 23rd European Conference on Knowledge Management*, vol. 23 No. 1 (2022). Retrieved 20.09.2024 from https://papers.academic-conferences.org/index.php/eckm/article/view/494
20. Siekiera, A.; Luck, A. (2016). *Key competences in vocational education and training – Poland*. Cedefop ReferNet thematic perspectives series. Retrieved from http://libserver.cedefop.europa.eu/vetelib/2016/ReferNet_PL_KC.pdf
21. Diependaele, M. (2024). *Samen werken aan een warm en welvarend Vlaanderen. Vlaams regeerakkoord 2024-2029*. Brussels, responsible publisher: Flemisch Government, Matthias Diependaele. Retrieved from https://publicaties.vlaanderen.be/view-file/69476
22. World Economic Forum (2023). *The Future of Jobs Report 2023*. Accessed on 20/09/2024, Retrieved from https://www.weforum.org/publications/the-future-of-jobs-report-2023/
23. *National Strategy for Digital Skills* (2020), Retrieved from https://repubblicadigitale.gov.it/portale/documents/20122/992735/National+Strategy+for+Digital+Skills.pdf/c3ff7732-e9ce-498e-71b3-f441ae55afcd?t=1666000144226

Appendices: Results of the Digital Economy and Society Index (DESI), 2022

The *Digital Economy and Society Index* (DESI) monitors Europe's overall digital performance and tracks the progress of EU countries in their digital competitiveness. In Chapter 2, *Human Capital*, of the full European analysis report, it is stated explicitly that for many modern professions, digital skills are essential life skills. The digital transition is clearly a priority for the EU and its member states. "The EU aims to equip at least 80% of people with at least basic digital skills and increase the number of ICT specialists to 20 million (around 10% of total employment), with convergence between men and women by 2030." (Digital economy and society index – DESI, 2022, p. 3.)

However, DESI report also stresses that every member state, even those considered frontrunners, is experiencing a serious shortage of digital experts, a challenge intensified by a consistent gender gap: just one in five ICT specialists and graduates is female. The report suggests that this disparity could influence how digital solutions are designed and implemented.

Several initiatives on a European level are launched to meet these pressing challenges. For instance, in October 2021, European Commission President Ursula von der Leyen launched the *Structured Dialogue* on digital education and skills to increase the political commitments on digital education and skills in the EU and its Member States. "The Dialogue will help Member States to prepare the Digital Decade roadmaps for the two digital skills targets, namely 80% of the EU

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population with basic skills and 20 million ICT specialists in employment by 2030." (Digital economy and society index – DESI, 2022, p. 10)

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CHAPTER 4

Training and professional retraining: challenges for the future

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Abstract:

The contribution analyses, through the main recent research conducted at European and OCSE level, how the demand for training by companies might change in the face of the transformations brought about by the digital and green transition, but also by the demographic evolution and, in general, by megatrends. The researches and documents analyed can provide a number of important insights because they lead to consider not only what will be the most in-demand skills in the coming years, but also the transformations of the workforce profiles, and pose a problem of methodologies and didactic approaches that take into account the characteristics of trainees, as well as methods of assessing skills at the end of a training/retraining course. A focus has been provided on stakeholder engagement and governance among key-actors.

Keywords: skills 1, training 2, needs analysis 3.

Introduction

The contribution analyes, through the main recent researches conducted at European and OCSE level, how the demand for training by companies might change in the face of the transformations brought about by the digital and green transition, but also by the demographic evolution and, in general, by megatrends (European Commission, ESPAS, n.d.) The researches and documents analyed can provide a number of important insights because they lead to consider not only what will be the most in-demand skills in the coming years, but also the transformations of the workforce profiles, and pose a problem concerning methodologies and didactical approaches;

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characteristics of trainees, as well as methodologies concerning assessing skills at the end of a training/retraining course. A focus has been provided on stakeholder engagement and governance among key-actors.

Transformation and emerging skills needs

Structural transformation of the labour market and impact on training

The structural transformations affecting the labour market bring demands not only for technical and professionalising skills, but also for different soft skills from the past. In both cases, these are major challenges both for companies (which are unable to meet this demand) and for the training system at EU level and for each member state. In fact, skills required are still new and their codification in the reports is still very recent and in the process of being defined and recognised in the training systems of the EU member states (Cedefop 2023; World Economic Forum and PwC, 2023, Eurofound 2020).

In their report, World Economic Forum (2023) points out that employers see skills gaps in the local labour market as the foremost barrier towards achieving industry transformation and investing in learning and training on the job as the most promising workforce strategy for achieving their business goals, formulating effective reskilling and upskilling strategies for the next five years is essential for maximizing business performance. A relevant aspect of this process is that the multiple transformations taking place are highlighting a demand not only for technical skills (related to a twin transition: digitalisation or green), but also for soft skills.

The number of manufacturing jobs has decreased in advanced economies in the past decades, and an increasing number of the remaining jobs in this sector now require the ability to operate, monitor and maintain advanced industrial robots. At the same time, new jobs requiring new combinations of skills have emerged, such as data scientists, web developer or social media manager. Further changes are expected in the future. Researches suggests that, should current cutting-edge technology become widespread, 32% of current jobs across the 32 countries analysed are likely to see significant changes in how they are carried out and a further 14% of jobs could be completely automated (OECD, 2018; Cedefop 2023b).

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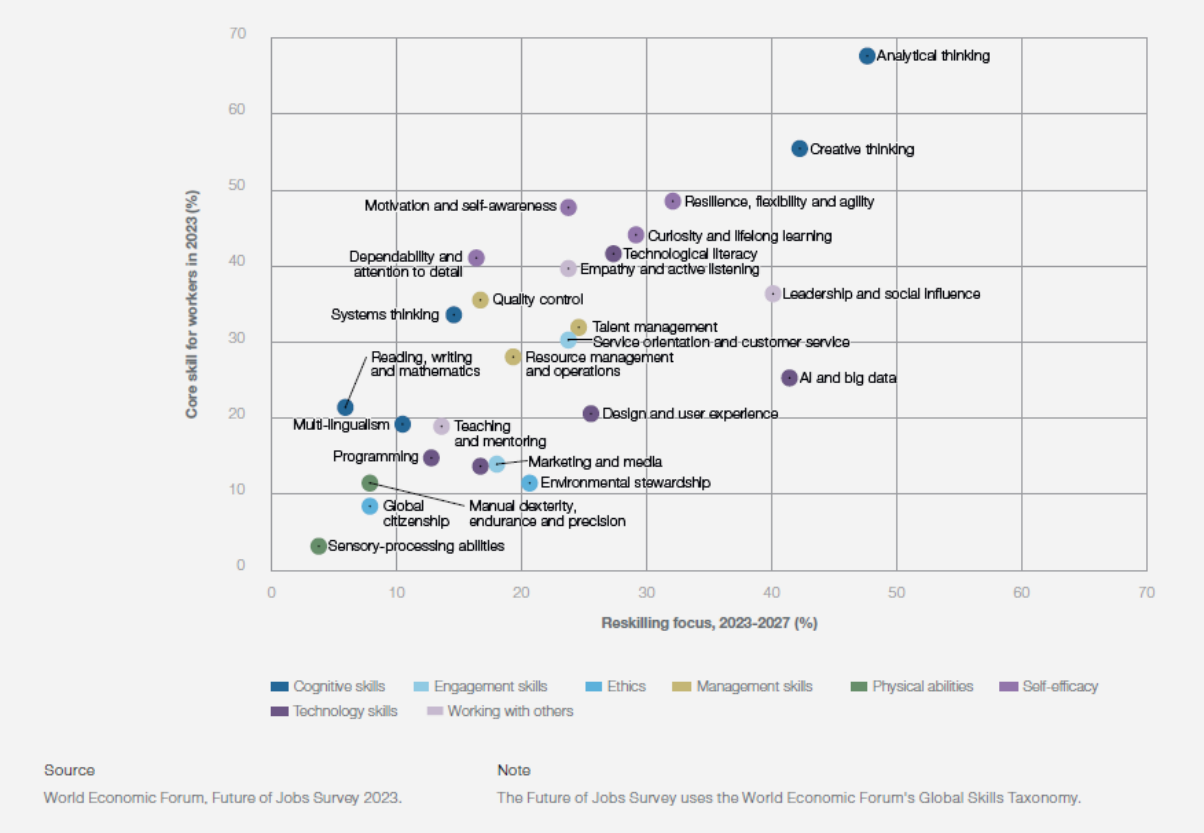

Figure 10: The evolving skills landscape, 2023-2027. Adapted from "World Economic Forum, Future of Jobs Survey (2023)

Thus, the combination of these transformations will drive specific areas of job growth and decline and have significant impact on future skills needs (World Economic Forum, 2023).

World Economic Forum (2018) focused on Future Skills and highlights the "top ten" key skills to develop, such as critical thinking, creativity, and digital literacy. The most recent researches (World Economic Forum, 2023) emphasizes that analytical thinking is considered the most required one, followed by creative thinking, self-efficacy skills (resilience, flexibility and agility), motivation and self-awareness; curiosity and lifelong learning. This ranking shows how much awareness there is to recognize the importance of the ability to adapt to disrupted and transforming workplaces. Only at ranks sixth we can find "technological literacy".

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Transformation of workforce profile and impact on training needs

Demographic change and training

Aging of the workforce, migration flows and the need to improve the participation of women in male sectors (STEM) and of vulnerable people have to be more taken into account by training system: according to the survey on the future of work (World Economic Forum, 2023), in the next five years the majority part from the companies will give priority to women (79%), young people under 25 (68%) and disabled people (51%) as part of their Diversity and Inclusion programs. According to this survey, only a minority of respondents will give priority to religious, ethnic or racial background disadvantaged (39%) and to elderly workers (over 55 years old) (36%), to LGBTQI+ (35%) and to a low- income background (33%).

Demographic and social change poses new challenges to companies and the continuous training system: first of all the ability to integrate the work activity of different generations and groups by recognizing the specificities of each and, above all, the changing motivational factors that guide people in their way of working and living. (Harvard Business Review Italia, 2023). In this context, *adult learning systems should be more inclusive and diversified:* Cedefop (2023) highlights that in an ever-changing world of work, increasing the engagement of all in adult learning is crucial for their lasting social and economic inclusion. However, today, only around 40% of adults in OECD countries participate in adult learning in a given year; some of this training involves only a few hours of instruction and is not well aligned with emerging skill demands.

A very relevant point is also connected to the ageing of the workforce. As reported by Eurofound (2024b), faced with this challenge that will increasingly characterise the labour market, countries are responding with various programmes and interventions, mostly funded by the ESF, for which the role of social partners and a multi-stakeholder approach in which VET providers are not just "providers" but key players in designing training pathways are particularly relevant. Finally, a focal point concerns gender: the double transition is leading to an increase in employment and training opportunities, but the risk is that - having to manage the skills and needs expressed by male-dominated sectors - this transformation could have negative effects on the female component, underrepresented in key sectors (transport, energy, ICT), in highly automated processes and in STEM paths. (EiGE, 2024)

In light of this situation, vocational education and training systems must be reoriented; the need for up/ reskilling of the weakest workers (elderly, women and even migrants) requires a rethinking of the approaches used, of the methodologies, but also of the skills assessment system

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(Eurofound 2020). On these issues, numerous studies conducted worldwide and in macro-regions outline some interesting perspectives regarding:

- the need to address prejudices related to foreign and/or older workers;
- the assessment of workers' skills, especially over 45s, to avoid their expulsion;
- the need to adopt different training approaches adapted to the target group.

Introducing new approaches to training and assessing skills acquired through up/reskilling pathways can have a positive impact on these target groups most at risk of marginalization. In particular, a "skills-first approach" (World Economic Forum, 2023; PwC, 2023) can bring economic growth, greater equity and inclusion by recognizing and providing individuals with the skills needed to succeed in a rapidly changing labour market. Both institutional reports of 2023 stress that focusing on the different skills, on potential and on motivation of the individuals, a skills-first approach can help remove prejudices involuntary from the recruitment process, to address issues related to the equal pay for equals work, increasing loyalty and productivity, as well as triggering a bond positive Between diversity of the workforce and innovation.

Furthermore, each category of workers has very specific needs and motivations, therefore in order to understand the different expectations and needs of people, it becomes essential to adopt listening strategies and tools aimed at understanding perceptions and needs at every moment of the *employee life cycle*, thus enabling the use of more advanced People Analytics tools. (Harvard Business Review Italy, 2023).

Rethinking and transforming the need analysis

Training and need analysis: a key-point for the future

In order to make the different perspectives visible, a knot to be unraveled concerns the issue of a needs analysis, which should be more effective and more contextualized, which should be centred and temporally adapted to the contingent needs of companies and workers, revised on a conceptual and methodological level, and considered as a counselling need for the companies.

The literature on economic dynamics, innovation trends and competitive challenges that are emerging on a global scale highlights a vast and complex area of potentially interesting needs that are not intercepted or not highlighted by the various forms of training intervention: non-explicit needs, linked to the poor ability of many companies to plan training linked to competitive recovery strategies, and invisible needs, linked to the poor representation of needs

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that come from the weak components of the job offer (the needs, often voiceless, of disadvantaged workers, such as over 45s, women, young people, migrants, employees of micro-enterprises) (Fondimpresa, 2016, Inapp, 2022). As the World Economic Forum (2023) points out, despite the indications on the skills emerging, training offer from companies / education systems / training professional is not always aligned with needs and skills.

Making an unexpressed need explicit means operating both on the side of the needs perceived by the organization and on that of the needs perceived by workers; an accompanying action is needed when analysing needs in close connection with the examination of the broader sectoral and competitive scenarios and, at the same time, a bilateral approach that takes into account the needs that companies are unable to translate into explicit demand and the professional needs of workers. Actions that would allow the emergence and expression of a multiplicity of needs that currently remain implicit and not intercepted.

In order to outline possible scenarios and consider the complexity and interrelationships between factors, actors and contexts, recent EU reports highlight the need to introduce in a systemic way: processes participatory and involvement of stakeholders; analysis based on methodologies both quantitative and qualitative; they highlight also the need to look specifically to SMEs, whose approach to the needs training and skills is deeply different from that from the big enterprises (Eurofound, 2024a).

Therefore, on the methodological side, the process of analysis of training needs qualifies as a systemic and relational event, as it is implemented at multiple interdependent levels (person, group, organization, community of practices) and in a mutual relationship of recognition (Bonometti 2008); the analysis of needs is outlined as a social research activity, from which it derives methods and tools of investigation, and of which it is necessary to understand:

- what dimensions are included (in this case company needs and workers' needs);
- which variables are significant within each dimension;
- what indicators can be used to measure (in a broad sense) these variables.

These aspects are the start points to define the information to search for and build the need analysis tools.

The empirical methods for conducting the training needs assessment are several and can range from questionnaires to interviews, from checklists to focus groups, to ethnographic observation. The choice and refinement of the tools must be consistent with the purposes of the investigation and the subjects to whom it is addressed, in order to be able to read reality in a useful manner

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and as free from prejudice as possible. Currently, in the major part of the cases , the analysis of the needs is carried out with methodologies mainly quantitative (surveys) (Eurofound, 2024a), while it would be desirable to proceed by integrating the different tools, according to the mixed methods approach , as shown by some good practices present in some EU countries, like Slovenia (Rodič B. et al., 2012) and Poland (Ministry of Education and Science, 2020, Gazeta Uniwersytecka UŚ, 2024).

To make a further step forward, Cedefop (2023a) underlines the importance of adopting a "anticipation strategy from the skills needs for better process decision-making": in results of some countries of the EU they demonstrate the effectiveness of the use of different approaches to the anticipation from the skills. This method provides a vision in depth from the labour market trends and skills needs and involves stakeholders at all levels process levels decision-making. Such agreements support resilience and the ability to react to unexpected shocks and adapt to crises permanent.

As example of an application of foresight methodology is the project "Capability Blue Hub FVG: The FVG blue network for training on the economy of the sea" (MARE FVG, n.d.) carried out in Italy (Fruli Venezia Giulia Region). a recent example of the implementation of this approach (ended in july 2024). During the first year, more than 60 experts from the regional administration, training and education system, and enterprises were involved through meetings. The main objective was the creation of a coordination network between the main actors of the training and employment sector of the maritime economy, in order to anticipate future skills needs and support enterprises in the digital and ecological transition. As a result of this collaboration, three pilot projects were developed: an innovative model to anticipate future professional needs in the Blue Economy, a multimedia platform for orientation to the professions of the sea, and a shared meta-laboratory for an experiential training offer between school, enterprises and training. The method of the course, based on design thinking and foresights, was particularly interesting.

How to keep skills and their evaluation up-to-date in a changing labour market?

The importance of the assessment

Another emerging issue is the transformation of the system moving from a "formal qualification based" to a "skill based". An interesting evidence comes from Urban (2022); the research evidence reports that in OCSE area employers are increasingly changing their training and hiring practices to emphasize skills over formal qualifications. Skills-based hiring focuses on job

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candidates' observable and measurable skills that are relevant to a job rather than on educational credentials. Further, employers increasingly emphasize behavioural characteristics alongside relevant skills and knowledge as key competencies that must be considered when evaluating job candidates. This recruiting approach aims to identify and hire the most suitable candidates for performing each job in an organization, thus optimizing long-term results and subsequent cost savings and improving workforce retention and job satisfaction.

Urban (2022) also stressed that not only is the nature of work changing, but evidence shows that what employers value in employees has also been changing. Today's employers are increasingly interested in job candidates' skills and less interested in solely their educational credentials.

According to the same Author (Urban, 2022),the aim of training for skills based hiring has been to provide current workers and job seekers with in-demand skills on a faster timeline than traditional educational institutions that offer standard two- or four-year degrees. Urban (2022) notes that the IT (or more broadly IT and communications) sector was arguably an early adopter of skills-based hiring. However, over time similar solutions have been increasingly implemented across other sectors, too.

Among the main transformations reported by researches is the shift from a system based on formal qualifications to one centred on competences. The "skills-first" approach to hiring and developing people (World Economic Forum and PwC, 2023) focuses on whether a person has the right skills and competencies for a particular role, rather than having the right degree, job history or previous job titles. This approach leads to new strategies for detecting skills needs, new methods of assessing performance, but also to a rethinking of the company's objectives, contents and training methods, and a reflection on the target group involved and to be involved. According to World Economic Forum (2018), promoting equitable access to training opportunities is vital to ensure that everyone, regardless of their background, can benefit from changes in the labour market.

Training also needs to be rethought in the way it is used and in the evaluation of output competences. The micro-credential system represents an experiment that goes in this direction. Cedefop (2023) point out the importance to consider a vatPressing short-term shortages must be addressed quickly, for example via short courses leading to microcredentials. Furthermore, Cedefop (2023a) reports that adult education and training to be useful for individuals, firms and societies, the training provision should be of high quality. Good information on the quality of training programmes and providers is essential to help individuals and employers make

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informed decisions on adult learning. However, many countries lack adequate quality control mechanisms at different levels of the adult learning system. Further, training activities do not always lead to the desired results and only two-thirds of training participants think training helped them achieve positive employment outcomes. Setting and monitoring quality standards, ensuring that training leads to certification, and regular evaluation of adult learning programmes, can support high quality adult learning systems.

Different approaches among countries

Several approaches: an overview

The recent analysis by Cedefop (2023b) on future-preparedness adult learning system reveals marked differences between training systems in EU countries in the ways and approaches with which they are coping with transformations and emerging skills needs. The possibility of comparing good practices is an important way to address future transformations. According to Cedefop (2023), many countries are facing pressing skill challenges but have adult learning systems that are under-prepared to address these. While some countries with more urgent skill challenges (e.g. Italy, Portugal, Slovenia and Spain) have comparatively well-prepared adult learning systems, other countries are lagging behind (e.g. Greece). Denmark and Norway perform well across most dimensions, yet each country still faces unique adult learning challenges. There are no "best performer": even when countries perform relatively well in one training model area, there is room for improvement. The report (Cedefop, 2023) also sets out a comprehensive policy agenda to increase the future readiness of each country's adult learning systems:

1. The coverage and inclusiveness of adult learning must be improved by helping adults make informed choices, tackling barriers to participation and encouraging employers to offer training;
2. Training content should more strongly align with the skill needs of the labour market by collecting and making use of skill assessment and anticipation information;
3. The quality and impact of training provision must be improved by assessing the quality of providers, making quality information publicly accessible and encouraging the use of work organisation practices which raise returns to training;
4. Adequate and sustainable financing should be put in place, including through public funding and incentives for employers and individuals to contribute; and

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5. Governance mechanisms must be strengthened to improve vertical and horizontal coordination between different actors involved in the adult learning system.

Stakeholder engagement and governance mechanisms

Stakeholder engagement as key-factor

As observed in previous paragraphs, adult learning is a complex policy field, which encompasses programmes designed to pursue a variety of objectives and reach different target groups. As a result, the responsibility for adult learning is often split across several ministries, the social partners and other stakeholders, and encompasses different levels of government. In this context, good coordination mechanisms are essential to ensure that policies do not duplicate, but reinforce each other. The challenges and opportunities the EU faces are powerful enough to reshape the future irreversibly. This gives leverage for veering away from primarily short-term focused policy responses to immediate skills challenges and moving towards holistic approaches that aim to achieve a more technological advanced, greener and fairer future. As reported by Cedefop (2023) there are a list of steps (recommendations) to follows in the next years to enable the innovation and deep transformation of training "ecosystem":

a) Investing in STEM and digital skills to drive up participation and labour market activation measures aimed at integrating medium-skilled people (particularly females) and other groups with low participation rates.

b) Considering VET as an agent of change and other skills ecosystem players need to promote and market such programmes to avoid negative stereotypes about jobs or sectors among learners.

c) Moving away from "silo-thinking".

Furthermore, Cedefop (2023) notes that traditional boundaries between the worlds of education and training, employment and careers are blurring, and trends and challenges may be national or global, but sectoral needs and local realities define how they can be tackled. Stakeholder partnerships need to be encouraged and upscaled (i.e. Pact for Skills, 2020). According to the paper (Cedefop 2023), the multistakeholder approach requires to engage the employers and to empower local level players (local policymakers, employers, VET providers, social partners and citizens) and promote a transparent collaboration aimed to develop shared visions, which

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can become a basis for addressing current and future challenges and benefitting from emerging opportunities.

Eurofound (2020) poses some significant problems: first, the market-driven skills currently in demand could become obsolete in a short time, and the work required to rearrange curricula often has a negative impact on the resources of education and VET institutions. According to Eurofound (2020), training policies should be based on close collaboration and synergies between industrial environments, socialn the same l partners and governments, as well as education and training providers. The same document (Eurofound, 2020) stresses that companies and research institutes also need to look ahead and work together in order to identify the skills and competencies needed in a constantly changing environment. A multistakeholder approach contributes to an "ecosystem" with wide point of view.

In this transformative training system, a key role is played by VET actors: according to Cedefop (2023b), to achieve this, it is important that they provide the right skills and reach workers most at risk of job loss. Yet on average across the OECD only two in three firms assess their future skill needs and those who do, do not always align their training policy with this analysis. To improve the alignment of adult learning with the skill needs of the labour market, it is essential that high-quality information on skill needs is available and feeds into adult learning policies. (Cedefop 2023a) notes that institutions and structures supporting the delivery of VET are diversifying and expanding by increasingly addressing the need for up- and reskilling (lifelong learning) and by covering higher qualifications levels (EQF 5-8). The same document (Cedefop 2023a) notes that traditional VET at upper secondary level (EQF 3-4) is retaining a strong identity, helped by the reduction in the overall numbers of schools and an increase in their general size. According to the above mentioned research, while the number of VET qualifications has decreased in most countries, reflecting changes in tasks and occupations, the increasing emphasis on individual tailoring (for example through modularisation) and institutional autonomy (for example in relation to curricula) point towards more flexible VET systems responding to inevitably changing skills and 6. Overall, this signals that VET cannot be reduced to the acquisition of narrow technical tasks but must address and combine a widening range of knowledge, skills and competences.

Cedefop (2023a) reports taht VET is not only for youngsters but has an increasing role for adults as well. This forces institutions and systems to tailor teaching and learning to individual needs, with increased importance of modularisation, recognition of prior learning and individualised learning plans. The conclusion – according to Cedefop (2023 and 2023a) is that while the

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tripartite model of coordination and governance currently underpins most IVET systems, this is not the case when moving to higher levels or to continuing training aiming at up-and reskilling. The same paper (Cedefop 2023a) notes that this is a question for the future, also reflecting the priority given to practice-oriented leaning, is how best to coordinate this expanded and diversified VET-system. For VET to stay relevant in the future it needs to be linked to occupations and the labour market in ways that ensure relevance and quality: 'future assurance' stands out as a key challenge for VET in the decades ahead.

The training providers: formal and informal approaches

Emerging approaches

The need to align the demand for skills and the supply of training represents a major challenge to be faced in the coming years, as otherwise the proposed training interventions will prove ineffective in responding to the rapid changes. This is true both in terms of content, but also in terms of methodologies and setting.

Research reports analysed at EU and international level highlight the need to change the way training courses are designed and organized, the tools and the setting. On-the-job modes should be more widespread and experimented with, overcoming and revising more traditional, face-to-face, classroom-based modes. According to World Economic Forum (2023) companies report that investing in learning and on-the-job training and automating processes are the most common workforce strategies which will be adopted to deliver their organizations' business goals. Respondents expect to implement these strategies in the next five years. Workforce development is most commonly considered to be the responsibility of workers and managers, with 27% of training expected to be furnished by on-the-job training and coaching, ahead of the 23% by internal training departments and the 16% by employer-sponsored apprenticeships. To close skills gaps, respondents expect to reject external training solutions in favour of company-led initiatives.

Skills are crucial for both incremental and radical innovation. New skills can be obtained formally through training, but skills are also acquired informally by gaining experience and exchanging knowledge with colleagues, customers and others. It is important for companies to establish connections with formal educational institutions, especially vocational training providers. Equally important is the need for training providers to meet companies' requirements in terms of the quality and relevance of training, in partnership with companies and relevant business or industry associations. National training supports, such as those targeting sectors,

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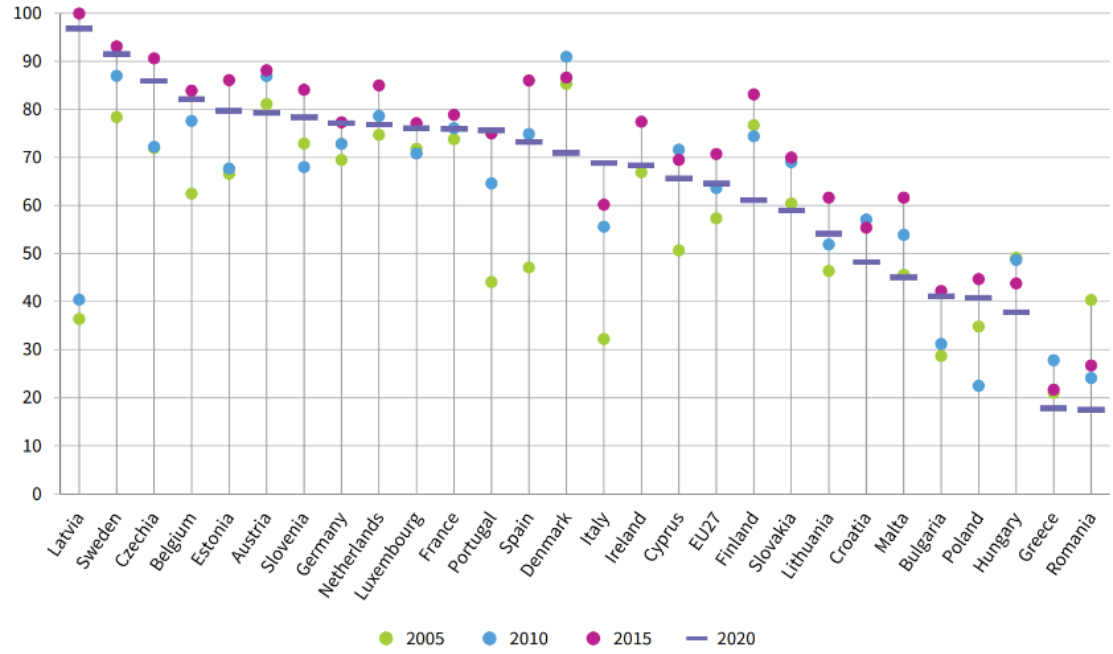
regions or SMEs, could be directed towards such training efforts. The preparedness of the workforce to meet future challenges requires that systems exist to anticipate needs for skills and continuous training.

The available data highlights how on the job training is not used in the same way in EU countries. According to (Eurofound, 2024c), the share of adults participating in learning in the EU increased steadily over 2007–2022. Disparities among member qtates also increased, signalling a diverging trend. The performance of the Nordic member states improved, while eastern European member states tended to lag behind.



Note: *Missing data for Croatia (2005) and Ireland (2010). Linear input used.*
Source: *Eurostat [trng_cvt_01s__custom_10080033]*

Figure 11: Enterprises providing on-the-job training, EU and member qtates, 2005–2020 (%) (2023) adapted from Eurofound, Role of human capital inequalities in social cohesion and convergence, 2024

The global trend, just highlighted, is further supported by recent statistical data from Istat regarding adult education in Italy. According to this survey, despite a persistent gap in the level of participation of Italians in training activities compared to the average recorded in the EU, there is a notable inclination towards non-formal interventions (in the age group of 25-64 years, as much as 34,1% of the Italian population falls into this category). Specifically:

- The North East region of Italy shows a strong inclination towards non-formal activities (an average of 36.4%);

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- This approach is particularly favoured by women (about 66.6% of the entire population);
- The most commonly used informal learning methods in Italy are characterized by the use of electronic devices (e.g., smartphones, personal computers).

Furthermore, according to the already mentioned research (Eurofound, 2024), informal learning is dependent on the way organisations are structured. While workers need to be proactive in their engagement with learning, equally important is that management supports, nurtures and provides the conditions for learning to occur. It is important that there is validation and recognition of informal learning to complement formal skills acquisition. Lastly, training providers and human resource managers should take full account of the role of informal learning practices within companies and their interaction and connection with formal training provision. Creating a skilful and competent workforce is at the core of EU initiatives such as the Digital Compass, the European Pillar of Social Rights Action Plan, and the Recovery and Resilience Facility.

Given the inclination of Italians and businesses towards informal training approaches, and to support the validation and recognition processes of such learning while integrating it with formal competencies, Italy has progressively modernized its education and training systems since 2013, aiming to increase employability, mobility, and social integration of workers and students, and to ensure a better connection between formal, non-formal, and informal learning.

This process has led to the establishment, at the national level, of the so-called QNQ (National Qualifications Framework), which serves as the mechanism for referencing qualifications to the European Qualifications Framework (EQF), aimed at aligning and comparing the Italian specialization system with those of other countries. The national framework “summarizes” the status of all qualifications present in the Italian regions and is periodically subject to "review" in order to introduce new professional profiles and competencies resulting from technological transformations and the related needs of the labour market (for example, the ongoing digitalization process of the Italian production system – Industry 4.0).

However, the combination of formal and non-formal training and the users' expressed need for less “official” training have prompted various sector operators to experiment with innovative methodologies. In this regard, a brief overview of some particularly interesting projects for Italy (especially regarding training techniques and informal approaches) is proposed below.

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>>PROJECTS RELATED TO CPIA (Centers for Adult Education), which are educational institutions with didactic, managerial, and organizational autonomy, whose training offerings are exclusively dedicated to adults and young adults interested in qualifying and requalifying by obtaining a qualification (often involving individuals employed in various sectors). Within the CPIA network across Italy, various "informal" training methods have been experimented with, such as the production of films, the use of "educational robotics" (e.g., Arduino and Unity), which help learners acquire skills particularly related to technological transformations, or MOOC (Massive Open Online Courses), which are fully online training activities open to all and can be accessed "on demand" by participants, facilitating the management of their work and family commitments.

>>PROJECT "LEARNING BUBBLES": It is an experimental project (funded by the Erasmus+ Program - Key Action 2)[18] based on collaboration between different worlds: schools, community urban gardens, and digital technology. This initiative aims to combine the beauty of the natural environment, technological innovation, and tradition to promote the wellbeing of local communities and facilitate the acquisition of new skills by participants. The project involved partners from Italy, France, England, and Belgium. In this context, the Learning Bubbles project developed its methodology by integrating formal, non-formal, and informal education. The Learning Bubbles approach brings training activities directly to community urban gardens, which are places of great social impact, providing a conducive environment for wellbeing during the learning process. The intervention involves the participation of schools, urban gardens, teachers, educators, organizations focused on non-formal training, students/pupils, and their families. The project includes the use of "learning bubbles" where participants can "pause" to engage in "formal" training moments. It promotes the use of digital educators for individual learning, as well as gardeners (professional figures who actively involve small groups of students and community garden operators). The various activities utilize key digital technologies (such as augmented reality, IoT systems, and big data), allowing for the acquisition of skills that are particularly valued by Italian companies in an innovative and non-formal manner.

>>MOVE UP PROJECT. Funded by Erasmus+[19], the project aimed at designing, piloting, and integrating an innovative, flexible, and high-quality retraining pathway for unemployed or inactive low-skilled mothers in Italy, Austria, Greece, and Portugal. This pathway offers them the opportunity to assess, recognize, and further develop their prior learning to facilitate their

[18] See further in: https://www.learningbubbles.eu/.

[19] See further in: https://www.azione.com/it/progetti/move-up.

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participation in training and the labour market, especially by valuing the skills acquired through their role as parents. The focus of prior learning is on the personal, social, and learning competencies (PSL) they have acquired/are acquiring through their parenting role, evaluating it as a preliminary driver for upskilling. The project actions include self-assessment of PSL competencies (using specific tools) and the design of the MOVE UP PLAN, based on personalized learning programs, learning by doing, and a modular structure aimed at developing/strengthening digital skills and soft skills (which are increasingly valued by the business world in light of the profound transformations in the labour market) linked to PSL competencies (acquired through the parenting role).

Within Italian companies (including smaller ones), there is an increasing adoption of training techniques with entirely innovative approaches classified under the category of "GAME BASED LEARNING". The term 'Game Based Learning' refers to learning achieved through a playful approach, that means to use any sort of games (boardgames, Edu-Larp, role games) or video games. The latter, a product of digital transformation, are considered an ideal means to achieve educational goals. Technologies such as virtual reality (VR) allow students to immerse themselves in computer-generated scenarios, taking on the role of someone else, becoming the main characters in the story, and engaging with the themes presented by the game. In recent years, Italian companies (and consequently their employees) have begun to more frequently choose game-based learning approaches, since they have realized that these methods improve production processes (fostering a stimulating work environment, promoting a higher degree of engagement, and increasing attractiveness for Generation Z).

Factors that make a company more training-oriented (towards the future)

How to push companies forward the future?

The possibility of innovating training also depends on the characteristics of the company: size, sector, but also cultural, organizational and leadership models. A Research based on European Company Survey by Eurofound (2019) and Cedefop (2023), supplemented by a qualitative analysis shows that companies that use a set of workplace practices promoting employee autonomy, inviting ideas and improvements, rewarding performance and enhancing skills development are more likely to be market innovators.

Key figures of Eurofound (2019) and Cedefop (2023) show that there is much potential in the economy for boosting innovation among small and medium-sized enterprises (SMEs) and in establishments more than 10 years old. Innovative establishments are highly digitalised

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compared to the EU average. In particular, they are likely to use data analytics to improve their production processes or service delivery. Innovation is not just a technical process of developing or acquiring technology; it also requires companies to adopt work organisation, direct employee participation and HRM practices that support innovation activities and learning strategies. Both documents show that establishments where management facilitates employees to work autonomously and where self-directed teams are prevalent are more likely to innovate in their market than workplaces where the predominant model is one of managerial command and control. The case studies of innovative companies reported in Eurofound (2019) suggest that, where workers have autonomy in their jobs, they are more likely to propose suggestions for new products and services and process improvements. he management in innovative establishments has high expectations of employees – in terms of helping colleagues, staying longer at work when needed and making suggestions for improvements to the business – and also uses a range of practices to motivate them. The case studies show that managers in innovative companies encourage employees to be creative and to think outside the box. The evidences from Eurofound (2019) report demonstrate that establishments that offer comprehensive training and learning opportunities are more likely to innovate than those where the scope for skills development is limited. The case studies suggest that innovation is supported not only by training from external providers, both formal and non-formal, but also by internal non-formal and informal learning facilitated through work organisation practices and job design ('non-formal' meaning intentional, structured training that does not necessarily lead to formal qualifications). As reported by the above mentioned reports, crucial element for fostering innovation is employee participation in organisational decision-making. Establishments that regularly engage with staff and use several means to do so, and where workers have an influence on management decisions, have a higher likelihood of introducing innovations to the market, compared to those establishments characterised by the absence of these practices. Collaboration with other establishments is positively associated with innovation in companies. Evidence from the case studies shows that companies tap into their large networks of collaborators, experts and customers to develop new ideas and to stay up-to-date with new technologies, services, products and processes.

The mechanism just highlighted is evidenced by key statistical data (Eurofound, 2019 and Cedefop 2024) showing that new organizational models and professional roles with shared responsibilities for innovation are expanding within Italian companies. The 41% of large companies have formalized an Innovation Management department, while 51% have defined roles for Innovation Champions, tasked with promoting the spread of innovation and coordinating with business functions. 74% have adopted 'Corporate Entrepreneurship' initiatives

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to stimulate entrepreneurial approaches among their employees, particularly through training in digital and entrepreneurial skills (55%), leadership styles focused on change management (52%), action learning spaces (35%), and contests to gather ideas (32%).

The idea that management plays a crucial role in creating conditions that give workers opportunities to make use of their skills, and that this improves the efficiency, innovativeness, and adaptability of companies, is gaining ground. The policy indication (Cedefop , 2023; Eurofound, 2023) are:

- Encourage companies to adopt workplace practices that are associated with innovation
- Strengthen line managers' training and human resource managers' training.
- Focus on skills as the basis of innovation.
- Encourage networking and innovative clusters.
- Enlist the social partners to promote the concept of workplace learning through direct employee participation
- The regular EU-wide surveys of continuing training in European enterprises (CVTS) conducted by Eurostat and Cedefop's analyses demonstrate that micro, small and medium-sized enterprises (MSMEs) train their employees less than larger companies do.
- The comparative analysis on case studies and good practice among Countries show that MSMEs overcome the barriers preventing them from meeting their current training needs, and promoting organisational development that can lead to increased and more effective training in the long run, are the two fundamental strategies to improve MSME training performance. Achieving this requires a well-coordinated or, better, an integrated set of policies and instruments offering targeted and mediated approach.
- Broad stakeholder cooperation is needed, including policy-makers and social partners, and holistic policy approaches linking different policy domains: lifelong learning, employment, business development and innovation. There is a need to combine financing and structural support instruments in order to tackle different root causes of MSME low training performance. As not one, but several barriers typically impede MSME training provision, it is necessary to develop a balanced set of instruments that simultaneously address more than one barrier (e.g. by combining funding, consultancy services and tailored CVET offer).

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• More research is needed on the availability and interplay of targeted and mediated support instruments geared to MSMEs, supply-side-funded CVET and instruments supporting individual MSME workers. Evaluating these instruments, including those offered in packages, in terms of their complementarity and synergies, can optimise their effectiveness. As policies and instruments are always rooted in a regional, sectoral and national skills formation system, they should be assessed against this backdrop.

Further investigations confirm what has been described so far. In particular, companies that adopt a 'smart' governance model (meaning they pay greater attention to quality and working conditions, engage employees in the planning and management of activities, and implement organizational changes) not only demonstrate overall better management but also a higher degree of employee satisfaction and excellent performance results (both in terms of production and quality of finished products). Additionally, companies that have embraced the 'smart' model have a significant proportion of staff involved in training (on average, over 80% of employees) and a similarly strong inclination towards introducing innovations related to production.

Considering determinants and consequences of workplace learning (Kankaraš, 2021) as insights from the 2019 European company survey, the author reports that workers learn most when engaging in new and challenging activities in which they are granted a sufficient amount of autonomy to solve issues themselves or in collaboration with their colleagues or mentors. Informal learning is the key aspect of workplaces in terms of company performance, especially employee wellbeing. Such findings call for more attention from policymakers and organisation management to various forms of informal learning at the workplace. This is especially true when considering the apparent lack of beneficial effects of formal and non-formal learning on employee wellbeing and company performance. These findings again illustrate the overwhelming prominence of informal learning at the workplace compared to formal and nonformal learning forms. But they also indicate the learning potential that exists at workplaces. It presents an incredible opportunity for action, at organisational, national and international levels. Such action must aim to create institutional conditions, legal frameworks, learning resources, and the right incentives for companies to start organising their workplaces in a way that will facilitate workplace learning, especially its various informal forms.

The significant attention of companies (including small ones) to support training and innovation processes within their organizations, as a direct consequence of the ongoing transformations in the labour market, has led various production entities to establish internal training structures known as Academies. In Italy, over the years, numerous corporate academies have been set up

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(according to Acknowledge and AIF, there were 160 in 2021), created not only to teach new hires how to perform their jobs but also to promote the dissemination of internal knowledge and to tackle the daily challenges of innovation. In this Country, Corporate Universities are relatively recent, but this type of structural training is increasingly seen as a crucial element for maintaining competitiveness, particularly in contexts where new professional skill requirements arise due to labour market transformations (such as the introduction of new technologies). Corporate Academies are characterized by the following elements:

- Flexibility: Thanks to the availability of online courses and digital learning materials, employees can access training whenever and wherever they find it most convenient.
- Monitoring and evaluation interventions: These assess employees' learning progress to identify any gaps or deficits and initiate tailored recovery programs. This process significantly enhances employee engagement and retention.
- Focus on new technologies and related skills (e.g., artificial intelligence, automation, data analysis) that promote a propensity for innovation, the development of innovative ideas, and the adoption of best practices.

Conclusions

The contribution analyes, through a desk analysis on main European and OCSE documents and good practices at Country level, how the demand for training by companies might change in next years. The evidence confirms the impact of the digital and the green transition, but also the importance and impact led by demographic change and, in general, by megatrends. Main insights invite to consider not only what will be the most in-demand skills in the coming years, but also the transformations of the workforce profiles, and pose a problem of methodologies and didactic approaches that take into account the characteristics of trainees, as well as methods of assessing skills at the end of a training/retraining course. A focus has been provided on stakeholder engagement and governance among key-actors.

References

1. Bonometti, S. (2008). Il processo di analisi dei bisogni formativi. In C. Girelli (Ed.), *Processi e metodologie formative: Teoria e applicazioni nella scuola, nella sanità, nell'industria, nel turismo e nel terzo settore*. Edizioni Centro Studi Erickson.

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2. Buldioski, G., & Titley, G. (2022). *T-KIT on training essentials.*
3. Carrozzi, G. P., & Quaglino, G. P. (2003). *Il processo di formazione: Dall'analisi dei bisogni alla valutazione dei risultati.* Milano: Franco Angeli.
4. Cedefop. (2023a). *The future of vocational education and training in Europe.*
5. Cedefop. (2023b). *Fostering skills use for sustained business performance: Evidence from the European Company Survey.*
6. Cedefop. (2023c). *Big skills for small companies.*
7. Cedefop (Kankaraš, M.). (2021). *Workplace learning: Determinants and consequences: Insights from the 2019 European company survey.*
8. EIGE. (2023). *Gender equality index 2023: Towards a green transition in transport and energy.* Publications Office of the European Union.
9. Eurofound. (2024a). *Company practices to tackle labour shortages.*
10. Eurofound. (2024b). *Working conditions and sustainable work: Keeping older workers engaged – Policies, practices and mechanisms.*
11. Eurofound. (2024c). *Role of human capital inequalities in social cohesion and convergence.*
12. Eurofound. (2023). *Changing labour markets: How to prevent a mismatch between skills and jobs in times of transition.*
13. Eurofound & Cedefop. (2021). *Innovation in EU companies: Do workplace practices matter?*
14. Eurofound. (2020). *Game-changing technologies: Transforming production and employment in Europe.*
15. Fondimpresa. (2023). *(Ed. Ferri, V., & Iencenelli, N.) Rapporto di monitoraggio valutativo 2023: La sfida della formazione in azienda nell'era delle twin transition. Evidenze dall'indagine ROLA 2021 e 2022 e buone prassi formative.*
16. Fondimpresa. (2016). *(Ed. Bednarz, F., Bianchi, F., & Sivilotti, B.) Sistema stabile di rilevazione e valutazione degli interventi finanziati: Rapporto Regionale Friuli Venezia Giulia 2014-2015.*
17. European Commission, European Strategy and Policy Analysis System (ESPAS). (n.d.). *European Strategy and Policy Analysis System (ESPAS).* Retrieved from https://ec.europa.eu/assets/epsc/pages/espas/index.html
18. Gazeta Uniwersytecka UŚ. (2024). Uczelnie przyszłości – nowe możliwości w zakresie kształcenia. *Gazeta Uniwersytecka UŚ, (6), 316.*
19. GUS. (2024). Polacy ruszyli po wiedzę: Zdobywają ją inaczej niż kiedyś.
20. Iannucci, M., Massimo, R., Navarra, A., Cacciola, S., & Pozzana, A. (2023). Le competenze che contano nella new way of working. In *Tomorrow People – Supplemento a Harvard Business Review Italia*, 6(2023).
21. INAPP (Ed. Bergamante, F., & Luppi, M.). (2024). *Rapporto PLUS 2023: Osservare le traiettorie del mercato del lavoro.*
22. INAPP. (2023a). *Rapporto INAPP – Lavoro, formazione, welfare: Un percorso di crescita accidentato.*
23. INAPP & ANPAL (per conto del Ministero del Lavoro e delle Politiche Sociali). (2023b). *XXIII rapporto sulla formazione continua – Annualità 2021-2022.*

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24. Innocente, L., Romio, A., Carlino, D., & Conoscenti, F. S. (2023). Nuove generazioni, nuove sfide. In *Tomorrow People – Supplemento a Harvard Business Review Italia*, 6(2023).

25. ISTAT. (2024). *La formazione degli adulti*. Collana Statistiche Report.

26. MARE FVG. (n.d.). *Capability Blue Hub*. Retrieved from https://www.marefvg.it/it/progetto/capability-blue-hub/

27. Ministry of Education and Science. (2020). *Integrated Skills Strategy 2030 (Detailed Part)*.

28. Morelli, M. V., & Semerari, R. (2023). Riflessioni sul futuro del lavoro. In *Tomorrow People – Supplemento a Harvard Business Review Italia*, 6(2023).

29. Mosca, R. (2012). L'analisi dei bisogni di formazione in azienda e la progettazione di un intervento formativo. In *Tigor: Rivista di Scienze della Comunicazione*, 4(2), July–December.

30. OECD. (2024). *Getting skills right: Future-ready adult learning systems.*

31. OECD, & ILO. (2018). *Approaches to anticipating skills for the future of work*.

32. Politecnico Universitario di Milano. (2024). *Gli investimenti in digitale in Italia*. Osservatori.net – Digital Innovation.

33. Rodič, B., Vukovič, G., Završnik, B., & Miglič, G. (2012). Issues in introducing training needs analysis in Slovenia's public administration. *Transylvanian Review of Administrative Sciences.*

34. Tamayo, J., Doumi, L., Goel, S., Kovács-Ondrejkovic, O., & Sadun, R. (2023). Il reskilling nell'era dell'IA: Cinque nuovi paradigmi per i leader (e per i dipendenti). *Harvard Business Review, 10(2023)*.

35. URBAN Institute. (2022). *Skills-based hiring and older workers.*

36. World Economic Forum, & PwC. (2023). *Putting skills first: A framework for action*. In *Future of Jobs Report 2023*.

37. World Economic Forum. (2018). *Towards a reskilling revolution: A future of jobs for all.*

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CHAPTER 5

Flexible work arrangements trends: from the past to the future

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Abstract:

This state-of-the-art review explores flexible work arrangements (FWA) by examining key definitions, individual and organizational consequences, the role of technology, and future challenges from macroeconomic and societal perspectives. From both institutional and academic viewpoints, FWA encompasses diverse practices such as telecommuting, flextime, and compressed workweeks, designed to offer employees greater control over when, where, and how they work. The review highlights that while FWAs can improve job satisfaction, work-life balance, and productivity, they also present challenges such as blurred work-life boundaries, potential isolation, and inequities in access to flexibility. Organizational outcomes vary, with positive effects on engagement and retention but also potential drawbacks such as difficulties in team coordination and managing remote performance. The present review also highlights the role of moderators – such as job autonomy, planning behaviours, management support, and organizational culture – in shaping the success of FWA implementation. Looking forward, the review identifies the future challenges related with internal and external flexibility organizational needs. The review concludes by emphasizing that FWAs have clear implications at a macro level, specifically on productivity, employment wages, labour market participation, skills, ways-of-living, migratory dynamics, labour relations and economic growth.

Keywords: Flexible work arrangements (FWA), teleworking, remote work, flexibility, wellbeing, technology, challenges

Introduction

Working outside the employer's premises is not a new reality, but it has undergone significant transformations with the use of technology and the changes brought about by the pandemic. The notion of flexibility can be associated with three major dimensions of work: location, time, and employment relationship, all of which intersect both conceptually and in terms of their

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implications. This is a topic of interest for i) academics, who seek to understand the antecedents and consequences of these new work arrangements; ii) practitioners, who are responsible for adopting these work models and defining the conditions for their implementation; iii) as well as government bodies that are responsible for regulating aspects related to the impact of adopting these practices.

Working at home has always existed since the early days of work (manufacturing, craftsmanship, caregiving). However, working from home or from other locations besides the employer's premises became accessible to other activities with the development of technology, and it became particularly prevalent during the pandemic. Historically, working at home has been done mainly by:

> "low-skilled and low-paid workers engaged in manufacturing and routine service work; nowadays, homeworkers are largely managerial, professional or administrative staff who possess higher qualifications and skills and receive better pay" (ETUI, 2022, p.3).

The social relevance of this topic is evident through the numerous official publications by national and international organizations addressing these issues. Regarding the main purpose of the project, the following synthesis aims to focus on flexible work arrangements (FWA) based on the use of technology (excluding other forms of flexible work).

Technology is one of the biggest transformations that permeates the new work arrangements, and its impact can be analysed on three main levels:

In the very definition, introducing flexibility regarding the possible locations (*flex-place*) where work is performed using technology (e.g., telework); it also enables platform-based work, which introduces the notion of flexibility in the employment relationship itself.

In temporal flexibility (*flextime*), with technology raising important issues around connection and disconnection, as well as the possibility for employers to monitor workers through technological tools.

In the teleworkability of job content, meaning that the use of technology has made many jobs suitable for remote work or has increased the potential for teleworkability in several jobs, since the required digital skills are assured.

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Definitions

Institutional Perspective

One of the first remarks is the coexistence of multiple terms that require conceptual clarification. For ILO (2020), a useful starting point for distinguishing concepts such as remote work, telework, work-at-home, home-based work, and related notions is understanding the idea of a 'default place of work' and how it relates to the physical location where the job is actually performed (typically the worker's primary job). The default place of work refers to the location where the work could generally be expected to occur, given the nature of the profession and the worker's employment status (e.g., dependent vs. independent, each with different implications). Importantly, the default location does not imply that all or most work will occur in a single place and therefore differs from the idea of a 'main place of work.' In this context, telework can be seen as a subset within the broader concept of remote work. It includes workers who perform tasks remotely using information and communications technology (ICT) or landline telephones, enabling work from locations outside the default place of work. Telework stands apart as a distinct category because it specifically involves the remote use of personal electronic devices.

Other categories as work at home or home-based work refers to work that takes place, respectively, partly or fully within the workers' own residence, independent of the default place of work and can be intersected with telework (teleworking from home, or home-base teleworking). Eurofound (2022, p.4) consider telework as "a work arrangement where work was performed outside the default place of work by means of ICT with different frequencies". Teleworking is the phenomenon of "using information technology to work from anywhere and at any time and can be mixed with more traditional working patters, giving rise to hybrid models" (ETUI, 2022, p.4). This involves working in a variety of places, including at or from home, on the employer's premises, on the move and elsewhere. Besides the overlapping definitions, there's also a lack of statistical standards associated with these concepts in different countries (ILO, 2020). Thus, when it comes to measure these concepts is important to consider both frequency (mainly, regularly, occasionally) and mobility (high-mobility vs low-mobility referring to interchangeability between different places of work).

Besides the workplace, the second most involved dimension in flexible arrangements is working time. Working time is a crucial factor both on workers' lives and production, as it is associated with impacts on worker protection and negative outcomes (OECD, 2022) and it can also be a consequence of teleworking (Eurofound, 2022), since working outside the employer's premises

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(especially from home) can lead to less clear management of working hours and difficulty in setting boundaries between working time and non-working time for individuals.

Another concept that precedes the classification of FWA is precisely the potential that each job may have to be performed in other locations through technology, i.e., its potential to be teleworked. Despite the prevalence of telework in the post-pandemic period, a large portion of workers have little or no opportunity to perform their tasks remotely or through technology (such as machine operation, product manufacturing, activities involving interaction with others, in-person customer service, or caregiving). Some jobs are more teleworkable than others and digital forms of communication have considerably increased the possibility for remote social interaction (Eurofound, 2022). But the potential for remote work – *teleworkability* – is mainly determined by tasks and activities and not occupations or jobs, as depends on the mix of activities undertaken in each occupation and on their physical, spatial, and interpersonal context.

The McKinsey Global Institute (2020) analysed over 2,000 activities across more than 800 occupations to determine which activities and roles hold the highest potential for remote work. This assessment was based on data from the Occupational Information Network (O*NET) across various countries, both within and outside the EU. The findings suggest that:

- Activities related with updating knowledge and interacting with computers revealed highest potential for remote work;
- Some specific sectors (as finance, management, professional services, and information) have the highest potential for remote work;
- The potential for remote work is higher in more advanced economies, reflecting the unique combination of their sectors, occupations, and types of activities;
- Workforces in advanced economies can spend more time working remotely than those in emerging economies: while most workers cannot work remotely, up to a quarter in advanced economies can do so three to five days a week.

Academic Perspective

The concept of "telecommuting" emerged as one of the initial terms to describe remote work setups, coined by Nilles in 1975. It originally described individuals working from home while staying connected to their workplace through technology. In the U.S., "telecommuting" has since become widely used, along with "telework," to denote various work activities performed outside a central office but linked to it (e.g., Bailey & Kurland, 2002; Golden & Veiga, 2005). In Europe,

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the term “e-work” is more commonly used to signify virtual work. Kirk and Belovics (2006) define e-workers as full-time home-based employees who rely primarily on electronic communication, with limited face-to-face interactions with their office, colleagues, or supervisors. A broader term, “remote working,” describes a flexible approach allowing or requiring employees to work outside the traditional office, often from home or on the go (Franken et al., 2020).

Flexible work arrangements (FWAs) can be classified by work location (flex-place), work timing (flex-time), and increasingly, the flexibility within employment relationships (Spreitzer et al., 2017). “Flextime” refers to control over working hours, enabling options such as adjusted start and end times, compressed workweeks, reduced hours, and flexible leave. Conversely, “flexplace” policies allow employees to work from various locations outside the traditional office, including telecommuting or remote work, alternate company locations, or home (Shifrin & Michel, 2022).

Flexibility in employment relationships, designed to enhance agility in labour markets, reflects a shift from standard employment to shorter-term assignments, sometimes leading to job insecurity (Lam et al., 2015). Three examples of this flexibility are direct employment beyond standard contracts, co-employment/agency work, and contracting (Spreitzer et al., 2017).

Flexible work arrangements (FWA) Individual and Organizational Consequences and Moderators

FWA

International comparisons (OECD, 2022) show that workers' ability to work flexible hours, i.e., to autonomously decide their starting and finishing times, is associated with better wellbeing, although to varying degrees across countries. The literature also points to positive associations with employment, wages, and productivity. In contrast, the link between teleworking and workers' well-being varies depending on the outcomes and also varies across countries (Eurofound, 2022). Empirical results show a negative association with self-assessed health, positive associations with life and job satisfaction, and mixed associations with work-life balance.

Empirical research also indicates a strong link between long working hours and negative health outcomes, especially when workers have limited control over their schedules. However, the evidence is less definitive regarding other aspects of wellbeing and life satisfaction. Studies emphasize that reducing standard weekly hours can improve worker wellbeing, provided that

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it does not lead to increased work intensity. Findings suggest that, in addition to regulating maximum hours and overtime, reducing standard working hours could also serve as a strategic tool in working time policy to improve worker wellbeing under certain conditions (OECD, 2022).

Flexible work is widely promoted as beneficial for both individuals and organizations, with evidence showing that organizations offering flexible options see productivity gains, lower space needs, and reduced costs, while employees report improved work-life balance, higher satisfaction, and stronger organizational commitment (Johnson et al., 2020). Charalampous et al. (2019) found that remote e-working is associated with more positive emotions and fewer negative ones. Despite intensified remote work demands, employees report greater organizational commitment, possibly due to feeling trusted by their employers to manage their responsibilities remotely (Charalampous et al., 2019).

Flexible work has also been linked to better mental health by enabling employees to align work hours with personal obligations, like childcare, thereby reducing conflicts between work and family (Johnson et al., 2020). Flexible schedules are intended to help individuals manage personal resources effectively across different roles, potentially lowering stress levels and promoting healthier habits (Shifrin & Michel, 2022). Additional benefits include reduced absenteeism and fewer physical symptoms, underscoring the positive effects of flexible arrangements on both personal and organizational wellbeing (Johnson et al., 2020).

However, flexible arrangements may also lead to challenges like insufficient work recovery at home and weakened social ties, resulting in potential isolation. Remote e-working can blur personal and professional boundaries, with technology enabling after-hours work. This creates challenges in mentally detaching from work, even while away from the office. Working from home or other remote locations may also reduce social connection opportunities, leading to isolation and weakened workplace bonds (Johnson et al., 2020).

In fact, while many employees express a strong interest in remote work due to its numerous advantages—such as enhanced well-being, job satisfaction, and performance—it also presents several challenges. These include increased work-family conflict, difficulty disengaging from work, feelings of isolation, and reduced accessibility to colleagues or supervisors (e.g., Eddleston & Mulki, 2017; Felstead & Henseke, 2017; Gajendran & Harrison, 2007; Golden, 2012; Golden & Fromen, 2011; Golden & Gajendran, 2019; Lapierre et al., 2016; Vega et al., 2015). Remote work entails a shift in the work environment—most commonly to a home office—during standard working hours (Allen et al., 2015; Golden & Gajendran, 2019). When multiple household members share the same space, working from home can blur the boundaries between

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professional and personal life, placing significant demands on an individual's resources (Radulović et al., 2021; Trougakos et al., 2020. Workplace isolation refers to an individual's perceived detachment from colleagues and the organization's support system (Marshall & Michaels, 2007). Thus, when communication occurs primarily through remote work it often fails to satisfy the psychological need for belonging, as discussions tend to be centered on work-related tasks (Wang et al, 2021). Moreover, remote work may create a sense of disadvantage among employees compared to their in-office counterparts due to limited interactions with managers and supervisors, what could lead to social isolation perceptions (Bently et al., 2016). Additionally, previous literature suggests that remote work associated with a higher level of work-related stress (e.g., Lunde et al.; Oakman et al., 2020). Remote work stress reflects the perception that remote work introduces obstacles, challenges, or threats that impede learning, growth, or goal attainment (Cavanaugh et al., 2000). Examples of stress responses in remote work include frustration due to inaccessible colleagues or irritation stemming from micromanagement by distrustful supervisors (Charalampous et al., 2019), resulting in feelings of exhaustion and demotivation (Cavanaugh et al., 2000; Edwards et al., 2014; LePine et al., 2016). Two key concerns associated with remote work include the heightened risk of interruptions from household members during the workday and the potential for excessive integration of work and personal life, leading to a continuous work cycle for remote employees (Adkins & Premeaux, 2014; Charalampous et al., 2019; Gajendran & Harrison, 2007; Lapierre et al., 2016).

Remote work introduces additional challenges, such as reduced knowledge sharing, which can be addressed through strong technological support and occasional face-to-face interactions, especially for new employees (Golden & Raghuram, 2010; Allen et al., 2015). Some remote workers also report fewer advancement opportunities (Kelliher & Anderson, 2008), and high-intensity telework can strain coworker relationships (Gajendran & Harrison, 2007). Subordinates with remote managers report more negative experiences than those with on-site managers (Golden & Fromen, 2011). Physical isolation in remote work can also lead to perceptions of reduced organizational respect and, consequently, lower organizational identification (Bartel et al., 2012).

Remote teams also face a distinct set of benefits and challenges, as members often operate across different time zones and countries, with limited face-to-face interactions (Spreitzer et al., 2017). The reliance on electronic communication and the absence of physical presence can diminish feelings of work meaningfulness and responsibility, as virtual work may weaken intimacy and identification among coworkers (Gibson et al., 2011). Furthermore, geographically

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dispersed teams can trigger the formation of »faultlines«—hypothetical divisions that split the group into subgroups—thereby impairing group cohesion and functioning (Polzer et al., 2006), particularly when multiple members are located at different sites (O'Leary & Mortensen, 2010).

A recent study highlights five themes that shape the remote work experience: technology, work-life balance, workspace, workload, and team relationships (Franken et al., 2021). IT issues under tight deadlines can raise stress, while access to work materials increases availability and fosters an "always-on" culture (Schwarzmüller et al., 2018). Nevertheless, effective use of resources and a shared understanding within teams can improve the technology experience. Flexible work arrangements also promote work-life balance, enabling optimized productivity and more family time by spreading work hours across traditional and non-traditional times. Environmental factors like noise and ergonomics significantly impact productivity and wellbeing; a favorable home environment can ease work-related strain, while an unsuitable setup can lead to stress and unmanageable demands. Despite increased workload, employees often report higher productivity due to fewer distractions, no commute, and task completion flexibility. However, they also experience isolation, affecting trust in colleagues and managers and exacerbating stress from balancing work and personal duties. Strong team dynamics are essential to overcome these challenges, with collaborative support helping to maintain productivity and wellbeing in flexible remote environments (Franken et al., 2021).

Moderators Influencing the Effects of Flexible Work Arrangements

Previous literature identifies several moderators that amplify the benefits and mitigate the challenges of remote work, influencing how these arrangements are experienced by individuals and organizations alike. Organizational support, for example, has been shown to reduce feelings of social isolation among remote workers, thereby enhancing the positive outcomes of flexible work arrangements. Additionally, supportive organizations are more likely to foster social support networks among remote employees, colleagues, and supervisors (Charalampous et al., 2019). Good management of flexible work arrangements, as research suggests, is often characterized by an organizational culture that values flexibility, trust, close communication, and timely support (Franken et al., 2021).

The success of flexible work arrangements also depends on employees' access to and proficiency with communication and collaboration technologies. Organizations that invest in comprehensive technological tools tend to facilitate smoother transitions to flexible work models (Charalampous et al., 2019). Moreover, managerial support appears to be crucial for implementing and sustaining flexible work arrangements. According to Franken et al. (2021),

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line managers play a key role in modeling flexible work practices and sharing the challenges they encounter, which can help to normalize these practices for employees and provide a supportive framework to address challenges.

Research further indicates that individual autonomy over work processes and decision-making strengthens the positive impact of flexible work arrangements. This includes having choices about whether and when to work remotely, allowing employees to adjust their schedules to optimize productivity (e.g., Johnson et al., 2020). Employees with higher autonomy benefit more from these arrangements as they can tailor their work to align with personal and professional goals.

Additionally, Spreitzer et al. (2017) highlight other factors that enhance the benefits and alleviate challenges associated with remote work, such as maintaining positive relationships with supervisors and colleagues, and limiting the extent of virtual work to moderate levels. Azar et al. (2018) studied the role of planning behaviour, noting that planning facilitates the organization of tasks and aligns schedules with available resources, increasing the likelihood of meeting work goals. The study observed that planning strengthens the connection between flexible work arrangement usage and work-life conflict: higher levels of planning correlate with a stronger relationship between flexible work use and work-life balance challenges.

Technology and FWA Future Challenges

One of the most significant trends has been the rapid rise of remote and hybrid working models. The prevalence of telework in the EU has surged compared to previous levels (Eurofound, 2022): in April 2020, it was estimated that 33.7% of employees worked exclusively from home, while 14.2% adopted a hybrid approach, working from various locations, including home, the employer's premises, and other places. This shift towards remote and hybrid work is expected to persist, heavily relying on technology (MGI, 2020)."

Country comparisons reported by Eurofound (2022) bring some clarity about this increase: in 2008, less than 8% of employees were working from home 'sometimes' or 'usually'. The percentage progressively increased over the years, reaching 11% in 2019, just before the crisis and the frequency of teleworking quickly increased to 19% in 2020, and reached 22% in 2021. The rise was noted mainly among employees 'usually' working from home. Regarding telework evolution by gender, 24% of women reported working from home at least some of the time in 2021, up from 8% in 2008. In 2021, some 21% of men were working from home, up from 7% in 2008. Regarding age, between 2008–2019, increasing trends were registered in all age cohorts except those aged 65 and over. The most evident relative increase was recorded for

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younger workers (aged 15–24) and core-age workers (aged 25–49): in 2021, around 12% of employees aged 15–24 reported working from home, compared with less than 3% in 2008 and 4% in 2019. Despite that, multivariate analysis shows that, before and during the pandemic, young workers were less likely to telework (maybe because this was reserved to more experienced and autonomous workers).

Another challenge is the employees' monitoring. It can include a "combination of traditional methods, such as micromanagement and excessive supervision, including calls, messages and e-meetings, and new methods using specific monitoring software and surveillance tools. The extensive increase in the use of digital tools raises concerns regarding privacy, surveillance and monitoring of workers and their performance, including the need to respect the applicable rules on collection of personal data. This is even more challenging when working remotely with ICT" (Eurofound, 2022, p.30), and led to the regulation of the right to disconnect in many EU countries.

Several authors have been focusing future challenges related with Remote and hybrid work. For instance, Schwarzmüller et al., (2018) emphasized that due to recent technological advances, "organizations currently face massive changes of their work design and leadership" (p.114). Moreover the authors stressed that the exact nature of these changes "is still unclear as most existing studies were conducted during earlier stages of the digital transformation and the available literature is highly fragmented" (Schwarzmüller et al., 2018, p.114). Considering this situation, the authors conducted an open-ended online survey with 49 recognized digitalization experts and identified key themes of change. Four key themes of change affecting both work design and leadership emerged. The first key theme represents "the changes in the work-life and health domain, implying an altered relationship between work and private life" (Schwarzmüller et al., 2018, p.121). The second key theme implies changes resulting from the use of information and communication technology that have an impact on the way the work is done and, in the communication, /collaboration. The third key theme focus the performance and talent management in organizations, highlighting that "as digitalization changes competency requirements as well as performance measurement and management" (Schwarzmüller et al., 2018, p.121) will also change. The fourth key theme deals with organizational hierarchies, "as employees take over more responsibility and leaders display different types of influence behaviour in the age of omnipresent computing" (Schwarzmüller et al., 2018, p.121).

More recently, Kraus et al. (2023) that cover the organizational capabilities and culture (e.g., What type of organizational culture is best suited to support remote workers in navigating work-home conflicts), organizational performance (e.g., What are the conditions that make employees

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working remotely more/less productive), individual features (e.g., What skills are critical to form and maintain trustful relationships in a virtual work environment?), knowledge management (e.g., How is knowledge shared between employees and employers in contexts of remote and hybrid work?),as well as the dark sides of digitalization (e.g., What are the main undesirable consequences of working from home (e.g., loneliness, decreased creativity, lack of motivation)?) and policy implications (e.g, How can policies be designed to optimize the factors that influence the success and effectiveness of remote working and hybrid work arrangements?).

Additionally, in a very recent systematic review Hesselbarth et al. (2024) focused on technology-driven work arrangements and highlights the 6 main trends in the literature and identifies the future challenges related with internal and external flexibility organizational needs. The three internal flexibility needs, reflect the overall goal of technology-driven work arrangements to achieve internal and external flexibility via coordinated and consistent patterns of action across all clusters. Namely, the first focus issues related with virtual teams within organizations, suggesting that while virtual teams help structure work more flexibly and dynamically, organizations need to ensure that they put the right conditions in place to foster effective teamwork. This highlights "the challenge of creating a high-trust work environment where employees experience positive emotions, which is even more relevant in virtual than face-to-face teams" (Hesselbarth et al., 2024, p.985). The second highlights the Virtual communication processes within organizations, that emphasize the use of ICT and communication mechanisms in a digital work environment, thereby shedding light on how technology-driven work arrangements address internal flexibility needs in the process dimension. Namely,

> "While virtuality enables organizations to counter complex environments where communication is ubiquitous, humans still hold the potential to undermine computer-mediated communication processes" (Hesselbarth et al., 2024, p.987).

The third, emphasizes the need for the enhancement of self-responsibility of organizational actors which has implications of former hierarchy-heavy organizations transforming to less hierarchical structures. This requires individuals to take on responsibility for their work outcomes instead of referring to their line of report. This perspective emphasizes the need for employee skills and corresponding character traits to engage successfully with complexity and adapt to internal flexibility needs. In this context, self-responsibility focuses "encouraging employees to make their own decisions, thus adding flexibility to the work process and being responsible for their physical and psychological performance capability" (Hesselbarth et al., 2024, p.988).

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Macroeconomic and Societal Perspectives

Regarding economic benefits, some studies, even before the pandemic, highlighted the positive relationship between telework and economic advantages for both employees and organizations. Indeed, at the firm level, previous research has stated that FWA reduce real estate costs and enable employees to save on commuting expenses by working from home or alternative satellite offices (Gajendran & Harrison, 2007).

Thus, economic benefits can be considered one of the key motivations for adopting FWAs. From the firm's perspective, FWAs can serve as a strategy to reduce real estate costs by downsizing office spaces, lower overhead expenses through hotelling arrangements or by equipping employees to work from home, and facilitate labour cost reductions by hiring workers with limited benefits (Bailey & Kurland, 2002).

Actually, the observed downsizing of office spaces in many companies is now posing new challenges for return-to-office policies. In fact, "while many companies continue to follow hybrid and work-from-home models, companies such as Amazon, JP Morgan Chase, and Nike moved to mandated in-office policies of at least four days a week in 2024" (McKinsey, 2025, p.1), fueling the debate on the diversity of practices and the optimal degree of flexibility regarding workplace and working hours.

Beyond the individual and organizational levels, FWA has clear implications at a more macro level: productivity, employment, wages, labour market participation, skills, ways of living, migratory dynamics, labour relations and economic grow. Regarding time-flex, the reduction in normal hours (and other modalities e.g.: compressed week, four-day week, et) should be considered taking into account their potential impact on employment and productivity; regarding flex-place, several documents highlight the positive impacts of teleworking on productivity and employment, and also associate teleworking with other positive outcomes, especially in terms of attracting and retaining workers, as well as increasing female labour force participation OECD, 2022).

It seems that the impact of FWA on working conditions (productivity, work relationships and preferences, long working hours and flexible working time, work-life balance, etc.) manifests differently in different countries (Eurofound, 2022). Moreover, the combined effects of spatial and temporal flexibility may bring still unknown and distinct consequences for different contexts and geographies. An OECD study (2022) analysed the effects of work time reduction policies in different countries, and the results show that: i) at the macro level there was no significant effects on employment, wages and productivity; and ii) regarding the firm-level effects, it was

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observed economic outcomes in some countries point to contrasted results. More evidence is needed to understand why such positive effects manifest in some cases and not in others, but it could be explained by national differences in the institutional context of the decision-making process, notably wellfunctioning collective bargaining and strong social dialogue.

It is also important to anticipate that the future development of teleworking will not be similar across different countries. Technical, social, economic, cultural and regulatory frameworks facilitate higher prevalence of telework in certain countries (Eurofound, 2022) and some occupations and sectors may have higher shares of telework. Results at country level also strengthen the association between teleworkability and average wage levels, suggesting that the pandemic may have indirectly led to "a new dimension of wage inequality within European labour markets" (Eurofound, 2022, p.20).

In fact, the pandemic has had, for some individuals, the effect of detaching them from a permanent place of work. For others, the pandemic has even detached them from the country where the employer and/or its premises are located (ETUI, 2022). Extending the labour pool to workers from other countries could be an immediate solution for the skills and labour shortages but might have two important consequences: 1) the fragmentation of the internal labour market within the organisation (bringing inequalities and the subjection to different jurisdictions and laws, with the creation of obvious obstacles to collective bargaining); and 2) the risk of undermining employment standards and creating unfair competition, particularly in the case of labour pool expansion to non-EU countries. This reality has a great impact on migratory movements, especially in the case of economic migrants.

Thus, besides the need to regulate FWA (Eurofound, 2022) at a company-level (collective bargaining), at a sectoral-level (collective agreements) and at a national-level[20] (legislative initiatives like the telework regime itself, the right to request teleworking, the right to disconnect, the compensation for cost and equipment, the vigilance in occupational risks exposure, working time regulation), the risk created by the labour pool expansion stemming from the remote work potential can be dealt with employment regulation, for instance, the "application of EU employment standards to situations sufficiently closely connected with the EU" (ETUI, 2022, p.6).

The potential for remote work is predominantly concentrated among highly skilled and educated workers within specific industries, occupations, and regions. This concentration significantly influences urban economies, transportation systems, consumer spending, and more (MGI, 2020).

[20] Examples of national policies are presented in specific chapters in this document (please see Chapters 8 and 9).

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In one hand, many of low teleworkable jobs are at the same time low waged and more at risk from broad trends such as automation and digitization. In that sense, remote work thus risks accentuating inequalities at a social level. An increase in teleworking may intensified the wage and employment gap between high-skilled and low-skilled workers and workers with different educational levels widen other less visible inequalities on working: the possibilities for autonomy and flexibility of work – resources more frequently offered to teleworkers (Eurofound, 2022).

On the other hand, telework can also be framed like an "urban phenomenon", since its role in reducing commuting and therefore carbon emissions and thus have a positive contribution to the green transition (Eurofound, 2022). Also, the remote potential to work through ICT, is an opportunity to have new profiles of living and urban transitions that need to be supported. For instance, it is an opportunity for more qualified people live and new jobs to be developed in new geographic areas (inside each country and between countries), bringing new consumption patterns and development pathways to typically more depopulated or disadvantaged regions. This requires an adequate response (housing, transportation, and public services) in terms of urban planning, social cohesion and cross-country public policies.

References

1. Adkins, C. L., & Premeaux, S. A. (2014). The use of communication technology to manage work-home boundaries. *Journal of Behavioral & Applied Management, 15*(2), 82–100.
2. Allen, T. D., Golden, T. D., & Shockley, K. M. (2015). How effective is telecommuting? Assessing the status of our scientific findings. *Psychological science in the public interest*, *16*(2), 40-68.
3. Azar, S., Khan, A., & Van Eerde, W. (2018). Modelling linkages between flexible work arrangements' use and organizational outcomes. *Journal of Business Research, 91*, 134-143
4. Bailey, D. E., & Kurland, N. B. (2002). A review of telework research: Findings, new directions, and lessons for the study of modern work. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, *23*(4), 383-400.
5. Bartel, C. A., Wrzesniewski, A., & Wiesenfeld, B. M. (2012). Knowing where you stand: Physical isolation, perceived respect, and organizational identification among virtual employees. *Organization Science*, (3), *743-757*.
6. Bentley, T. A., Teo, S. T., McLeod, L., Tan, F., Bosua, R., & Gloet, M. (2016). The role of organisational support in teleworker wellbeing: A socio-technical systems approach. *Applied Ergonomics*, *52*, 207-215.
7. Charalampous, M., Grant, C. A., Tramontano, C., & Michailidis, E. (2019). Systematically reviewing remote e-workers' well-being at work: A multidimensional approach. *European Journal of Work and Organizational Psychology, 28*(1), 51-73. Cavanaugh, M. A., Boswell, W. R., Roehling, M. V., & Boudreau, J. W. (2000). An empirical examination of self-reported work stress among US managers. *Journal of Applied Psychology*, *85*(1), 65.

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8. Eddleston, K. A., & Mulki, J. (2017). Toward understanding remote workers' management of work-family boundaries: The complexity of workplace embeddedness. *Group & Organization Management, 42*, 346–387.
9. Edwards, B. D., Franco-Watkins, A. M., Cullen, K. L., Howell, J. W., & Acuf, R. E., Jr. (2014). Unifying the challenge-hindrance and sociocognitive models of stress. *International Journal of Stress Management, 21*, 162–185.
10. ETUI – European Trade Union Institute (2022). Remote working and European private international law. Brussels: ETUI Policy Brief
11. Eurofound (2022). The rise in telework: Impact on working conditions and regulations. Dublin: Publications Office of the European Union.
12. Felstead, A., & Henseke, G. (2017). Assessing the growth of remote working and its consequences for efort, well-being and work-life balance. *New Technology Work & Employment,* 32, 195–212.
13. Franken, E., Bentley, T., Shafaei, A., Farr-Wharton, B., Onnis, L. A., & Omari, M. (2021). Forced flexibility and remote working: Opportunities and challenges in the new normal. *Journal of Management & Organization, 27*(6), 1131-1149.
14. Gajendran, R. S., & Harrison, D. A. (2007). The good, the bad, and the unknown about telecommuting: meta-analysis of psychological mediators and individual consequences. *Journal of Applied Psychology*, *92*(6), 1524.
15. Gibson, C. B., Gibbs, J. L., Stanko, T. L., Tesluk, P., & Cohen, S. G. (2011). Including the "I" in virtuality and modern job design: Extending the job characteristics model to include the moderating effect of individual experiences of electronic dependence and copresence. *Organization Science*, *22*(6), 1481-1499.
16. Golden, T. (2012). Altering the efects of work and family confict on exhaustion: Telework during traditional and non-traditional work hours. Journal of Business and Psychology, *27*, 255–269.
17. Golden, T. D., & Fromen, A. (2011). Does it matter where your manager works? Comparing managerial work mode (traditional, telework, virtual) across subordinate work experiences and outcomes. *Human Relations*, *64*(11), 1451-1475.
18. Golden, T. D., & Gajendran, R. S. (2019). Unpacking the role of a telecommuter's job in their performance: Examining job complexity, problem solving, interdependence, and social support. Journal of Business & Psychology, 34, 55–69.
19. Golden, T. D., & Raghuram, S. (2010). Teleworker knowledge sharing and the role of altered relational and technological interactions. *Journal of Organizational Behavior*, *31*(8), 1061-1085.
20. Golden, T. D., & Veiga, J. F. (2005). The impact of extent of telecommuting on job satisfaction: Resolving inconsistent findings. *Journal of management*, *31*(2), 301-318.
21. Hesselbarth, Y., Alfes, K., & Festing, M. (2024). Understanding technology-driven work arrangements from a complexity perspective: a systematic literature review and an agenda for future research. The International Journal of Human Resource Management, 35(5), 964-1006.
22. ILO (2020). *Defining and measuring remote work, telework, work at home and home-based work*. Geneve: International Labour Organization
23. Johnson, A., Dey, S., Nguyen, H., Groth, M., Joyce, S., Tan, L., ... & Harvey, S. B. (2020). A review and agenda for examining how technology-driven changes at work will impact workplace mental health and employee well-being. *Australian Journal of Management, 45*(3), 402-424.
24. Kelliher, C., & Anderson, D. (2008). For better or for worse? An analysis of how flexible working practices influence employees' perceptions of job quality. *The International Journal of Human Resource Management, 19*(3), 419-431.

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25. Kirk, J., & Belovics, R. (2006). Making e-working work. *Journal of Employment Counseling*, *43*(1), 39-46.
26. Kraus, S., Ferraris, A., & Bertello, A. (2023). The future of work: How innovation and digitalization re-shape the workplace. Journal of Innovation & Knowledge, 8(4), 100438.
27. Lapierre, L. M., Van Steenbergen, E. F., Peeters, M. C. W., & Kluwer, E. S. (2016). Juggling work and family responsibilities when involuntarily working more from home: A multiwave study of fnancial sales professionals. *Journal of Organizational Behavior, 37*, 804–822.
28. LePine, M. A., Zhang, Y., Crawford, E. R., & Rich, B. L. (2016). Turning their pain to gain: Charismatic leader infuence on follower stress appraisal and job performance. *Academy of Management Journal, 59*, 1036–1059.
29. Lunde, L. K., Fløvik, L., Christensen, J. O., Johannessen, H. A., Finne, L. B., Jørgensen, I. L., ... & Vleeshouwers, J. (2022). The relationship between telework from home and employee health: a systematic review. *BMC Public Health*, *22*(1), 47.
30. Marshall, G. W., Michaels, C. E., & Mulki, J. P. (2007). Workplace isolation: Exploring the construct and its measurement. *Psychology & Marketing*, *24*(3), 195-223.
31. McKinsey (2025). Returning to the office? Focus more on practices and less on the policy. McKinsey Quarterly.
32. MGI (2020). What's next for remote work: An analysis of 2,000 tasks, 800 jobs, and nine countries. McKinsey Global Institute
33. Nilles, J. (1975). Telecommunications and organizational decentralization. *IEEE Transactions on communications*, *23*(10), 1142-1147.
34. Oakman, J., Kinsman, N., Stuckey, R., Graham, M., & Weale, V. (2020). A rapid review of mental and physical health effects of working at home: how do we optimise health? *BMC Public Health*, *20*, 1-13.
35. OECD (2022). *OECD Employment Outlook 2022: Building Back More Inclusive Labour Markets*. Paris: OECD Publishing.
36. O'Leary, M. B., & Mortensen, M. (2010). Go (con) figure: Subgroups, imbalance, and isolates in geographically dispersed teams. *Organization Science*, *21*(1), 115-131.
37. Polzer, J. T., Crisp, C. B., Jarvenpaa, S. L., & Kim, J. W. (2006). Extending the faultline model to geographically dispersed teams: How colocated subgroups can impair group functioning. *Academy of management Journal*, *49*(4), 679-692.
38. Radulović, A. H., Žaja, R., Milošević, M., Radulović, B., Luketić, I., & Božić, T. (2021). Work from home and musculoskeletal pain in telecommunications workers during COVID-19 pandemic: A pilot study. *Archives of Industrial Hygiene & Toxicology*, *72*, 232–239.
39. Schwarzmüller, T., Brosi, P., Duman, D., & Welpe, I. M. (2018). How does the digital transformation affect organizations? Key themes of change in work design and leadership. *Management Revue, 29*(2), 114-138.
40. Shifrin, N. V., & Michel, J. S. (2022). Flexible work arrangements and employee health: A meta-analytic review. *Work & Stress, 36*(1), 60-85.
41. Spreitzer, G. M., Cameron, L., & Garrett, L. (2017). Alternative work arrangements: Two images of the new world of work. Annual Review of Organizational Psychology and Organizational Behavior, *4*(1), 473-499.
42. Troup, C., & Rose, J. (2012). Working from home: Do formal or informal telework arrangements provide better work–family outcomes? *Community, Work & Family*, 15, 471–486. ht
43. Wang, B., Liu, Y., Qian, J., & Parker, S. K. (2021). Achieving effective remote working during the COVID-19 pandemic: A work design perspective. *Applied Psychology*, *70*(1), 16-59.

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CHAPTER 6

Study of the evolution of working conditions and employee wellbeing

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Abstract:

The evolution of working conditions and workforce wellbeing is increasingly prioritised in modern workplaces. This paper examines three key areas: the evolution of working conditions and employee wellbeing, stress management and mental health, and the changing dynamics of workplace well-being. Through an analysis of recent global reports and surveys, this research highlights the urgent need for holistic approaches to workforce management that address not only physical safety but also mental and emotional wellbeing. The COVID-19 pandemic further accelerated changes in workplace dynamics, with remote work raising new challenges. This paper synthesises existing research on the critical role of leadership, organisational culture, and proactive mental health strategies in fostering sustainable and supportive work environments.

Keywords: Wellbeing, Engagement, Mentality, Stress, Remote, Leadership, Balance, Management

Introduction

In the 21st century, the nature of work has transformed significantly, reflecting shifts in technology, organisational culture, and societal expectations. Today's work environments are no longer solely concerned with maximising efficiency but are increasingly focusing on the holistic wellbeing of employees. These changes reflect a growing understanding that employee wellbeing is not merely an ethical imperative, but a key driver of organisational performance, creativity, and resilience.

This paper explores three critical areas that are central to the discourse on workplace wellbeing: the evolution of working conditions, the impact of stress management and mental health practices, and the changing dynamics of modern workplaces. The study draws upon global reports and research, including the State of the Global Workplace: 2024 Report by Gallup (2024), which highlights emerging challenges and opportunities for improving employee engagement and mental health on a global scale.

Additionally, the COVID-19 pandemic catalysed a global shift in how workplaces operate, with many organisations adopting hybrid or fully remote work models. This transition has brought forth both opportunities for greater flexibility and significant challenges related to employee wellbeing, particularly regarding isolation and work-life balance. By synthesising insights from

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several authoritative reports, this paper aims to provide a comprehensive understanding of the evolving landscape of workplace wellbeing and its implications for employees and organisations alike.

The Evolution of Working Conditions and Employee Wellbeing

Historically, working conditions have focused primarily on physical safety measures and labour rights, with efforts concentrated on reducing workplace injuries and ensuring compliance with labour laws. However, in the last few decades.

Historically, workplace regulations have focused on physical safety, as demonstrated by the Swedish Work Environment Act (SFS 1977, p. 1160), which mandates employers to take responsibility for a safe working environment. Over time, this has expanded to include mental and emotional health as crucial components of employee wellbeing (Government Offices of Sweden, 1977, amended in 2020).

In recent years, national strategies such as the Government's Work Environment Strategy 2021–2025 have highlighted the importance of psychosocial wellbeing. This strategy outlines proactive measures for handling modern workplace risks, such as stress and burnout, and emphasises the significance of a safe, inclusive work environment for diverse worker groups (Löfven et al., 2021).

We can clearly see a paradigm shift toward a more comprehensive view of wellbeing that incorporates mental, emotional, and social health. This evolution in workplace thinking is shaped by the recognition that employee wellbeing plays a critical role in overall productivity, job satisfaction, and organisational performance.

The Third European Survey of Enterprises on New and Emerging Risks (Howard et al., 2022) illustrates the significant progress made by European organisations in addressing emerging workplace risks. The report highlights the increasing importance placed on psychosocial factors such as stress, bullying, and mental health (EU-OSHA, 2019). These risks, though not as tangible as physical hazards, have profound effects on employee health and wellbeing.

Berglund et al. (2014) state that workplace bullying in Swedish higher education, while relatively infrequent, significantly contributes to stress and burnout, especially among women and teaching/research staff. Although social support from colleagues and supervisors can buffer these effects, its impact diminishes with higher levels of bullying. Challenges include the study's cross-sectional limits, potential recall bias, and non-response bias, alongside the ambiguous

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effects of COVID-19 on workplace dynamics. These findings highlight the need for effective anti-bullying policies and targeted mental health support to address burnout risks in academic environments.

The State of the Global Workplace: 2024 Report by Gallup provides a broad overview of the current state of workplace engagement across the globe. According to Gallup's research, disengagement among employees remains a significant issue, with an estimated $8.9 trillion in lost productivity annually due to low levels of employee engagement (Gallup, 2024). The report emphasizes the need for organizations to adopt proactive strategies to address employee dissatisfaction, including fostering inclusive, engaging, and supportive work environments.

The findings from the Eurobarometer Report on Occupational Safety and Health in Post-Pandemic Workplaces also support the need for organizational evolution. The pandemic exposed vulnerabilities in existing workplace structures, particularly concerning mental health. As remote work became the norm for millions of employees worldwide, organizations were forced to quickly adapt, implementing new policies to protect both physical and mental wellbeing (EU-OSHA, 2021).

This evolution is not just reactive but anticipatory. The Organization of Work and Its Significance for Health and Wellbeing report emphasizes the critical role of work organization in shaping employee wellbeing. Factors such as job autonomy, work-life balance, social support, and the provision of meaningful tasks can greatly influence health outcomes (Swedish Agency for Work Environment Expertise, 2020). Flexible work conditions, for example, have been shown to reduce burnout and increase employee satisfaction, highlighting the importance of a supportive and adaptive organizational culture.

Finally, the Healthy Workplaces for Women and Men of All Ages report provides valuable insights into the specific needs of diverse groups within the workforce. This report stresses the importance of gender-sensitive policies and inclusive practices that accommodate workers across different life stages (Aronsson et al., 2017). The growing focus on diversity, equity, and inclusion (DEI) initiatives underscores the broader commitment to fostering a workplace where all employees can thrive.

Stress Management and Mental Health in the Workplace

Stress management and mental health have become central concerns for organizations aiming to create sustainable and healthy work environments. Chronic stress, driven by high demands,

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inadequate support, and poor work-life balance, is a leading cause of employee disengagement and burnout. The State of the Global Workplace: 2024 Report reveals alarming statistics, with 41% of global workers reporting high levels of daily stress (Gallup, 2024). These findings reflect the need for comprehensive mental health strategies that address both the causes and effects of workplace stress.

Effective stress management requires a multifaceted approach. The Report on Good Workplace Practices to Support Individuals Experiencing Mental Health Problems identifies several key strategies, including open communication, mental health training for managers, and the implementation of mental health resources such as counselling and stress reduction programs (EU-OSHA, 2021). These strategies are not only preventive but also restorative, helping employees recover from periods of heightened stress.

The Psychosocial Work Environment: Health and Wellbeing report underscores the connection between stress and adverse health outcomes, ranging from mental health disorders like anxiety and depression to physical conditions such as cardiovascular disease and musculoskeletal disorders (Swedish Agency for Work Environment Expertise, 2020). This research highlights the importance of addressing job demands, control over work tasks, and social support systems within the workplace as critical factors in mitigating stress.

Furthermore, the role of management is critical in shaping a supportive work environment. Research indicates that employees who have engaged, empathetic managers are significantly less likely to experience stress and burnout. The State of the Global Workplace: 2024 Report suggests that 70% of the variance in team engagement can be attributed to the quality of leadership (Gallup, 2024). This points to the necessity of developing leadership training programs that focus on mental health awareness and effective stress management techniques.

Changing Workplace Dynamics and Workforce Wellbeing

The COVID-19 pandemic accelerated changes in workplace dynamics, leading to a widespread adoption of remote and hybrid work models. While these changes offer flexibility, they also introduce new challenges for maintaining employee wellbeing. Remote work, in particular, can lead to feelings of isolation, decreased social interaction, and blurred boundaries between work and personal life. The Psychosocial Risks to Workers' Well-Being: Lessons from the COVID-19 Pandemic report highlights how these new dynamics have exacerbated existing mental health challenges, particularly for workers who lack sufficient social support (Eurofound, 2023).

Remote work has become a double-edged sword. On the one hand, it allows for greater autonomy and flexibility, reducing commuting times and allowing employees to better balance

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work with personal responsibilities. On the other hand, it can exacerbate stress due to the lack of separation between home and work, increased isolation, and the pressure to be constantly "on-call". The Remote Work: A Review of International Research on Work Environment and Health provides insights into how these dynamics have affected employee productivity, mental health, and work-life balance, with a particular emphasis on gender disparities (Swedish Agency for Work Environment Expertise, 2022). Women, in particular, face increased challenges as they often bear a greater share of household and caregiving responsibilities, leading to heightened stress levels during remote work.

In addition, the Strategic Research Agenda for Mental Health calls for a comprehensive approach to mental health in the workplace, particularly in the context of these changing dynamics. The agenda stresses the importance of early intervention, continuous support, and mental health promotion as key components of a successful mental health strategy (Björck et al., 2023). As workplace dynamics evolve, organizations must remain agile and adaptable, implementing policies that not only address current challenges but also anticipate future needs.

Evaluation of the Relevance and Quality of the Information

The sources used in this report are diverse and authoritative, representing a wide range of perspectives on workplace wellbeing. Reports from organisations such as Gallup (2024), EU-OSHA (in Howard et al., 2022), and the Swedish Agency for Work Environment Expertise (Parding et al., 2020) provide a robust foundation for understanding the current challenges and opportunities facing modern workplaces. These sources are based on extensive data collection and analysis, ensuring that the findings are both reliable and applicable across various industries.

The State of the Global Workplace: 2024 Report (Gallup, 2024) is particularly valuable due to its global scope and the breadth of its findings. It offers a comprehensive analysis of employee engagement and mental health, making it an essential resource for understanding global trends in workforce wellbeing. Similarly, the systematic reviews provided by the Swedish Agency for Work Environment Expertise (Lytsy & Friberg, 2020) offer in-depth insights into the psychosocial aspects of work, which are often underappreciated in traditional workplace health assessments.

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Key Patterns and Ideas Emerging from the Data

Several key themes and patterns emerge from the analysis of the data:

Holistic Approaches to Wellbeing: There is a growing consensus that employee wellbeing encompasses more than just physical health. Organisations must adopt a holistic approach that addresses mental, emotional, and social wellbeing to create truly supportive work environments.

Leadership as a Critical Factor: Effective leadership is paramount in shaping positive work environments. Managers who are empathetic and supportive can significantly reduce stress and burnout, fostering greater engagement and job satisfaction.

The Complexities of Remote Work: While remote work offers flexibility, it also presents new challenges related to social isolation, work-life balance, and stress. Organisations must develop strategies to mitigate these risks, particularly for vulnerable groups such as women and caregivers.

Proactive Mental Health Strategies: Preventing workplace stress and burnout is more effective than addressing these issues after they arise. Organisations must be proactive in offering mental health resources and fostering a culture that promotes openness and support.

Conclusions

The evolution of workspaces toward human-centric designs highlights the importance of prioritising employee wellbeing, mental health, and adaptive workplace dynamics. As the workplace continues to evolve, particularly in the wake of the COVID-19 pandemic, companies must invest in strategies that foster flexibility, promote mental health, and engage leadership in creating supportive work environments. Organizations that prioritize these factors will not only experience improved employee satisfaction and productivity but also position themselves as leaders in the future of work.

The modern workplace is rapidly evolving to meet the changing demands of employees, organizations, and society. The shift toward more human-centric workspaces is a response to increasing awareness of the importance of employee wellbeing, mental health, and the dynamic nature of workplace conditions. The integration of flexible working arrangements, mental health resources, and leadership that prioritizes wellbeing has become essential in creating environments where employees can thrive.

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Leadership, in particular, plays a pivotal role in shaping workplace culture and fostering wellbeing. As seen in the reports by Gagnon et al. (2017) and Gallup (2024), organizations that focus on supportive leadership and proactive mental health initiatives have seen significant improvements in employee engagement and organizational performance. Similarly, the pandemic has accelerated the shift toward hybrid work models, emphasizing the need for adaptability, mental health support, and work-life balance, as highlighted by the OSH Pulse Eurobarometer (2021) and other studies.

To remain competitive and create sustainable work environments, organisations must prioritise the wellbeing of their workforce. The evidence presented throughout this report demonstrates that investing in wellbeing programs, mental health resources, and adaptive leadership is not only beneficial for employees but also contributes to the long-term success of organisations. By envisioning and creating workspaces with heart, businesses can build resilient, engaged, and high-performing teams prepared to meet the challenges of the future.

References

1. Aronsson, G., Nilsson, K., Johansson, B., Albin, M., Torgén, M., Nylén, P., Persson Waye, K., Vingård, E., Swedish Work Environment Authority, Elanders Sverige AB, & Mikael Gustavsen and Mia Åkermark. (2017). *Knowledge compilation 2016:8 Healthy workplaces for women and men of all ages* [Report]. Swedish Work Environment Authority. Retrieved from https://www.av.se/globalassets/filer/publikationer/kunskapssammanstallningar/healthy-workplaces-for-women-men-ages_eng_knowledge_compilation_2016_8.pdf
2. Berglund, D., Toropova, A., & Björklund, C. (2024). Workplace bullying, stress, burnout, and the role of perceived social support: findings from a Swedish national prevalence study in higher education. *European Journal of Higher Education*, *1*–21. Retrieved from https://doi.org/10.1080/21568235.2023.2301588
3. Björck, J., Kolouh, L., & Forte. (n.d.). *Strategic Research Agenda. For the national research programme on mental health. Executive summary*. Retrieved from https://forte.se/en/wp-content/uploads/sites/2/2023/10/fort-0089-strategisk-agenda-psykisk-ha-lsa-2023-kortversion-eng_ta-1.pdf
4. European Agency for Safety and Health at Work (EU-OSHA). (2021). *A review of good workplace practices to support individuals experiencing mental health problems*. Retrieved from https://osha.europa.eu/sites/default/files/documents/Good-workplace-practice-support-individuals-experiencing-mental-health-problems_EN.pdf
5. European Agency for Safety and Health at Work (EU-OSHA). (2021). *Eurobarometer report on occupational safety and health in post-pandemic workplaces*. Retrieved from https://osha.europa.eu/sites/default/files/Eurobarometer-OSH-in-post-pandemic-workplaces_en.pdf
6. Gagnon, C., John, E., & Theunissen, R. (2017, September 7). *Organizational health: A fast track to performance improvement*. McKinsey & Company. Retrieved from

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https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/organizational-health-a-fast-track-to-performance-improvement#/

7. Gallup. (2024). *State of the Global Workplace: 2024 Report.* Retrieved from https://www.gallup.com/workplace/349484/state-of-the-global-workplace.aspx
8. Government Offices of Sweden. (1977, amended 2020). *The Swedish Work Environment Act (SFS 1977:1160).* Retrieved from https://www.government.se/contentassets/86e9091526644e90b78d2ff937318530/sfs-19771160-work-environment-act/
9. Howard, A., Antczak, R., Albertsen, K., European Agency for Safety and Health at Work, Oxford Research, & Team Arbejdsliv. (2022). Third European Survey of Enterprises on New and Emerging Risks (ESENER 2019): Overview Report. In X. Irastorza & I. Anyfantis (Eds.), *European Agency for Safety and Health at Work* [Report]. Publications Office of the European Union. https://doi.org/10.2802/413156. Retrieved from https://osha.europa.eu/sites/default/files/esener-2019-overview-report.pdf
10. Lytsy, P., & Friberg, E. (2020). Psychosocial Work Environment: Health and Well-being - two systematic reviews. In Swedish Agency for Work Environment Expertise, *Swedish Agency for Work Environment Expertise*. Retrieved from https://media.sawee.se/2020/06/REPORT_psychosocial_work_environment_health_and_well-being.pdf
11. Löfven, S., Nordmark, E., & Arbetsmarknadsdepartementet. (2021). *A good work environment for the future – the Government's work environment strategy 2021–2025.* Retrieved from https://www.government.se/contentassets/7a8a3957c3364717971a18ac3ed1d94d/a-good-work-environment-for-the-future--the-governments-work-environment-strategy-20212025.pdf
12. Parding, K., Sjögren, F., Petersson, C., & Pekkari, N. (2020). The Organization of Work and Its Significance for Health and Wellbeing. In Swedish Agency for Work Environment Expertise, *REPORT 2020:7* [Report]. Swedish Agency for Work Environment Expertise. Retrieved from https://media.sawee.se/2020/06/The-Organization-of-Work-and-Its-Significance-for-Health-and-Wellbeing.pdf

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CHAPTER 7

Gender equality and the changing workplace dynamics and workforce wellbeing

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Abstract:

This paper analyses gender equality vis-a-vis the changing workplace dynamics and workforce wellbeing. In recent years, the participation of women in employment increased across the European Union. Yet, the gender employment and pay gaps persist and women are more likely to experience difficulties in combining paid work with their care responsibilities. In the post-pandemic world of work, flexible working arrangements increased in most EU Member States and further strengthened through the adoption of the EU Work-Life Balance Directive in 2019.

The COVID-19 pandemic led to a drastic increase in remote-working. Teleworking employees experienced different outcomes on their wellbeing and mental health during the pandemic. Balancing telework with private life was mostly found to be more difficult for women than men since women were more likely to take on caring and household responsibilities as well as home-schooling. Hence, more hybrid forms of telework can increase flexibility with positive impacts on performance and productivity.

Platform work is also expanding across Europe. Similarly to the traditional labour market, gender segregation and the gender pay gap are also evident in the platform economy. Despite its flexibility and autonomy, many jobs in the platform economy do not fall within the scope of social and employment protection systems, with workers facing higher risks of economic instability, discrimination, exclusion from collective representation, lack of upskilling and lack of occupational health and safety measures, than standard employees.

Keywords: gender equality, participation, work-life balance, remote work, platform work.

Introduction

In the EU, women and men tend to participate in different forms of employment, with women more likely to be employed in non-standard and often precarious work, than men (EiGE, 2023). This report examines how workplace dynamics are changing and the importance of wellbeing in this context, from a gendered perspective as part of the project TRANSFORM – *The Future of Human Workforce: Embracing Change, Challenges, and Opportunities*.

This article gives an overview of the situation in the EU with specific highlights on the countries that are partners in this project: Belgium, Slovenia, Portugal, Greece, Italy, Sweden, Germany, Poland and Malta. It addresses the gender dimension in relation to participation in employment;

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the reconciliation of work and family life; telework and remote working; as well as platform work.

Participation in employment

Gender equality and inclusion in the labour market are fostered through European policies. The Gender Equality Strategy 2020-2025 highlights the importance of closing gender gaps in the labour market so that women and men can thrive in a gender-equal economy (European Commission, 2020). One of the goals of the European Pillar of Social Rights is to increase the overall employment in the EU to 78% by 2030 and at least halve the gender employment gap compared to 2019 (European Union, 2021).

In light of this, many EU Member States developed initiatives and measures to empower more women to enter the labour market as employees or entrepreneurs (European Commission, 2024), thus impacting the demographics and the consequent workplace dynamics. Indeed, throughout the years, the participation of women in the labour market has increased considerably, reaching an average of 70.2% in 2023, ranging from 80.2% in Sweden, 77.2% in Germany, 75.4% in Portugal, 74.3% in Slovenia, 73.6% in Malta, 72.0% in Poland, 68.3% in Belgium, 57.6% in Greece and 56.5% in Italy (Eurostat, 2024a). As a result, the gender employment gap decreased to 10.2% in 2023, described as 'a new record low' by Eurostat (2024b), with Sweden, Portugal, Slovenia, Belgium, Germany registering a gap that is below the EU average, while Poland, Malta, Italy and Greece have higher gaps (Eurostat, 2024c).

Men still register higher employment rates in all of the EU Member States with an average of 80.4% (Eurostat, 2024a). In 2021 the full-time equivalent employment rates were higher for men than women irrespective of the age groups, family types, level of education, country of birth, and with/without a disability (EIGE, 2023). Men are also less likely to work on a part-time basis (7.7%) compared to women (27.9%) (Eurostat, 2024d).

Yet, the increasing participation of women in employment is characterised by gender segregation since women tend to be over-represented in 'female-dominated' jobs. Women are more likely to be represented in sectors such as education, healthcare and the social sectors. On the other hand, men tend to be more prevalent in higher-paying sectors such as technology, engineering and finance (EIGE, 2024a), or else in occupations such as drivers or mobile plant operators, trades workers and workers in mining/construction/manufacturing/transport (World Bank, 2023).

Moreover, women are also under-represented in top positions in employment, despite being better educated and active in the labour market. In 2024, 34.7% of the members of boards of

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largest listed companies in the EU27 were women. Countries such as Italy (44.6%) reached the gender balance zone exceeding 40%, while Germany (39.5%), Sweden (37.7%), Belgium (37.6%) and Portugal (34.7%) are catching up. In other countries, including Greece (27.2%), Slovenia (25.6%), Poland (23.8%), and Malta (17.1%), women account for less than a third in such boards (EIGE, 2024b).

Thus gender segregation weakens the economy, reduces competitiveness and can lead to difficulties for companies to find professionals in developing sectors. In addition, the under-representation of women in decision-making positions also restricts innovation and growth (World Bank, 2023).

Moreover, gender segregation limits choices for women and men, causes gender gaps in job quality and opportunities for career advancement, as well as in pay. Indeed, horizontal and vertical gender segregation leads to the gender pay gap, alongside other factors including pay discrimination and the unequal share of paid and unpaid work between women and men (which will be explained in further detail in the next section). Indeed, in 2023, women in the EU earned on average 12% less than men; with significant variations across countries: 17.6% in Germany; 13.6% in Greece; 11.2% in Sweden; 8.6% in Portugal; 7.8% in Poland; 5.4% in Slovenia; 5.1% in Malta; 2.2% in Italy; and 0.7% in Belgium (Eurostat, 2025a).

The gender pay gap tends to be higher in the private sector than in the public sector in almost all EU countries. It also varies across economic sectors, whereby women working in financial and insurance activities may be impacted by higher gender pay gaps. Furthermore, the gender pay gap is lowest for younger employees entering the labour market and increases with age. This may be a result of changing employment patterns and career interruptions due to caring responsibilities (Eurostat, 2025b), as explained in the following section.

Reconciling Work and Family Life

The unequal distribution of care responsibilities between women and men is one of the main reasons for gendered differences in employment (European Commission, 2024). Employed women who are involved in long term care and childcare (17.4%) are more likely to experience difficulties on a daily basis in combining paid work with their care responsibilities in the majority of the EU Member States (men: 13.8%), including Belgium, Germany, Greece, Italy, Malta, Poland and Portugal (EIGE, 2023a). In fact, employed women with care responsibilities are more likely than men in most EU Member States (including Belgium, Germany, Greece, Italy, Malta, Poland and Sweden) to reduce their working hours as a consequence of care

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responsibilities, while their male counterparts are more likely to increase their working hours in all EU Member States, except Belgium and Portugal (EIGE, 2023b).

In the post-pandemic world of work, flexible working arrangements increased in most EU Member States even though in several countries such as Sweden flexitime arrangements were already in place prior to the pandemic (Eurofound, 2024). Moreover, flexibility in the allocation of tasks at the workplace is also required due to digitalisation as well as fragmented, project-based, and on-demand work.

Following the pandemic, national debates on flexible working time policies ensued to address the demand for the work-life balance, autonomy and wellbeing of workers. In countries such as Germany, Greece, Malta, Portugal and Belgium an increase in flexibility at the place of work has been registered when compared to flexible working hours, but in countries such as Italy and Poland there is little debate on flexible working time, and typical working hours prevail (Eurofound, 2024).

Work-life balance was strengthened through the adoption of the EU Work-Life Balance Directive in 2019 that strengthened the reconciliation of work and family life for parents and carers. In order to transpose this Directive, various measures were implemented across the EU. Some Member States extended parental leave to at least four months of which at least two months cannot be transferred to the other parent (Malta, Poland, Portugal, Slovenia, Sweden); merged maternity and paternity leave (Portugal); introduced new paternity leave of at least 10 working days (Malta) or extended existing paternity leave to 2 weeks or more (Belgium, Italy, Portugal, Slovenia) (European Commission, 2024).

Work-life balance is also one of the principles of the European Pillar of Social Rights (European Commission, 2017) that calls for equal access for women and men to special leaves to enable them to fulfil their caring responsibilities.

These developments also enhance the health and wellbeing of workers (Eurofound, 2020), since working conditions that are not family-friendly such as long or unpredictable working hours can have a negative impact on the physical and mental health of workers (ILO, 2023).

However, when flexibility measures such as working from home, flexible hours, leave and career interruption policies are not correctly designed and used equally by women and men, women, who tend to be the primary users of such measures, can be impacted negatively through reduced earnings and precariousness often associated with these forms of work, leading to inequality in

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wages, career advancement (European Commission, 2024) and the feminisation of poverty particularly in old age.

Teleworking and Remote Working

The COVID-19 pandemic led to a drastic increase in remote-working. Teleworking empowers employers to modernise their work organisation enabling new forms of work and facilitating work-life balance for employees, supporting women and other groups to participate in the labour market (Eurofound, 2020). Indeed, 9.5% of employed women across Europe compared to 8.4% of employed men usually work from home, with higher prevalences for women and men in countries such as Belgium, Sweden, Malta and Germany (Eurostat, 2024e).

Teleworking employees working in different circumstances during the pandemic, experienced different outcomes on their wellbeing and mental health. On the one hand, telework led to reduced levels of stress and higher levels of satisfaction at work (Eurofound, 2022). On the other hand, telework practices during these times resulted in mental distress when telework was obligatory with negative consequences and difficulties faced by management to protect the wellbeing of workers. Particular groups of workers tended to experience worse outcomes, including teleworkers with (small) children, older workers, and others (Eurofound, 2022).

Indeed, during the pandemic, balancing telework with private life was mostly found to be more difficult for women than men since women were more likely to take on caring and household responsibilities as well as home-schooling. Women were also more likely to work long and irregular hours. On the other hand, Eurofound (2022) research shows that women were less likely than men to work overtime. Hence, rather than prolonging their paid working time, women needed to organise their time better and to reorganise their work schedule. This can probably be because women tended to carry out more unpaid work at home than men (Eurofound, 2022).

Telework can thus impact negatively work-life balance due to heavy workloads, the need to be available beyond working hours and frequent interruptions that lead to working longer hours, having fewer rest periods, and having less predictable schedules (Eurofound, 2020). Isolation, lack of communication and difficulties in management can also impact work relations when teleworking (Eurofound, 2022).

More hybrid forms of telework are strongly supported by employees as it reduces the risk of isolation and burnout. Moreover, hybrid forms of work can increase flexibility with positive

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impacts on performance and productivity. It fits the needs of employees to reconcile their work and private life, impacting their wellbeing (Eurofound, 2022).

Platform work

Platform work is one of the new forms of work that is expanding across Europe. In 2022, there were 28.3 million digital platform workers, who are estimated to increase to 43 million by 2025 (Council of the European Union, 2024). Estimates show that one in three workers on these platforms are women (ILO, 2024), and pilot data collection in 16 EU countries show that in 2022, 3.2% of all men and 2.8% of all women were engaged in digital platform work (Eurostat, 2024f).

Men tend to opt for platform work as it provides opportunities to work globally and to expand their clients abroad. Women are more likely to engage in this work due to flexibility to combine work with household and caring responsibilities or else to gain an additional income (EIGE & Eurofound, 2023). Moreover, James (2023) argues that remote "crowdwork"[21] is another facet of platform work, that is generally marketed for women with young families due to the flexibility and minimal barriers to entry in such work.

Gender segregation in the traditional labour market is also recurrent in platform work. Women mainly prevail in care work, domestic work and beauty work, and men in passenger transport and delivery sectors (ILO, 2024). The autonomy and flexibility afforded by this type of work depends on the services provided and the management practices of such platforms. Certain platform services with higher work autonomy, such as software development, are currently dominated by men, while other workers can experience low and limited work autonomy (EIGE, 2020) as well as lower job quality. Such jobs may require less investment by employers in employees and provide fewer opportunities to establish a relationship with their employer (Adebiyi, 2019).

The gender pay gap is also evident in the platform economy. Silbermann (2020) explains that this may be due to women settling for lower fees due to undervaluation, or because of their willingness to take jobs that pay less. Also women with caregiving responsibilities may not be available to work during higher-paid hours when demand is greater. In the ride-sharing sphere,

[21] Crowd employment is a new form of employment that 'uses an online platform to enable organisations or individuals to access an indefinite and unknown group of other organisations or individuals to solve specific problems or to provide specific services or products in exchange for payment'. (Eurofound, 2015)

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men tend to drive in areas and times that yield higher fees and to drive faster completing more rides per hour.

Many of the jobs in the platform economy do not fall within the scope of social and employment protection systems, with workers facing higher risks of economic instability, discrimination, exclusion from collective representation, lack of upskilling and lack of occupational health and safety measures, than standard employees (EIGE & Eurofound, 2023). Indeed, in 2022, more than half of digital platform workers were not covered in cases of unemployment (62.4%), sickness (56.3%) or work-related accidents (Eurostat, 2024f).

From a gendered perspective, women in platform work tend to have less access to all branches of social protection than men (ILO, ISSA & OECD, 2023). In addition, a considerable share of platform workers have limited or no access to maternity and paternity benefits, which may inhibit women's participation in such employment, restrict the equal sharing of unpaid care work, and curb access to old-age and disability benefits which particularly impact women who tend to live longer and to spend more years living with disabilities (EIGE, 2020).

The underrepresentation of platform workers in trade unions can also have a gendered dimension. For instance, individual negotiations can lead to lower pay; with more difficulties to resist exploitative practices by the platforms that limit workers' flexibility and autonomy making such work less attractive for persons with caring responsibilities, particularly women (EIGE, 2020).

Jobs in the sharing economy often provide scarce protection against discrimination compared to long-term full-time employment (Adebiyi, 2019). In addition, the fragmentation of work performed by different workers can lead to difficulties to apply EU's gender equality and non-discrimination legislation and to prove discrimination. Furthermore, sexual harassment and gender-based violence can also prevail in platform work, such as ride-sharing and home rental, impacting the victims' mental and physical health (EIGE, 2020).

Moreover, James (2023) argues that further research is required on the experiences of reconciliation of platform work and family life for crowd workers, in view that most of the feminist research on work-life balance predates platform work, limiting policy-development that can address the hardships of these workers.

Conclusions and Recommendations

The changing world of work and corresponding changing dynamics can provide various opportunities for women and men to enter and remain in employment as well as to advance in

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their careers. On the other hand, such dynamic environment can pose challenges and disadvantages which can have different impacts not only on the participation and working conditions of women and men, but also on their physical and mental wellbeing.

Effective and appropriate policies and laws are thus necessary to ensure that the wellbeing of workers is protected, fair working conditions are provided, and equality is safeguarded in changing forms of work, particularly in relation to the right to disconnect from work (European Parliament, 2024), and to regulate platform work (Council of the European Union, 2024a). In particular, an enhanced commitment is required to:

- Incentivise non-traditional choices in education, training, lifelong learning, upskilling, mentoring of women in areas that go beyond 'female-dominated' sectors to enhance their opportunities to enter and remain in areas such as STEM, ICT etc., and to advance in their careers into decision-making positions;
- Challenge traditional stereotypical notions related to unpaid care and promote equal sharing of care responsibilities between women and men;
- Strengthen flexible working arrangements at the workplace through appropriate policies, including family leaves;
- Ensure that flexible working arrangements and family-friendly measures are equally available to men and women in order to balance shared responsibilities of unpaid work within the family
- Review telework and remote working policies to ensure that the well-being of workers is effectively protected, alongside performance and productivity;
- Ensure that the Work-Life Balance Directive is effectively implemented and incentivise companies to go beyond the minimum requirements;
- Regulate and strengthen the right to disconnect from work (European Parliament, 2024) to spell out the distinction between professional and private life;
- Regulate platform work (Council of the European Union, 2024a) to ensure that platform workers fall within the scope of social and employment protection systems and can access maternity and other forms of family-friendly benefits;
- Ensure that European Directives (including the Women on Boards and Pay Transparency Directives) are effectively implemented at national level;

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- Address harassment and violence against women in new forms of work, particularly online and in platform work;
- Research the circumstances of women in new forms of work, including platform work, for timely and updated information required to address the resulting needs.

A gender perspective is thus to be mainstreamed in all measures, policy frameworks and proposed legislation to ensure that women and men can equally benefit from the opportunities of new forms of work and changing work dynamics and that the circumstances and needs of different groups of women and men are adequately addressed for the wellbeing of all.

References

1. Adebiyi, I. (2019). *Digitisation and women in the workforce: Exploring the impact of the gig economy on female 'participation' and 'status' in the labour market*. Granite Journal. Retrieved October 24, 2024 from https://www.abdn.ac.uk/pgrs/documents/Granite%20Digitisation%20and%20women%20in%20the%20workforce,%20Adebiyi,%20pp%2053-65.pdf
2. Council of the European Union. (2024). *Infographic – Spotlight on digital platform workers in the EU*. Retrieved September 30, 2024 from https://www.consilium.europa.eu/en/policies/platform-work-eu/
3. Council of the European Union. (2024a). *EU rules on platform work*. Retrieved September 30, 2024 from https://www.consilium.europa.eu/en/policies/platform-work-eu/
4. EIGE (2020). *Gender Equality Index 2020: Digitalisation and the future of work*. Retrieved September 30, 2024 from https://eige.europa.eu/publications-resources/toolkits-guides/gender-equality-index-2020-report/new-forms-work-and-flexible-working-practices-context-ict-sector-and-platform-work?language_content_entity=en
5. EIGE (2023). *Gender Equality Index 2023 - Towards a green transition in transport and energy*. Retrieved from https://eige.europa.eu/publications-resources/publications/gender-equality-index-2023-towards-green-transition-transport-and-energy.
6. EIGE. (2023a). *Gender Statistics Database - Frequency experiencing difficulties in combining paid work and care responsibilities*. Retrieved September 30, 2024 from from https://eige.europa.eu/gender-statistics/dgs/indicator/eige_gap_wlb__ggs_wlb_care/bar/year:2022/geo:EU27_2020,BE,BG,CZ,DK,DE,EE,IE,EL,ES,FR,HR,IT,CY,LV,LT,LU,HU,MT,NL,AT,PL,PT,RO,SI,SK,FI,SE/sex:M,W/care_number2:EVERY_DAY
7. EIGE. (2023b). *Gender Statistics Database - Consequences of care responsibilities on working life/career*. Retrieved September 30, 2024 from https://eige.europa.eu/gender-statistics/dgs/indicator/eige_gap_wlb__ggs_wlb_work/bar/year:2022/geo:EU27_2

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020,BE,BG,CZ,DK,DE,EE,IE,EL,ES,FR,HR,IT,CY,LV,LT,LU,HU,MT,NL,AT,PL,PT,RO,SI,SK,FI,SE/sex:M,W/implications:INC_WORK

8. EIGE. (2024a). *Gender Equality Index 2024 – Sustaining Momentum on a Fragile Path.* Retrieved from: https://eige.europa.eu/publications-resources/publications/gender-equality-index-2024-sustaining-momentum-fragile-path
9. EIGE. (2024b). *Gender Statistics Database – Largest Listed Companies: Presidents, Board Members and Employee Representatives.* Retrieved March 10, 2025 from https://eige.europa.eu/gender-statistics/dgs/indicator/wmidm_bus_bus__wmid_comp_compbm
10. EIGE & Eurofound. (2023). *Gender differences in motivation to engage in platform work.* Retrieved from https://www.eurofound.europa.eu/en/publications/2023/gender-differences-motivation-engage-platform-work
11. Eurofound. (2015). *New Forms of Employment.* Retrieved from https://www.eurofound.europa.eu/en/publications/2015/new-forms-employment
12. Eurofound. (2020). *Industrial relations Regulations to address work-life balance in digital flexible working arrangements.* Retrieved from https://www.eurofound.europa.eu/en/publications/2020/regulations-address-work-life-balance-digital-flexible-working-arrangements
13. Eurofound. (2022). *Working conditions - The rise in telework: Impact on working conditions and regulations.* Retrieved from https://www.eurofound.europa.eu/en/publications/2022/rise-telework-impact-working-conditions-and-regulations
14. Eurofound. (2024). *Working conditions and sustainable work - Flexible work increases post-pandemic, but not for everyone.* Retrieved September 30, 2024 from https://www.eurofound.europa.eu/en/resources/article/2024/flexible-work-increases-post-pandemic-not-everyone
15. European Commission. (2024). *2024 Report on Gender Equality in the EU.* https://commission.europa.eu/document/download/965ed6c9-3983-4299-8581-046bf0735702_en?filename=2024%20Report%20on%20Gender%20Equality%20in%20the%20EU_coming%20soon.pdf
16. European Commission. (2020, 152 final). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - A Union of Equality: Gender Equality Strategy 2020-2025.* Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0152
17. European Commission. (2017, 250 final). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Establishing a European Pillar of Social Rights.* Retrieved November 19, 2024 from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0250
18. European Parliament. (2024). *Parliament wants to ensure the right to disconnect from work.* Retrieved September 30, 2024 from https://www.europarl.europa.eu/topics/en/article/20210121STO96103/parliament-wants-to-ensure-the-right-to-disconnect-from-work

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

19. European Union. (2021). *The European Pillar of Social Rights Action Plan*. Retrieved from https://op.europa.eu/webpub/empl/european-pillar-of-social-rights/en/#chapter2

20. Eurostat (2024a). *Employment and activity by sex and age - annual data*. Retrieved September 30, 2024 from https://ec.europa.eu/eurostat/databrowser/view/lfsi_emp_a__custom_12977234/default/table?lang=en

21. Eurostat. (2024b). *Statistics Explained - SDG 5 Gender Equality*. Retrieved September 30, 2024. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=SDG_5_-_Gender_equality&oldid=531396#Gender_employment_gap

22. Eurostat. (2024c). *Gender employment gap, by type of employment*. Retrieved September 30, 2024 from https://ec.europa.eu/eurostat/databrowser/view/sdg_05_30/default/table?lang=en

23. Eurostat. (2024d). *Part-time employment and temporary contracts - annaul data*. Retrieved September 30, 2024 from https://ec.europa.eu/eurostat/databrowser/view/lfsi_pt_a__custom_12987415/default/table?lang=en

24. Eurostat. (2024e). *Employed persons working from home as a percentage of the total employment, by sex, age and professional status(%)*. Retrieved September 30, 2024 from from https://ec.europa.eu/eurostat/databrowser/view/LFSA_EHOMP/default/table?lang=en

25. Eurostat. (2024f). *Statistics Explained - Employment Statistics: Digital Platform Workers*. Retrieved September 30, 2024 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Employment_statistics_-_digital_platform_workers#Main_concept_and_data_collection

26. Eurostat. (2025a). *Gender Pay Gap in Unadjusted Form*. Retrieved March 10, 2025 from https://ec.europa.eu/eurostat/databrowser/view/sdg_05_20/default/table?lang=en

27. Eurostat. (2025b). *Statistics Explained - Gender Pay Gap Statistics*. Retrieved March 10, 2025 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Gender_pay_gap_statistics

28. ILO, ISSA, OECD. (2023, January). Technical paper. *Providing adequate and sustainable social protection for workers in the gig and platform economy*. Retrieved from https://www.ilo.org/media/366091/download

29. International Labour Organisation (ILO). (2023). *Achieving gender equality at work*. Retrieved from https://www.ilo.org/media/364041/download

30. International Labour Organisation (ILO). (2024). *Realizing decent work in the platform economy*. Retrieved from https://www.ilo.org/resource/conference-paper/ilc/113/realizing-decent-work-platform-economy

31. National Commission for the Promotion of Equality (NCPE) (2023) Annual Report 2023. https://ncpe.gov.mt/wp-content/uploads/2024/07/NCPE-Annual-Report-2023.pdf

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

32. James, A., (2023). *Platform work-lives in the gig economy*: Recentering work-family research. Gender, Work & Organisation. Retrieved October 24, 2024 from https://onlinelibrary.wiley.com/doi/full/10.1111/gwao.13087

33. Silbermann, J., (2020). *Gender-Based Pay Gaps in the Gig Economy*. Harvard Journal of Law & Gender. Retrieved October 24, 2024 from: https://journals.law.harvard.edu/jlg/2020/02/gender-based-pay-gaps-in-the-gig-economy/#:~:text=Yet%20another%20study%20from%202018,for%20gender%2Dbased%20pay%20gaps.

34. The World Bank. (2023). *Gender-Based Employment Segregation: Understanding Causes and Policies Interventions.* Retrieved March 10, 2025 from https://documents1.worldbank.org/curated/en/483621554129720460/pdf/Gender-Based-Employment-Segregation-Understanding-Causes-and-Policy-Interventions.pdf

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CHAPTER 8

Employment and vocational training policies in the context of digitalization and globalization

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Abstract:

This chapter explores the evolving landscape of workplace dynamics within the framework of employment and vocational training policies, particularly in the context of digitalization and globalization. With the increasing integration of technologies like artificial intelligence (AI), public and private sector collaborations are essential for creating new job opportunities and ensuring that both employers and employees possess relevant digital and soft skills. Reskilling and upskilling initiatives are highlighted as vital support mechanisms for workers at risk of displacement due to automation, promoting a culture of lifelong learning facilitated by governments and social partners.

The analysis emphasizes various national policies and initiatives across European countries, including Slovenia, Greece, Sweden, Malta, Poland, Portugal, Germany, Belgium, and Italy. These initiatives aim to align vocational education and training (VET) with labour market needs, ensuring that workers are equipped to navigate the evolving digital landscape. Furthermore, the document underscores the importance of addressing potential risks associated with automation, such as job insecurity and limited career advancement, to foster a resilient workforce capable of thriving in an increasingly automated economy.

In conclusion, proactive policymaking and strategic investments in education and training are essential to harnessing the opportunities presented by automation. By focusing on digital skills development and lifelong learning, Europe can prepare its workforce for future challenges while ensuring sustainable economic growth and social inclusion.

Keywords: Workforce Digital Development, Workforce Resilience, Automation, Lifelong Learning

Introduction

In this chapter we will explore the evolving landscape of workplace dynamics within the framework of employment and vocational training policies, particularly in the context of digitalization and globalization. As industries increasingly adopt digital tools and global networks expand, the nature of work and workforce expectations undergo rapid transformation, making workforce wellbeing a vital component of sustainable growth and productivity. This part of the State-of-the-Art report addresses Research Question 3 (RQ3), investigating how workplace dynamics are shifting and why the wellbeing of employees is essential within this evolving framework. Through desk research, we will analyse recent policies, trends, and practices shaping vocational training and employment in this new era, aiming to

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provide insights into how organizations can navigate these changes to support employee resilience and adapt to future workplace demands.

The goal is to provide a comprehensive understanding of how shifts in technology, work culture, and organizational structures impact the daily experiences and productivity of employees. By highlighting the connection between evolving workplace dynamics and employee wellbeing, this chapter aims to offer insights into strategies for organizations to foster a supportive, adaptive, and thriving work environment, ultimately enhancing both individual and organizational success.

Employment and vocational training policies in EU level and partner countries

Policies and initiative at EU level

Today's world is characterized by increased global connectivity, which drives rapid economic digitalization. The United Nations' International Telecommunication Union (ITU) reported that, as of 2021, approximately 63% of the global population had internet access, with the COVID-19 pandemic accelerating digital transformation efforts (ITU, 2021).

Table 3
Summarizing key European Union policies and initiatives

Policy/Initiative	Objective	Key Areas of Focus	Source
Digital Decade Policy Program 2030	To drive digital transformation across the EU by 2030.	Digital skills, ICT workforce, SME digitalization, cross-border infrastructure (5G, quantum computing, cybersecurity)	European Commission, 2024; European Parliament, 2023.
SELFIE Initiative	To support schools in their digital transformation by providing a self-reflection tool for enhancing digital capacities	Digital leadership, teaching practices, school infrastructure, stakeholder involvement	European Commission, 2022; European Schoolnet, 2023
European Social Fund Plus (ESF+)	To provide funding for employment programs focusing on digital and green economy transitions.	Workforce upskilling, digital skills training, vulnerable group support	European Commission, 2024; European Parliament, 2023.

Digital technology now deeply integrates into most businesses and workplaces, transforming labour markets and fundamentally altering workforce dynamics. Although clear data on digital

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employment's full scope and impact is still limited, stakeholders such as governments, businesses, NGOs, and civil society recognize its developmental potential.

SELFIE for Work-Based Learning

The SELFIE initiative (European Commission. SELFIE for work-based learning) (European Comission (n.d.) for workplace learning is designed to enhance the effectiveness of work-based training by encouraging self-reflection on digital readiness among participants. This tool allows employees and organizations to evaluate how effectively they are incorporating digital technologies into their training and development processes. By focusing on digital integration, SELFIE promotes a culture of continuous improvement, helping to identify both strengths and areas needing enhancement within the workplace environment.

The tool aims to improve the quality of work-based learning experiences, ultimately boosting the employability of participants by equipping them with relevant digital skills (European Comission (n.d.). Employers can utilize SELFIE to foster better educational outcomes, ensuring that their workforce is prepared for the demands of the modern job market. The initiative reflects a broader trend towards recognizing the importance of digital competencies in professional settings and the need for ongoing development in this area.

The tool was mentioned and analysed in the Digital Transformation of Vocational Education and Training (VET) Workshop which was held in Seville on March 7-8, 2024 (Herrero et al., 2024). The discussion revolved around VET's role as a vital link between education and the workforce and highlighted the need for equipping both current and future workers with essential skills, particularly digital competencies, to meet the evolving demands of the job market.

Participants explored how this tool can help educators and learners assess their integration of digital technologies into training programs, ultimately enhancing the quality of work-based learning experiences.

The Digital Decade Policy Program (2030)

This program outlines a strategic framework for digital transformation across the EU, focusing on four core areas: digital skills, infrastructure, business digitalization, and public services modernization (European Commission, 2024). The program includes ambitious goals, such as training 20 million ICT specialists and equipping 80% of EU citizens with basic digital skills by 2030. By prioritizing workforce development and the digital transformation of small and

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medium-sized enterprises (SMEs), the policy promotes inclusive digital skill-building across member states. Additionally, multi-country projects aim to strengthen cross-border digital infrastructure and foster innovation through targeted investments in 5G, quantum computing, and cybersecurity (European Commission, 2024; European Parliament, 2023).

The European Social Fund Plus (ESF+)

A key EU funding instrument aimed at promoting employment through initiatives that develop digital skills and facilitate workforce training (European Commission, 2024). By dedicating resources to skill enhancement and workforce upskilling, ESF+ supports transitions into digital and green economy roles, focusing particularly on vulnerable groups and industries undergoing rapid digital change. This funding aligns with the EU's larger objectives of fostering a fair, adaptable, and resilient labour market that can meet the evolving demands of digital transformation (European Parliament, 2023; European Commission, 2024)

Policies and Initiatives at national level

Belgium

Recent studies underscore the significance of initiatives and strategic approaches adopted by the Belgian government and educational institutions. One of them is increasing digitalization efforts. According to a study by ManpowerGroup (2021), approximately 36% of Belgian companies are ramping up their digitization initiatives. Notably, many employers plan to maintain or even expand their workforce despite the rise of automation. This trend is particularly prevalent among medium and large enterprises, which leverage digital transformation to enhance market competitiveness and create new job opportunities. These organizations recognize that digital tools can improve productivity and innovation, necessitating a workforce equipped with advanced digital skills.

The Joint Research Centre (JRC) emphasizes the critical role of digital transformation in VET. It indicates that for Belgium to prepare its future workforce adequately, VET systems must evolve to address the digital skills gap effectively (European Commission, 2020). The integration of digital skills into vocational curricula is essential for enabling learners to capitalize on job opportunities generated by this transformation.

Belgium has been proactive in promoting the SELFIE (Self-reflection on Effective Learning by Fostering the use of Innovative Educational Technologies) tool, which assists educational institutions in assessing and enhancing their digital readiness for vocational training (European Commission, 2021).

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Germany

Germany is also implementing several vocational training policies aimed at digital transformation, recognizing the necessity of equipping its workforce with essential digital skills to meet the demands of a rapidly evolving job market. In 2016 has been established the Digital Strategy 2025, an overarching framework prioritizes enhancing digital competencies across all educational levels, including vocational training (Bundesministerium für Bildung und Forschung, 2016). The strategy's goals include ensuring that every student acquires foundational knowledge in information science and programming by 2025. This initiative highlights the importance of digital education as a key component in shaping a technologically proficient workforce. Moreover, it aims to transform workplaces into primary venues for acquiring up-to-date information technology knowledge, ensuring that publicly funded educational institutions provide essential teaching materials online.

Germany's renowned Dual Education System integrates classroom instruction with hands-on training in a professional setting (Hogeforster & Döding, 2012). This model allows students to gain practical experience while developing theoretical knowledge. It has evolved to incorporate digital skills training, ensuring that apprentices are well-prepared for the digital economy (BIBB, 2021). Employers are encouraged to adopt new technologies and integrate them into their training programs, thereby fostering a culture of continuous learning and adaptation to technological changes.

Finally, the German government is committed to promoting lifelong learning initiatives, particularly in digital skills, through policies that support collaboration among educational institutions, businesses, and governmental bodies (Bundesministerium für Bildung und Forschung, 2020). This multifaceted approach aims to create a workforce that is adept not only in technical skills but also possesses critical soft skills such as adaptability, problem-solving, and teamwork, which are essential in a digitally transformed workplace.

Greece

In Greece, a range of national initiatives is being implemented to enhance vocational training in response to the demands of digitalization and workforce development. Acknowledging the pressing need to equip the workforce for the demands of the digital economy, the Greek government has initiated multiple strategic actions (Krasavina, 2024).

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One significant entity in this effort is the Public Employment Service (DYPA), which focuses on reducing unemployment through various active labour market measures. DYPA provides comprehensive training programs aimed at reskilling and upskilling workers, particularly in sectors experiencing high demand. The agency operates numerous adult training centers, apprenticeship schools, and vocational education institutions to tackle the skills gap in the job market, which has become increasingly critical as unemployment rates have begun to decrease.

Additionally, Greece's Digital Transformation Paper (2020–2025) (Krasavina, 2024) emphasizes the importance of enhancing digital skills across multiple sectors. This strategic document prioritizes the development of digital capacities and the alignment of educational programs with technological advancements. The Ministry of Digital Governance is leading initiatives designed to foster digital literacy, enabling citizens to engage productively in the digital workforce (Krasavina, 2024). These initiatives include the integration of digital skills into educational curricula and the promotion of lifelong learning opportunities that cater to the needs of both young people and adults.

Moreover, the National Skills Strategy is a vital component of Greece's response to workforce challenges. This strategy outlines specific goals for improving skill levels, particularly in digital and technical fields. It aims to create synergies between educational institutions and the private sector, facilitating apprenticeships and job placements that align with labour market requirements.

Greece is also actively participating in EU-funded programs aimed at digital skills enhancement, such as the Skills for Growth initiative, which focuses on fostering skills development through collaborative projects with EU member states. These efforts not only aim to address current labour market needs but also to prepare the workforce for future technological advancements.

Malta

Malta has established a framework for digital transformation and workforce development through several key initiatives, notably the Malta Digital Strategy 2022-2027 and the Malta AI Policy (Malta Diġitali, 2022; MDIA, 2019). These strategic documents reflect the government's commitment to fostering a digitally literate society that is well-prepared for the demands of the modern job market.

The Malta Digital Strategy 2022-2027 (Malta Diġitali, 2022) emphasizes the significance of digital transformation as a vehicle for improving both societal and economic conditions. This

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strategy outlines the government's role as a catalyst for change, promoting the integration of digital technologies across various sectors, including VET (Malta Ministry for the Economy and Industry, 2022). By prioritizing digital skills development, the strategy aims to enhance the employability of the workforce and ensure that citizens can effectively engage with the digital economy. The strategy includes specific initiatives to modernize VET curricula by including digital competencies and encouraging partnerships between educational institutions and industries to align training with labour market needs.

Moreover, the Malta AI Policy (MDIA, 2019) serves as a critical framework aimed at preparing the workforce for an AI-driven economy. Recognizing the transformative potential of artificial intelligence, this policy integrates AI education at various levels of the educational system, including vocational training (Malta Ministry for the Economy and Industry, 2021). The policy focuses on equipping future workers with essential skills such as data literacy, machine learning, and ethical AI practices, which are increasingly relevant in the context of automation and digital innovation. This initiative not only fosters digital competencies but also ensures that the workforce is prepared to adapt to emerging job roles influenced by AI technologies.

Malta has implemented the Digital Innovation Hub (DIH), which serves as a central resource for promoting digitalization among businesses, particularly SMEs. The DIH offers training programs, workshops, and consultancy services to help enterprises embrace digital transformation (Malta Chamber of Commerce, 2022). These initiatives are designed to upskill employees and provide them with the tools needed to thrive in a digitally-driven landscape.

Additionally, the Skills for the Future program focuses on enhancing the overall skill levels of the workforce in areas related to digital technologies. This program promotes lifelong learning and professional development, facilitating access to training opportunities that align with current and future labour market demands (Malta Ministry for Education, 2022).

Italy

The key policies and strategies include the National Industry 4.0 Plan and the Recovery and Resilience Plan, which together focus on improving digital capabilities across multiple sectors.

National Industry 4.0 Plan. Launched in 2017, the National Industry 4.0 Plan represents a strategic effort by the Italian government to bolster the digital transformation of its manufacturing and industrial sectors. This initiative seeks to promote technological advancement

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through substantial investments in innovation and workforce development. Key components of the plan include:

Investment Incentives: The plan provides significant tax incentives aimed at stimulating corporate investment in advanced technologies, such as artificial intelligence, robotics, and the Internet of Things (IoT). These financial incentives encourage businesses to adopt new technologies that enhance productivity and competitiveness (Ministero dello Sviluppo Economico, 2021).

Upskilling Workforce: By facilitating the upskilling of workers through targeted training programs, the National Industry 4.0 Plan emphasizes the importance of equipping employees with the necessary digital skills to thrive in a technology-driven environment. Companies are encouraged to invest in employee training to prepare their workforce for the challenges posed by digitalization (OECD, 2021).

Poland

Poland is actively addressing the growing demand for skilled labour through a range of vocational training policies that focus on digitalization and workforce development. This commitment is evident in the substantial investments being made in educational programs designed to equip the workforce with essential digital skills that are increasingly demanded across various sectors.

Polish Integrated Skills Strategy 2030 (pl. *Zintegrowana Strategia Umiejętności 2030*) (Ministerstwo Edukacji Narodowej, 2019) involves a holistic approach focused on enhancing workforce skills, with a particular emphasis on digital competencies. It prioritizes embedding digital skills within vocational education and training programs to equip students for the demands of today's labour market. Additionally, the strategy aims to strengthen partnerships between educational institutions and the private sector to develop training initiatives aligned with industry requirements. (Instytut Badań Edukacyjnych, n.d.).

Regarding digital Transformation in Vocational Education, the government is leveraging automation and mechanization to enhance productivity while addressing the skills gap among economically inactive populations. Programs aimed at upskilling workers in digital technologies are being implemented, with a focus on providing access to vocational training for those who have been traditionally underrepresented in the labour market, such as women and older adults (Ministerstwo Cyfryzacji, 2024).

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Poland's National Recovery Plan (pl. *Krajowy Plan Odbudowy i Zwiększania Odporności*) (Ministerstwo Funduszy i Polityki Regionalnej, 2023), supported by the EU's Recovery and Resilience Facility, includes significant investments in digital skills training and lifelong learning initiatives. These investments are vital for adapting the workforce to rapid technological changes and ensuring that individuals can thrive in a digitally transformed economy (Ministerstwo Aktywów Państwowych, n.d.). The plan emphasizes the importance of equipping workers with skills in areas such as artificial intelligence, cybersecurity, and data analysis.

According to OECD (2021) report, the Polish government is also fostering partnerships and collaborations between vocational schools, universities, and industry stakeholders to enhance access to training programs. This collaboration aims to create a more responsive education system that can quickly adapt to the changing demands of the labour market. Initiatives such as internships and apprenticeships are being promoted to provide practical experience in digital environments (OECD, 2021).

Finally, the "Broad Alliance for Digital Skills in Poland" (pl. *Szerokie Porozumienie na Rzecz Rozwoju Umiejętności Cyfrowych*) (Rada ds. Cyfryzacji, 2014) is an initiative that focuses on training programs that specifically target digital skills development in key sectors such as information technology, manufacturing, and services. The project aims to enhance the employability of participants by providing them with the skills necessary to succeed in a rapidly changing job market (Directorate-General for Communications Networks, Content and Technology, 2024).

Portugal

The government of Portugal has implemented several key initiatives aimed at equipping the workforce to thrive in an increasingly digital economy. One is the National Qualification System (*Sistema Nacional de Qualificações*) (Diário da República, 2007), an initiative is crucial in addressing labour market demands by improving the qualifications of workers. The System emphasizes lifelong learning and includes mechanisms for validating and recognizing skills acquired through non-formal and informal education (Agência Nacional para a Qualificação e o Ensino Profissional, 2021). This system not only promotes formal education but also acknowledges the value of skills gained through real-world experiences, ensuring that individuals are recognized for their competencies regardless of how they were acquired. This holistic approach to qualifications is essential in responding to the dynamic needs of the labour market, particularly in digital fields.

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The Portugal Digital Strategy (Portugal Government, 2020) was launched in 2020, this strategy aims to foster digital transformation across various sectors, including VET. This strategy sets ambitious goals to enhance digital skills among the workforce, focusing on creating a digitally literate population capable of adapting to evolving job requirements and technological advancements (Portugal Government, 2020). It specific actions such as the development of digital competences in schools and training institutions, promoting initiatives that enhance access to technology and digital tools.

Integrated System of VET (*Sistema Integrado de Educação e Formação Profissional*) is a system is designed to provide comprehensive training opportunities, aligning educational pathways with labour market needs. It incorporates digital skills training as a fundamental component, ensuring that both current and future workers are equipped with the necessary competencies to succeed in a digital economy (Agência Nacional para a Qualificação e o Ensino Profissional, 2021). The Integrated System emphasizes collaboration between educational institutions and businesses to create training programs that are responsive to market demands.

Slovenia

In Slovenia, the Ministry of Education is actively modernizing curricula to integrate digital skills training across various vocational disciplines (Vlada Republike Slovenije, 2023). This initiative aims to prepare individuals for both current and emerging roles shaped by technological advancements. Slovenia is also engaged in EU-level frameworks like the European Skills Agenda, which encourages member states to invest in upskilling and reskilling efforts. These frameworks promote lifelong learning and enhance collaboration between educational institutions and businesses, thereby creating more apprenticeship opportunities that focus on digital competencies.

Furthermore, the Slovenian Digital Coalition (Slovenian Digital Coalition, n.d.), established in 2016, plays a significant role in this transformation by uniting stakeholders from the public and private sectors to streamline digital transformation processes. The coalition emphasizes improving digital skills, promoting better integration of digital technologies in education, and enhancing the overall quality of life through digital inclusion. This strategic approach aligns with the goals outlined in Slovenia's Digital Transformation Strategy (Digitalna Slovenija, 2030), aiming to adapt education to the needs of a digital economy and ensure that the workforce is well-equipped to thrive in this evolving landscape.

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Sweden

Sweden places a strong emphasis on lifelong learning and skills development to equip its workforce for the evolving job market. A pivotal initiative is the National Strategy for Digital Skills (2020), which aims to enhance digital competence across all sectors of society, including VET. This strategy highlights the necessity of integrating digital skills into VET curricula, ensuring that students acquire the competencies required for both current job roles and future employment opportunities (Swedish Government, 2020).

The Swedish Agency for Economic and Regional Growth (Tillväxtverket, 2020) has also been instrumental in promoting digitalization, particularly among small and medium-sized enterprises (SMEs). This agency facilitates a variety of training programs designed to enhance employees' digital skills, thereby supporting the adaptation of the workforce to new technological advancements. Additionally, these programs aim to bolster the digital infrastructure of VET institutions, ensuring they are well-equipped to meet the needs of both students and employers (Tillväxtverket, 2020).

In 2021, Sweden further reinforced its commitment to digital skills through the Digitalization Strategy for the Public Sector, which aims to promote digital competence among public sector employees. This initiative emphasizes the importance of a digitally competent workforce in delivering effective public services and ensuring that citizens can access digital services (Swedish Government, 2021). Moreover, the strategy includes measures to support digital training for teachers and educators, enabling them to effectively integrate digital tools into their teaching practices.

Sweden's investment in digital skills training is not limited to formal education; the country also supports lifelong learning initiatives through various platforms. For example, the Folkbildning (adult education) system offers flexible learning opportunities that cater to adults seeking to improve their digital skills. These programs are designed to accommodate different learning paces and styles, fostering an inclusive environment that encourages participation from all segments of society (Swedish National Agency for Education, 2021).

Conclusions

Automation, managed to make a way into our lives and if used correctly can present a significant opportunity for addressing workforce shortages and enhancing skills development throughout Europe. Organisations that are getting prepared for the digital future, must anticipate the job opportunities that will arise from automation and its integration with technologies such as

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artificial intelligence (AI). The coallboration between private and public section is crucial in job creation and ensuring that employers & workers are equipped with relevant skills needed for this new work environment. These skills must encompass not only digital competencies but also essential transversal skills like leadership and management, which are vital for adapting to the evolving demands of the labour market (European Commission, 2021; OECD, 2021).

To support workers who may face displacement or important changes in their roles due to automation, reskilling and upskilling initiatives are essential. Governments, alongside social partners, play a pivotal role in fostering a culture of lifelong learning. This involves not just providing access to suitable training programs, but also offering guidance and financial support for education and skill development. Such initiatives help ensure that the workforce remains competitive and prepared to meet the challenges posed by technological advancements (European Skills Agenda, 2020; Digital Transformation Paper, 2020-2025).

Finally, policymakers must address the potential risks associated with automation, including job security & limited career advancement opportunities. By implementing comprehensive policies that promote workforce resilience, governments can minimise the threats of unemployment and job inactivity in a rapidly changing labour market. A focus on both the challenges and opportunities of automation will be critical to securing a stable and prosperous future for Europe's workforce (European Commission, 2021; OECD, 2021).

References

1. Aparicio-Martínez, P., Perea-Moreno, A.-J., Martínez-Jiménez, M.-P., Redel-Macías, M. D., & Pagliari, C. (2021). Social media, cognitive overload, and sleep patterns in university students. *Computers in Human Behavior, 115*, 106586. Retrieved from https://doi.org/10.1016/j.chb.2021.106586
2. Cedefop. (2023). *Vocational education and training policy briefs 2023 – Sweden*. Retrieved from https://www.cedefop.europa.eu
3. Diário da República. (2007). *Decreto-Lei n° [31.12.2007], de [Fecha específica]*. Retrieved from https://diariodarepublica.pt/dr/legislacao-consolidada/decreto-lei/2007-34556675
4. Digitalna Slovenija (n.d.). Retrieved from https://www.digitalna.si/en/
5. Directorate-General for Communications Networks, Content and Technology. (2024, August 02). Poland - Broad Alliance for Digital Skills. *Digital skills and jobs platform*. Retrieved from https://digital-skills-jobs.europa.eu/en/about/national-coalitions/poland-broad-alliance-digital-skills
6. European Commission. (n.d.). *SELFIE for work-based learning*. Retrieved from https://education.ec.europa.eu/selfie-for-work-based-learning

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

7. European Commission. (2024). *Europe's digital decade: 2030 targets*. Retrieved from https://ec.europa.eu
8. European Commission. (2024). *Digital Transformation of Vocational Education and Training (VET) Workshop*. JRC Publications Repository. Retrieved from https://publications.jrc.ec.europa.eu/repository/handle/JRC138603
9. European Parliament. (2023). *Digital transformation strategy for Europe*. Retrieved from https://europarl.europa.eu
10. European Proceedings of Social and Behavioural Sciences. (2021). *New technologies in education and their impact on student behavior*. Retrieved from https://www.europeanproceedings.com/article/10.15405/epsbs.2021.04.7
11. European Commission. (2022). *How automation affects work, economies, and society*. Retrieved from https://cordis.europa.eu/article/id/430224-how-automation-affects-work-economies-and-society
12. European Commission. (2024). *Digital decade 2024 report: Country fact pages*. Retrieved from https://digital-strategy.ec.europa.eu/en/factpages/digital-decade-2024-report-country-fact-pages
13. European Commission. (n.d.). *SELFIE for work-based learning*. Retrieved October 4, 2024, from https://education.ec.europa.eu/selfie/selfie-for-work-based-learning
14. European Labour Authority. (2024). *Good practice fiche: Regulating the digital platforms economy*. Retrieved from https://www.ela.europa.eu/sites/default/files/2024-06/Good-practice-fiche-EL-UDW_Regulating-the-digital-platforms-economy.pdf
15. Herrero, C., Villar Onrubia, D., Cosgrove, J., Kluzer, S., Centeno, C., Castaño Muñoz, J., Romero Rodríguez, S., Moreno Morilla, C., Weikert García, L., Arroyo Sagasta, A., Zubizarreta Pagalday, A., Wisniewski, D. and Fabe, N., *Digital Transformation of Vocational Education and Training (VET) Workshop*, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/94528, JRC138603
16. Hogeforster, J., & Döding, L. (2012). The educational systems in the Baltic Sea Region with special consideration of the dual system in Germany. In *Job Market Innovations: Testing and implementation of new methods of promoting employment in the niching, perishing and little popular occupations*. Hamburg.
17. Krasavina, Andra. (2024) Greece - National Digital Decade strategic roadmap. Helenic republic. Ministry of Digital Governance of Greece. Retrieved from: https://digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/greece-national-digital-decade-strategic-roadmap.
18. International Telecommunication Union (ITU). (2021). *Measuring digital development: Facts and figures 2021*. International Telecommunication Union.
19. Instytut Badań Edukacyjnych. (n.d.). Zintegrowana Strategia Umiejętności 2030. https://ibe.edu.pl/pl/projekty-zakonczone/krajowe/zintegrowana-strategia-umiejetnosci
20. International Labour Organization. (2023). *The impact of digitalization on employment*. Retrieved from https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_emp/documents/publication/wcms_854353.pdf

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21. Malta Digitali. (2022). *Malta Digital Strategy 2022-2027*. Retrieved from https://www.maltadigitali.mt

22. Malta Digital Innovation Authority (MDIA). (2019). *Strategy and Vision for Artificial Intelligence in Malta 2030*. Retrieved from https://www.mdia.gov.mt/malta-ai-strategy/

23. Ministerstwo Aktywów Państwowych. (n.d.). Krajowy Plan Odbudowy i Zwiększania Odporności. Retrieved from https://www.gov.pl/web/aktywa-panstwowe/krajowy-plan-odbudowy-i-zwiekszania-odpornosci

24. Ministerstwo Cyfryzacji. (2024). Strategia Cyfryzacji Polski do 2035 roku. Retrieved from https://www.gov.pl/web/cyfryzacja/strategia-cyfryzacji-polski-do-2035-roku

25. Ministerstwo Edukacji Narodowej. (2019). *Zintegrowana Strategia Umiejętności 2030 (część ogólna)*. Retrieved from https://kwalifikacje.gov.pl/images/zsu.pdf

26. Ministerstwo Funduszy i Polityki Regionalnej. (2023). *Krajowy Plan Odbudowy i Zwiększania Odporności*. Retrieved from https://www.funduszeeuropejskie.gov.pl/media/109762/KPO.pdf

27. Ministry for Education, Sport, Youth, Research, and Innovation. (2023). *National Skills Strategy*. Retrieved from https://education.gov.mt

28. National Institute of Occupational Health (STAMI). (2020). *The influence of digitalization and new technologies on psychosocial work environment and employee health*. Retrieved from https://stami.brage.unit.no/stami-xmlui/bitstream/handle/11250/2723779/Rapport-The-influence-of-digitalization-and-new-technologies-on-psychosocial-work-environment-and-employee-health.pdf?sequence=2

29. Organisation for Economic Co-operation and Development (OECD). (2021). *Going digital: Shaping policies, improving lives*. Organisation for Economic Cooperation and Development.

30. Potgieter, I.L. (2021). Surviving the Digital Era: The Link Between Positive Coping, Workplace Friendships and Career Adaptability. In: Ferreira, N., Potgieter, I.L., Coetzee, M. (eds) *Agile Coping in the Digital Workplace*. Springer, Cham. https://doi.org/10.1007/978-3-030-70228-1_4

31. Public Employment Service (DYPA). (2023). *Active labor market policies in Greece*. Retrieved from https://www.dypa.gr

32. Rada ds. Cyfryzacji. (2014, September 11). Szerokie Porozumienie na rzecz Rozwoju Umiejętności Cyfrowych. *Serwis Rzeczypospolitej Polskiej*. www.gov.pl/documents/31305/0/szerokie_porozumienie_na_rzecz_umiejetnosci_cyfrowych.pdf

33. Swedish Agency for Economic and Regional Growth. (2020). *National strategy for digital skills*. https://tillvaxtverket.se

34. Vlada Republike Slovenije (2023). *Krovna strategija digitalne preobrazbe Slovenije do leta 2030*. Vlada Republike Slovenije. https://www.gov.si/assets/ministrstva/MDP/Dokumenti/DSI2030-potrjena-na-Vladi-RS_marec-2023.pdf

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CHAPTER 9

Eu level labour policies and guidelines

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Abstract:

Since the establishment of foundational treaties such as the Treaty on European Union, the EU has aimed to create a cohesive labour market that emphasizes economic growth and social inclusion among member states. However, significant technological changes, along with demographic shifts and sustainability challenges, put pressure on current labour policies and necessitate urgent action. This chapter illustrates the EU's efforts in preparing the workforce for the challenges of digitalization and automation through labour policies, such as the European Pillar of Social Rights. Furthermore, it highlights the EU's strategic support for alleviating the impact of the COVID-19 pandemic through funding and Country-Specific Recommendations, which aim to identify national labour market challenges. By assessing current initiatives and projected future needs, this chapter aims to highlight the successes and shortcomings in the implementation of labour policies. Ultimately, the goal is to contribute to a deeper understanding of how the EU proactively shapes its labour market policies to create a resilient and adaptable workforce that can thrive in an increasingly automated world.

Keywords: labour market, labour policies, technological advancement, EPSR, RRF, automation

Introduction

Constant technological and social advancements are putting pressure on EU labour policies that were not fully prepared for the drastic changes of the modern world. While legal acts and regulations aim to set minimum standards that must be upheld by each member state, there is a continuous need to respond to the emerging challenges, such as the COVID-19 pandemic and the increasing automation in various sectors. As such, it is necessary to evaluate how the current labour policies are addressing these issues. This chapter seeks to explore the research question: 'How do current practices and policies compare and contrast with the future needs of the labour market?' Specifically, it focuses on EU-level labour policies and guidelines to assess their capacity to meet the anticipated transformations within the workforce.

The scope of this chapter is to examine the existing EU labour policies and initiatives, assessing their alignment with emerging labour market trends influenced by the green and digital transitions. By evaluating key initiatives such as the European Pillar of Social Rights and the Recovery and Resilience Facility in the context of future market needs, this chapter aims to provide a deeper understanding of the EU's approach to tackling these challenges. In doing so,

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it will illustrate the interconnected nature of labour market policies and the EU's commitment to preparing the workforce for a green and technologically advanced future.

Legal foundations of EU labour policies

Labour policies within the European Union are developed in accordance with the provisions outlined in the foundational treaties, such as the Treaty on European Union (TEU) (European Union, 2012a) and the Treaty on the Functioning of the European Union (TFEU) (European Union, 2012b). These treaties establish a framework for addressing employment, social protection, and equality at the national level, steering the creation and execution of policies aimed at tackling unemployment, improving worker mobility, and ensuring social inclusion.

To monitor the effectiveness of policies and their compliance with guidelines, the EU uses a system of governance that includes the European Semester, Employment Guidelines, Joint Employment Reports, and National Reform Programmes. This system oversees the implementation of national policies and their alignment with shared objectives in response to emerging challenges. Notable initiatives such as the European Pillar of Social Rights (EPSR) (European Commission, 2021a), Recovery and Resilience Facility (RRF) (European Parliament & Council of the European Union, 2021) and the Digital Education Action Plan (DEAP) (European Commission, 2020b) demonstrate the Union's dedication to improving living and working conditions in a socially inclusive manner. At the same time, these initiatives prepare the current and future workforce for the evolving labour market and the growing integration of robotics and AI systems.

The legal basis of European employment initiatives

The legal foundation for certain aspects of European Union's labour policies is outlined in Article 3(3) of the Treaty on European Union (TEU) (European Union, 2012a) and Articles 8-10, 145-150, 156-159, and 162-164 of the Treaty on the Functioning of the European Union (TFEU) (European Union, 2012b). These articles establish the framework and authority for the EU's actions in areas such as employment, social policies, and gender equality, among others, guiding the development and enforcement of legislation within its member states.

Article 3(3) of the Treaty on European Union (TEU) outlines the EU's main goals, emphasizing the promotion of a competitive social market economy with a focus on full employment and social progress, and underscoring the Union's commitment to social cohesion and sustainable development (European Union, 2012a). Complementing this are Articles 8 through 10 of the

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TFEU, which are vital for equality and non-discrimination efforts. Article 8 highlights the EU's dedication to promoting gender equality, while Articles 9 and 10 extend this commitment to a wide range of discrimination issues, including sex, race, ethnicity, religion, disability, age, and sexual orientation (European Union, 2012b, Articles 8, 9, & 10).

Articles 145 through 150 of the TFEU define the EU's role in supporting member states in improving employment conditions, developing labour market policies, and promoting social inclusion, establishing the legal basis for job creation, labour market flexibility, and workers' rights protection. These provisions assist in financing youth employment programs, such as the Erasmus+ program, promoting gender equality policies in the workplace, and supporting efforts to improve vocational training opportunities. On the other hand, social protection and the coordination of social security systems is described in articles 156 to 159. These articles focus on authorizing the EU to support member states' efforts in social security and welfare to ensure fair treatment and enhanced social protection. Finally, Articles 162 to 164 address the European Social Fund (ESF), which plays a crucial role in funding initiatives that boost employment opportunities, promote social inclusion, and mitigate regional disparities (European Union, 2012b, Articles 145–164). Article 153 of the TFEU supports and complements the policies of individual member states by establishing minimum standards that all must meet (EUR-Lex, n.d.).

Consequently, both the member states and the EU are required to work together to establish a coordinated employment strategy, focusing on developing a skilled, adaptable workforce and creating labour markets capable of responding to economic shifts, as outlined in Article 145 of the TFEU (European Parliament, n.d.a).

Labour policies, however, cannot be created in isolation in the EU due to the interconnected nature of the single market and the need for cohesive economic and social strategies. With 27 member states, each with its own economic conditions and labour market dynamics, the EU requires a coordinated approach to ensure that employment policies are effective and equitable across the region. In response to the financial crisis of 2008, the EU has developed the European Semester—a structured framework, including Employment Guidelines, Joint Employment Reports, and National Reform Programmes, to monitor and guide labour policies. This framework ensures that national policies align with EU-wide objectives, address cross-border challenges, and adapt to evolving issues such as economic crises, technological advancement, and social developments. Without a coordinated approach, disparities and inefficiencies could undermine the overall effectiveness of labour market policies across the Union (European Commission, n.d.a).

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The annual review of employment policies within the European Semester includes several key components:

At the core of this review are the Employment Guidelines, established under Article 148 of the Treaty on the Functioning of the European Union (TFEU) (European Union, 2012b). They serve as strategic recommendations for EU members, focusing on improving national employment policies in areas such as job creation, labour market adaptability, and upskilling.

The Joint Employment Report provides a broad overview of employment trends throughout the EU, identifying major challenges and the progress made by different member states. Complementing this, the National Reform Programmes are submitted by each country, detailing their planned reforms and strategies to tackle employment and economic issues (European Commission, n.d.a).

These documents, along with Country Reports and Country Specific Recommendations, ensure a coordinated and effective implementation of employment policies across the European Union. Their regular updates and amendments are essential for maintaining relevance in the face of economic shifts and crises, such as the COVID-19 pandemic, climate change, and the rapid pace of technological innovation in the EU, allowing policies to adapt to new challenges and opportunities. This evaluation and adjustment process reinforces the EU's commitment to fostering an inclusive and sustainable employment growth, ensuring that strategies remain effective in improving labour market outcomes.

Binding legal acts establishing labour standards

Binding legal acts within the European Union are crucial for shaping labour policies and maintaining uniform standards across the EU, safeguarding workers' rights, ensuring wellbeing, and promoting fairness. These regulations guarantee that essential protections, such as those outlined in the Working Time Directive and the Equal Treatment Directive, are upheld consistently across the EU, preventing exploitation and reducing disparities in labour standards. By establishing minimum requirements for working conditions, health and safety, and non-discrimination, EU directives help to create a level playing field, mitigating competitive imbalances among member states and avoiding a race to lower standards. Furthermore, they enhance the overall quality of employment by setting benchmarks for job security, workplace safety, and fair treatment.

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Health and safety at work

Since the 1980s, the EU has focused on improving health and safety at work through legislation that sets minimum standards while allowing each of its members to implement stricter measures. Legal provisions on health and safety are found in Articles 91, 114, 115, 151, 153, and 352 of the TFEU. These provisions support and complement national efforts, ensuring that the legislation does not obstruct the growth of small and medium-sized enterprises (SMEs). Major milestones in the field include the adoption of the Framework Directive 89/391/EEC, which laid the groundwork for various directives actively and pro-actively reducing workers' occupational risks by setting workers' protection standards, ensuring employers provide adequate training for the workers, and requiring employers to conduct health and safety monitoring (EU-OSHA, n.d.a).

Recent initiatives reflect the EU's ongoing commitment to tackling emerging challenges. For example, the Machinery Regulation adopted in 2023 (Regulation 2023/1230/EU) addresses physical and psychological risks that stem from the use of advanced robotics and AI solutions (Eurofound, 2024, pp. 3-4). Updates to directives on carcinogens (directive 2004/37/EC, which has already received 5 amendments) (EU-OSHA, n.d.b), and asbestos (2009/148/EC, amended by Directive 2023/2668), alongside the incorporation of COVID-19 into health and safety regulations, demonstrate the EU's responsive approach. The European Agency for Safety and Health at Work (EU-OSHA) supports these efforts by promoting risk prevention and conducting research. Focused on anticipating changes in the workplace, strengthening prevention efforts, and preparing for future health crises, the 2021-2027 EU Strategic Framework reinforces the EU's commitment to a safe and healthy working environment (European Parliament n.d.c).

The fight against poverty, social exclusion and discrimination

The EU aims to combat poverty and social exclusion, primarily through non-legislative cooperation as outlined in Article 153 TFEU. While pilot programs started in 1970s, significant progress was achieved only after the 1999 Treaty of Amsterdam made social exclusion a policy goal. The EU's open method of coordination (OMC) helps EU members set objectives, measure poverty, and coordinate social protection policies (European Parliament, n.d.a).

Although some of the main aims of the Europe 2020 strategy included employment rate increase among citizens aged 20–64 and poverty reduction (European Commission, 2010, pp. 8-9), the

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initiative fell short, and the 2021 European Pillar of Social Rights was developed to set new targets for reducing poverty by 2030.

In recent years, the "Union of Equality" has become a key priority, and initiatives such as Gender Equality Strategy and Action Plan on Integration and Inclusion have been developed (European Parliament n.d.e). This is in accordance with the anti-discrimination laws described in Article 19 of the TFEU, which covers various forms of inequality, with notable directives on racial equality, gender balance, and work-life balance. Funding for such initiatives comes from the European Social Fund Plus (ESF+) and the European Globalisation Adjustment Fund for Displaced Workers (EGF), which together allocate billions towards combating poverty, social exclusion, and supporting those facing work displacement (European Parliament, n.d.a).

Working conditions

The European Union underscores workers' rights to information and consultation through various directives, setting minimum standards while encouraging cooperation among member nations. This framework, rooted in Articles 5, 114, 115, 151, and 153 of the Treaty on the Functioning of the European Union (European Parliament n.d.f), aims to improve working conditions, social protection, and employment.

Key directives include Council Directive 75/129/EEC on collective redundancies, Directive 2002/14/EC on employee information and consultation, and Directive 94/45/EC (European Parliament n.d.f) on European Works Councils. Recent updates within this field address gaps, such as including seafarers in consultation rights and revising the European Works Council Directive to improve effectiveness. Newer directives, including Directive (EU) 2019/1152 (European Parliament & Council of the European Union, 2019a) on transparent working conditions, also address emerging work forms and algorithmic management (European Parliament n.d.f).

Freedom of movement for workers has been a core principle of the EU since its foundation, as outlined in Article 45 of the TFEU. It prohibits discrimination based on nationality in employment, pay, and working conditions, allowing EU workers to accept job offers, move freely, and reside in other EU countries. Nationals from EFTA countries (Iceland, Liechtenstein, Norway, and Switzerland) also enjoy the same rights. By 2022, 3.8% of EU citizens worked in a different member state, with 1.7 million cross-border workers and 4.6 million postings recorded. Consequently, key legislation, such as Directive 2004/38/EC and Regulation 492/2011, protects workers' rights to free movement, ensuring equal treatment, social benefits, and access

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to housing. Workers also gain permanent residence after five years and family reunification rights. Posted workers, however, are regulated separately under the Posting of Workers Directive, which ensures equal pay and rights for temporary assignments abroad (European Parliament n.d.b, n.d.d).

The future of the European labour market and its policies

From the 1950s to the 2010s, the EU's approach to employment policy evolved from offering targeted aid for industrial transitions (e.g., the European Coal and Steel Community's "readaptation aid") to adopting broad economic and social goals with specific labour market targets. For example, the Lisbon Strategy of 2000 aimed to make the EU a competitive knowledge-based economy, while Europe 2020 set a target to increase labour market participation and social inclusion. Nevertheless, throughout this evolution, the EU's strategies have consistently prioritized combating unemployment (e.g., the more recent European Social Fund Plus) and improving policy coordination among member states (e.g., the European Employment Strategy and Employment Committee), particularly in response to economic challenges and shifts (European Parliament n.d.a).

These efforts culminated in the introduction of the European Pillar of Social Rights (EPSR) by the European Commission in 2017. This framework established 20 fundamental principles and rights aimed at improving living and working conditions across the EU while promoting equal opportunities for all parties involved (European Commission, n.d.b). The EPSR provides a structured approach to enhancing social standards, monitored through a "social scoreboard" that tracks progress and ensures accountability via various indicators evaluating member states' performance in crucial areas such as equal opportunities, fair working conditions, and social protection (Eurostat, 2024b).

Adapting the EU labour market to technological advancements

Recent guidelines regarding the future needs of the EU labour market have been influenced by technological advancements, green transitions, demographic shifts, and global challenges (European Commission: Joint Research Centre, 2022, pp. iv-vii). Artificial intelligence (AI) and machine learning causing job displacement, digital competencies lagging behind the economic changes and low lifelong learning participation despite the increasing life expectancy are examples of some of the most pressing issues in modern-day EU.

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In response to these challenges, the EU has prioritized both the digital and green transitions to help workers adapt to technological advancements while promoting sustainable growth. These twin transitions are closely intertwined, as the digital transformation promotes efficiency and innovation across sectors, while the green transition focuses on reducing carbon emissions and enhancing sustainability. To meet these objectives, the EU is focusing on developing skills that bridge both areas. Digital skills, ranging from basic literacy and tool use to advanced competencies like programming, data analysis, and machine learning, are essential for leveraging technology to support eco-friendly practices. At the same time, green skills, such as expertise in sustainable practices, renewable energy, and environmental management, are crucial for shaping a low-carbon economy (European Commission: Joint Research Centre, 2022, pp. 13-26). Together, these competencies are expected to prepare the European labour market for a sustainable and technologically advanced future.

The Artificial Intelligence Act of 2024 (European Parliament & Council of the European Union, 2024) serves as an example of the EU's ambitious and proactive approach to emerging technologies. The act sets out to formulate the first comprehensive law on the use of AI to regulate its adoption and protect citizens from its potential threats (European Parliament & Council of the European Union, 2024, pp. 1-2). To achieve this objective, the European Commission developed a risk-based assessment method to classify which AI systems pose little threat (e.g., spam filters), which ones should be assessed to ensure they do not infringe on any fundamental human rights or endanger citizens (e.g., CV scanning tools or critical digital infrastructure), and which systems should be banned outright (e.g., systems that exploit user vulnerabilities or manipulate human behaviour) (Future of Life Institute, 2024). Through this act, the EU aims not only to address accountability and liability issues in AI systems but also to balance the increasing productivity achieved through the adoption of autonomous technologies (e.g., robotics) with the resulting implications for the work quality, including job loss, psychological concerns, and safety risks (Eurofound, 2024, pp. 3-4).

Building a skilled workforce for the future of the EU

Regulations and directives support and work together with key initiatives, such as the EPSR implementation action plan, which establishes targets for 2030 to significantly improve employment and training outcomes across Europe. One of its key goals is to achieve an employment rate of at least 78% for individuals aged 20 to 64 to increase labour market participation and reduce unemployment. The plan seeks to broaden employment opportunities

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and ensure that a greater proportion of working-age individuals can secure and maintain meaningful work. While the COVID-19 pandemic caused a drop in employment rates across the EU, Eurostat data for 2023 indicates that not only has the EU average risen to over 75%, several countries, including Sweden and the Netherlands, have significantly exceeded the indicator, and reached 82% employment rate (Eurostat, 2024a). Unfortunately, significant disparities exist in labour market participation across the EU, with countries like Greece and Italy continuing to struggle to meet the EU averages, reporting employment rates of 67.4% and 66.3%, respectively. Achieving the goal of the action plan is expected to contribute to economic growth and stability, address income inequality, and reduce social exclusion by providing more opportunities for people to engage in the economy (European Commission, 2021a, p. 10).

Alongside the employment rate goal, the action plan also seeks to achieve at least 60% annual participation in training among adults. This is in response to the labour and skill shortages across the EU, as nearly 63% of small and medium-sized businesses report having difficulties in finding employees with the necessary skills and competencies (European Commission, 2024e). Furthermore, the European Centre for the Development of Vocational Training (Cedefop) found that subsistence farmworkers, handicraft workers, and those in printing and manufacturing are among the groups most affected by automation in their sectors, with the risk of unemployment due to automation exceeding 15% (n.d.). Similarly, in 2020, McKinsey & Company (2021, p. 18) assessed that up to 22% of current work activities may be automated by 2030. These findings highlight the need for workers to update their skills regularly to remain competitive and adaptable. By setting this target, the EPSR plan seeks to foster a culture of lifelong learning, which can enhance individuals' employability and career prospects. Furthermore, by ensuring that a significant portion of the adult population engages in training, the plan aims to support economic competitiveness and ensure that the workforce is well-equipped to meet the demands of modern industries (European Commission, 2021a, pp. 10-11).

The first two sections of the EPSR principles—equal opportunities and access to the labour market (principles 1-4), and fair working conditions (principles 5-10) —are closely related to the targets of lifelong learning promotion and high employment levels. By promoting equal access to education and training, the EPSR aims to equip individuals with the skills and knowledge necessary to thrive in the labour market. This focus on lifelong learning not only improves employability but also empowers workers to adapt to changing economic demands, ultimately leading to better job prospects and career advancement.

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The implementation of social protection and inclusion measures (principles 11-20)—such as access to healthcare, housing, and social benefits—reinforces the goal of poverty reduction. These measures are aimed at forming a safety net that helps individuals maintain a decent standard of living, especially in times of unemployment or economic instability. When combined with access to quality employment and opportunities for continuous skill development, they help individuals break the cycle of poverty and contribute to their communities. Consequently, the three sections create a system that addresses both the causes and consequences of poverty.

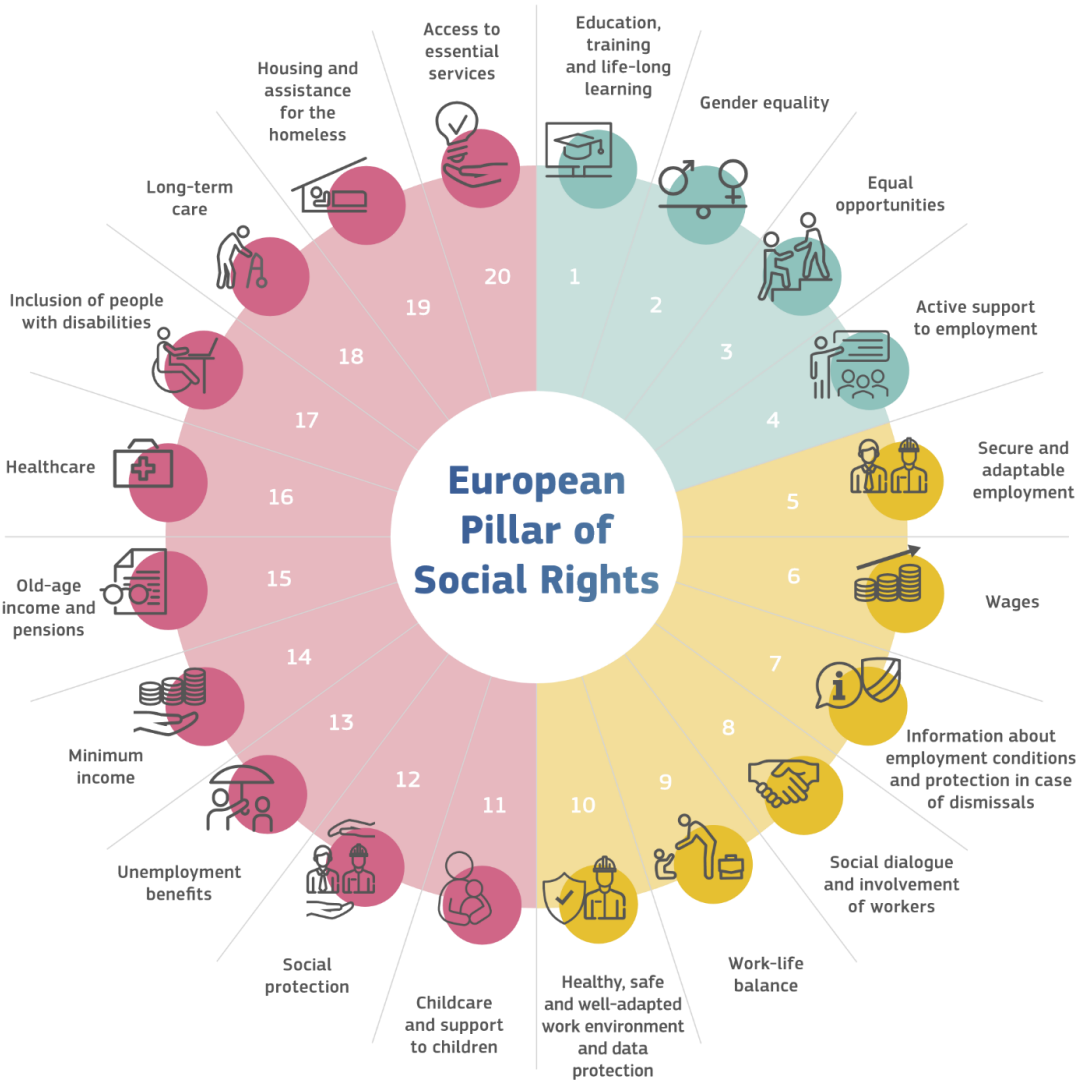

Figure 12: 20 principles of the European Pillar of Social Rights. Source: European Commission. (2021 a). European Pillar of Social Rights: Action Plan, p. 3.

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The European Social Fund Plus (ESF+) serves as the main support for the European Pillar of Social Rights and plays an important role in financing employment, education and upskilling initiatives with its €140 billion budget for the years 2021-2027. By co-funding initiatives at local, regional, and national levels, it seeks to improve the quality and quantity of jobs offered to the European workforce, while upholding and promoting the values of non-discriminatory practices and inclusivity (European Commission, n.d.c).

Fostering economic recovery and inclusion in the labour market

Aligned with the European Pillar of Social Rights is the Recovery and Resilience Facility (RRF), which, among others, supports policies aimed at reducing unemployment caused by the COVID-19 pandemic (European Parliament, 2022, pp. 2-3). Established in 2021 as part of the broader Next Generation EU recovery plan, and expected to run until 2026, the RRF is designed to provide significant financial support to EU members, combining public investments with targeted reforms. The facility addresses the severe economic disruptions caused by the pandemic, including the sharp decline in employment and economic output, while focusing on fostering a more resilient and adaptable workforce across the Union.

The RRF plays an important role in strengthening labour market conditions and addressing structural weaknesses exacerbated by the crisis. As the pandemic led to widespread job losses and economic uncertainty, the RRF was developed to ensure that member nations could implement essential reforms to bolster employment rates, enhance job creation, and improve workforce skills. One of the key elements of the RRF is its emphasis on reforms and investments that target country-specific labour market challenges, as identified through the European Semester's Country-Specific Recommendations (CSRs). These recommendations help ensure that the financial support provided by the RRF is directed toward addressing the most pressing issues in each member state, including labour market inequalities, skill mismatches, and low employment rates.

For example, the labour-related initiatives in Malta focus on providing digital learning platforms for adults, training and certifying professionals in the green and construction sectors, as well as on increasing digital readiness in SMEs to improve long term resilience (European Commission, 2024b). Similarly, Slovenia and Portugal have also made significant efforts to support the digital and green transitions. While Slovenia introduced a unified business register to enable at least 200 companies to acquire e-identities and support low-carbon start-ups by training mentors to develop sustainable business solutions (European Commission, 2024d), Portugal

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enhanced public administration accessibility for citizens and businesses through digitalization (European Commission, 2023b, p. 5; 2023a, p. 62). Slovakia, Belgium, and Italy, on the other hand, have made efforts to improve female labour participation and working conditions, as well as to support disadvantaged groups, including the Roma people (Zeitlin, Bokhorst & Eihmanis, 2023).

Equality initiatives are the centrepiece of some of the most recent plans in the EU, with the Gender Equality Strategy 2024-2029 addressing the persistent gender inequality and pay gap issues in many member nations (Council of Europe, 2024, pp. 24, 41-42). This is in response to several EU member states, including Germany and Slovakia, reporting a gender pay gap exceeding 17% (compared to the EU average of 12.7%), highlighting the shortcomings in creating a more inclusive labour market (Eurostat, 2022). As a result, the RRF serves not only as the EU's plan to mitigate the effects of the pandemic on the labour market, but also as a means to reduce the gender pay gap and address inequalities, promoting a more harmonious approach to tackling future challenges (European Commission, 2024c, pp. 5-10).

Developing competencies for a sustainable future

The needs of the labour landscape are further supported by initiatives such as the European Skills Agenda (European Commission, 2020d), the Digital Education Action Plan (DEAP) (European Commission, 2020b), and the European Green Deal (EGD) (European Commission, 2020c), which aim to address the current and future skill shortages in the EU. The European Skills Agenda outlines several quantitative indicators as objectives to be reached by 2025, with one indicator setting the goal of at least 70% of the EU population having basic digital skills, including the ability to use digital devices and communication applications to navigate online environments.

While several countries have already reached this goal (e.g., the Netherlands and Finland), other countries, such as Poland, are still not only below the goal of 70% but also below the EU average of 56% (European Commission, 2020d, p. 19; 2024a, p. 4). Nevertheless, significant progress has been made across the years, and EU members have developed several long-term strategies aimed at skills development, including the Polish Integrated Skills Strategy 2030 (Cedefop, 2021).

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Table 4:
European Skills Agenda Indicators

Indicators	Objectives for 2025	Current level (latest year available)	Percentage increase
Participation of adults aged 25-64 in learning during the last 12 month (in %)	50%	38% (2016)	+32%
Participation of low-qualified adults 25-64 in learning during the last 12 months (in %)	30%	18% (2016)	+67%
Share of unemployed adults aged 25-64 with a recent learning experience (in %)	20%	11% (2019)	+82%
Share of adults aged 16-74 having at least basic digital skills (in %)	70%	56% (2019)	+25%

Note: Data adapted from European Commission. (2020d). *European Skills Agenda for sustainable competitiveness, social fairness and resilience*, p. 19.

The development of digital skills is closely connected to the European Green Deal, which strives for carbon neutral Europe by 2050. To achieve this goal, developing green skills is essential, as the future workforce will need to be competent in sustainable technologies and practices (European Training Foundation, n.d.). Initiatives such as the Digital Education Action Plan (DEAP) seek not only to improve access to and participation in learning both digital and green skills but also to increase the availability of digital learning materials. By defining a long-term plan to educate the European workforce in the field of digital technologies, the plan will facilitate the transition to a circular economy and support the reduction of greenhouse gas emissions across the member states (European Commission, 2020b, pp. 2-4).

Conclusions

The foundational goals of the EU, as outlined in the Treaty on European Union (TEU) and the Treaty on the Functioning of the European Union (TFEU), promote a competitive social market economy, full employment, and social inclusion. However, these treaties alone cannot address the emerging challenges, such as the job loss caused by automation, low digital literacy rates, and the socio-economic impacts of the COVID-19 pandemic. In response, the EU implements strategic initiatives like the European Pillar of Social Rights (EPSR) and the Recovery and Resilience Facility (RRF) to confront these issues and build a more resilient labour market.

The EPSR has been crucial in creating a framework for fair labour markets, focusing on equitable working conditions, employment opportunities and social protection. Meanwhile, the RRF has been key in supporting post-pandemic recovery, addressing labour market disruptions, and fostering economic resilience according to country-specific recommendations. Additionally, the

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2024 Artificial Intelligence Act reflects the EU's proactive stance on managing the risks and opportunities associated with technological advancements, particularly in the field of artificial intelligence. These efforts stress the importance of developing digital and green skills to ensure the workforce can adapt to future labour market transformations.

Despite these measures, several challenges remain. Persistent gender inequalities, digital skill gaps, and varying levels of readiness across member states continue to persist. While countries like the Netherlands and Finland have made strides in achieving digital competency goals, others, such as Poland, struggle to meet the EU's targets. Furthermore, addressing the gender pay gap and enhancing inclusivity remain critical concerns in several regions.

As a result, the EU faces the task of balancing its ambitious objectives with the practical difficulties of implementation. Despite shortcomings in several sectors, the focus remains on building a labour market that is not only resilient and adaptable to technological and environmental changes but also inclusive, ensuring that all workers, regardless of background or gender, benefit from future opportunities.

REVIEW OF CURRENT POLICIES AND INITIATIVES THAT ADDRESS THE FUTURE NEEDS OF THE LABOUR MARKET BY PARTNERS COUNTRIES

Labour Policies in Belgium

Dr. Alexander van Biezen

Although Belgium has seen a lowering of unemployment in recent years due to job creation, it goes without saying that the Belgian labour market still faces a lot of challenges[22]. In order to come to grips with the current state of affairs in Belgium as to policy priorities to address these challenges pertaining to the future of an inclusive labour market, we will base ourselves on a working paper by the intergovernmental organization OECD (Organisation for Economic Co-operation and Development), *Addressing labour market challenges in Belgium* (Adalet McGowan, M., et al., 2020)[23]. This research pinpoints as one of the main challenges with regard to the future of the labour market in Belgium a coincidence of two factors: (1) regardless of recent improvements in this respect, employment rates remain low in Belgium, reflecting barriers to

[22] Belgium is divided into three regions: Flanders, Wallonia, and Brussels. This report focuses on Flanders, located in the northern part of the country. It is a Dutch-speaking region with its own government and parliament responsible for implementing policies within its jurisdiction.

[23] Related to the 2020 *OECD Economic Survey of Belgium* (see for the most recent version: OECD, 2024).

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finding a job such as low levels of skills and weak work incentives; (2) a growing awareness of the fact that the changing nature of work will require a faster adaptation of workers in general.

Drawing notably on insights from the OECD *Jobs Strategy*, the report focuses on the overall priority that each worker should have access to lifelong training, "with additional allowances targeted to disadvantaged workers" (Adalet McGowan, et al, 2020, p. 3). We want to stress the fact that the new *Jobs Strategy* considers job quality and inclusiveness as central policy priorities: "Policies and institutions that protect workers, foster inclusiveness and allow workers and firms to make the most of ongoing changes are also needed to promote good and sustainable outcomes. (Adalet McGowan et al., 2020, p. 7).

Boosting digital skills

The report recognizes the need for boosting digital skills, but recognizes that digital skills in Belgium remain relatively low, especially for some groups (Adalet McGowan et al., 2020, p. 21). The rapid spread of ICT has contributed to ICT skills shortages to a far greater extent in Belgium than in many other European countries (Adalet McGowan et al., 2020, p. 20). In 2017, only 18.2% of tertiary students in Belgium graduated in so-called STEM studies (Science, Technology, Engineering, Mathematics), well-below the OECD average of 27%. Although a large number of initiatives have been taken to increase the attractiveness of STEM studies, it is clear that such a development requires perseverance and patience.

Another policy priority is *the creation of a culture of lifelong learning*, the importance of which is further reinforced by population ageing, which increases the need to maintain skills up to date over longer working lives (Adalet McGowan et al., 2020, p. 23). This will be especially important in Belgium, as the participation in lifelong learning in Belgium (at 8.5% in 2018) is still way below the EU average of 11.1% (and certainly below the EU average target of 15% set by the *Education and Training 2020* framework) (Adalet McGowan et al., 2020, p. 27).

October 2024: new initiatives of the Flemish Government in Belgium

In Belgium there are three regions: Flanders (the Dutch-speaking northern part of Belgium), Wallonia (the French-speaking southern part of Belgium, with a German-speaking minority in the easternmost part of Wallonia), and the Region of Brussels-Capital. Apart from a federal government with national, overarching responsibilities like Defence, Social Security and Foreign Affairs, each region has its own government with regional responsibilities, amongst which

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Education and Labour. In other words, if we want to shed a light on governmental policies in Belgium with regard to education and labour, it is to the regions we must turn. For clarity's sake, we will focus on the region of Flanders, as it might be considered as indicative for the nation of Belgium as a whole for the purpose of this overview.

On 30 September 2024, a new government with Matthias Diependaele as Minister-President has been installed in Flanders which has announced quite a few new initiatives to face the current and future challenges of education and the labour market in its coalition agreement.

The *Digital Jump* in education

In 2020, the previous Flemish Minister of Education had launched the so-called Digisprong ("Digital Jump") initiative as there were many schools in Flanders having to contend with a shortfall in ICT structure and ICT skills (Dlependaele, 2024, p. 142). With the Digital Jump, a substantial amount of funding had been made available to realize the digitalization of compulsory education (primary school and secondary school), as part of the Flemish Government's Resilience Recovery Plan (Diependaele, 2024, p. 142). One of the most prominent parts of the ambitious Digital Jump program was to provide each and every pupil with a publicly funded laptop, starting from the 5th (i.e. penultimate) year of primary education up to the last year of secondary education. Although this ambitious initiative had been successfully implemented, these laptops unavoidably have a limited working lifespan, due to their intensive usage. Therefore, it is noteworthy that the new Flemish Government has announced to continue the funding of the Digital Jump program, broadening the original initiative to support teachers in the necessary professionalization of effective digital didactics (Diependaele, 2024, p. 142). In this respect, the Reference Framework for Educational Quality[24] is clarified accordingly, as it plays a pivotal role to ensure the continuation of quality of education throughout this digitalization process.

Facing the current and future challenges of the labour market

The new Flemish Government is fully aware of the current and future challenges of the labour market in Belgium, as summarized above, notably (Diependaele, 2024, pp. 23-31):

[24] The official Dutch name is 'referentiekader voor onderwijskwaliteit' (abbreviated to 'OK reference frame), see Diependaele (2024), p. 142.

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- The *demographic ageing of the population*, resulting in an increasing replacement demand in the years to come;
- A *fundamental transition of the social-economic fabric* as a consequence of climate change and the need for a society where everyone is kept on board as to digitalization;
- More specifically, *the need for increasing the employment rate of the active workforce*, as Flanders turns out to have a relatively large segment of the active workforce which is currently not employed (especially people with long-term health issues, persons with disabilities, and women with a migration background) (Diependaele, 2024, p. 23).

The strategic objective of the new Flemish Government is to augment the labour market participation by increasing the employment rate up to 80% (and possibly more), an objective which is unequivocally put forward as an absolute top priority with four distinct pillars:

- A reinforced activation of job seekers, people with long-term health issues and people not active within the labour market, thereby drilling for underutilized potential (Diependaele, 2024, pp. 25);
- Plans to continue to develop talents to increase productivity and to reinforce people's careers; (Diependaele, 2024, pp. 26-29)
- Focusing on "workable work", inclusive workplaces and a practicable, balanced combination of work and private life; (Diependaele, 2024, pp. 29-30)
- Facilitating labour migration for highly-skilled workers and bottleneck jobs (Diependaele, 2024, pp. 30-31).

The role of artificial intelligence and digital strategy

According to Diependaele (2024), the European Commission recognizes Flanders as an *innovation leader*, indicating that Flanders scores highly in integration of digital technologies within companies 99. At the same time, it is duly recognized that the technological evolution is accelerating significantly, especially with regard to artificial intelligence (AI) and data technology. To meet these challenges, the role of Agency Digital Flanders (Agentschap Digitaal Vlaanderen, n.d) is strengthened with an ambitious investment plan Flanders Radically Digital III

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(Diependaele, 2024, pp. 99–100). The existing platform MAGDA[25] will be scaled up to a Flemish Data Integration platform[26] to render this platform suitable for entering the AI era.

In order to be able to cope with the enormous acceleration of the digital transformation due to AI, a special AI expertise center will be established: Digital Flanders (Diependaele, 2024, p. 100).[27] To assist local authorities and administrations with digitalization processes, a special program Locally Digital (Diependaele, 2024, p. 100)[28] is in the making. The increased concern for digital security will be met by the creation of a Flemish Center for Digital Security (Diependaele, 2024, pp. 100-101).[29]

Labour Policies in Germany

Ewelina Barthel

Germany's labour market is undergoing significant transformations, shaped by demographic changes, economic trends, and technological advancements. The current labour policies are geared towards addressing immediate challenges such as labour shortages and skills mismatches, while anticipated future needs indicate a requirement for further adaptation in policies to ensure a sustainable workforce. This analysis will explore the key aspects of Germany's labour policies, their effectiveness concerning present conditions, and the predictions for future labour market needs up to 2035.

Germany's labour policies are primarily influenced by a dual system of vocational training that balances theoretical education with practical hands-on experience. This system has historically supported the country's strong manufacturing base and helped maintain a low unemployment rate. Current policies aim to attract skilled workers through various regulatory frameworks, supplemented by investments in education and training programs to improve the qualification levels of the workforce (Cedefop, 2024).

[25] MAGDA stands for the Dutch 'MAximale GegevensDeling tussen Administraties', i.e. maximal sharing of data between administrations.
[26] Official Dutch name: *Vlaams Data-Integratieplatform*.
[27] Offical Dutch name: *Digitaal Vlaanderen*.
[28] Official Dutch name: *Lokaal Digitaal-programma*.
[29] Official Dutch name: *Vlaams Centrum voor Digitale Veiligheid*.

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Future needs and challenges and answers of German labour policies

Skill Development

There will be a significant demand for workers to acquire new skills to adapt to evolving job roles, especially as automation continues to advance. An estimated 94 million workers (about 40% of the 2018 workforce) will require reskilling because more than 20% of their current tasks can potentially be automated. Additionally, around 21 million workers may need to switch occupations as their current roles decline (Landmann & Heumann, 2016) Skill development is a critical factor in the evolving labour market, particularly in response to rapid technological advancements and the digitization of the economy. The emphasis in future scenarios is predominantly on "lifelong learning", where the onus of skills acquisition is placed primarily on the individual workers. This means that workers must proactively seek out training opportunities to remain competitive in an increasingly digital landscape.

In the context of companies, while some organizations may provide structured training programs, a significant portion of continuing education is expected to be organized individually by employees. Consequently, there is a concern that workers in less lucrative sectors, and particularly older employees or those with lower qualifications, may struggle to keep pace with the required skill enhancements. This can lead to a widening skills gap where these groups become disconnected from the evolving job market. To address these challenges, there is a growing call for government involvement in facilitating advanced training programs. Such programs should be flexible enough to adapt to the fast-paced changes in technology while aligning with both employee needs and business requirements. The need for a balanced approach that combines personal responsibility with institutional support is vital for fostering an inclusive labour market in the future. Ultimately, the connection between skill development and employment opportunities will depend on both individual initiative and institutional frameworks that can support ongoing training throughout people's careers.

The response to the policies of the German government can be analysed through a review of several key scenarios regarding the implications of digitization, labour market dynamics, and social security. The German government's policies towards a flexible labour market have been substantial, aiming to align with the demands of digitization. The introduction of reforms, such as the unconditional basic income following the Hartz law changes, is an effort to ensure social stability amidst job losses in traditional sectors due to automation and advanced technologies. There is a notable concern around regional disparities due to the digital evolution orchestrated by the government. While some states have advanced rapidly in developing fiber-optic

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networks and digital infrastructures, others have lagged, leading to a significant divide between metropolitan areas and rural hinterlands where job opportunities are declining. The policies aimed at ensuring basic financial security have increasingly been funded through taxes, as the shift to freelance and precarious work diminishes contributions to social security systems. The social system is under considerable strain, with rising unemployment and fewer contributors, resulting in calls for reform to maintain a safety net for those left behind in the changing economy. The governance of digital infrastructure development has been questioned, suggesting that the federal government's slow pace in implementing comprehensive digital policies has created weaknesses in maintaining competitiveness. The success of industries reliant on high connectivity and skilled professionals further highlights the government's crucial role in shaping these environments. There is also a critique of the government's ability to adapt the educational system to meet the needs of a digitized economy (Landmann & Heumann, 2016). The gap in digital education between urban and rural areas continues to exacerbate employment disparities. Initiatives must be taken to enhance access to training for those impacted by digitization to bridge these gaps effectively. While the German government policies aim to transition the economy and labour market towards a digital future, significant challenges remain in ensuring equitable development across regions, sustaining social security, and adapting educational frameworks to prepare a skilled workforce. These policies must evolve to address the disparities and pressures exerted by rapid digitization and changing employment conditions (Landmann & Heumann, 2016).

Addressing Labour Shortages

By 2030, Europe may face a shortage of skilled workers as the working-age population shrinks by about 13.5 million (4%). The demand for highly skilled workers in growing sectors, such as technology and healthcare, will likely exceed supply. Therefore, attracting and retaining talent will become increasingly critical. (Garnitz, Schaller, Selleng, 2024)

According to Garnitz, Schaller, Selleng the ageing population will lead to a significant decrease in the working-age population. By 2035, many members of the baby boom generation will retire, resulting in a reduction of approximately 4.5 million people in the domestic workforce if there is no net immigration to offset this decline. This demographic shift exacerbates existing labour shortages, particularly in sectors that rely heavily on a younger workforce. There is a growing issue of misalignment between available job openings and the skills of job seekers. Many job vacancies are not suitable for the qualifications of available workers. In July 2023,

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about 43% of companies reported being affected by a lack of skilled personnel, especially in the service sector, and this problem is expected to persist, particularly as the labour market transforms due to technological advancements (Garnitz, Schaller, Selleng, 2024). Certain industries are more affected by labour shortages than others. Sectors such as healthcare, education, and technical professions are facing particularly acute shortages, driven by factors like the expansion of childcare services and the growing demand for skilled workers in digitalization and decarbonization projects (Fitzenberger, Holleitner & Kager, 2024). There has been a trend among young people to favour university education over vocational training, leading to a reduced number of applicants for skilled trades. This gives rise to a decline in the pool of qualified workers available for practical jobs, which is critical for the economy (Garnitz, Schaller & Selleng, 2024). Although immigration is identified as a potential solution to counteract labour shortages, various factors such as language barriers, skills recognition issues, and the fluctuating nature of immigration trends can limit its effectiveness. The influx of refugees does not necessarily align with the specific skill needs of the German labour market.

Addressing these challenges will require significant reforms in education, training, and labour market policies to enhance mobility, investment in digital infrastructure, and better integration of underrepresented groups in the workforce, such as older individuals and immigrants. Overall, the need for targeted actions to secure a future labour force capable of meeting the needs of a rapidly changing economy is critical (Fitzenberger, Holleitner & Kager, 2024). Fostering digital transformation is central to German market policies. There has been an emphasis on creating a robust digital infrastructure, particularly through the development of a comprehensive fiber-optic network across the country. This aims to ensure that businesses, especially in rural areas, are not left behind in a rapidly digitizing economy, which is a key factor for remaining competitive globally. The government is encouraged to support qualification measures to facilitate the transition of workers affected by structural changes. This includes providing training programs that align with evolving labour market demands and ensuring that workers, especially those from less favoured regions, have access to the skills required in a digital economy. There is a recognized necessity for policies that address social inequities that have surfaced due to these changes. The government has shifted its stance towards providing more universal social security measures like unconditional basic income, which is designed to cushion social hardships experienced by those left behind in the job market. This is part of a broader strategy to maintain social cohesion while accelerating economic development (Landmann & Heumann, 2024).

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Geographic Mobility

To meet the labour market's needs increased mobility will be essential. The labour market will require individuals to move to dynamic growth hubs, where job opportunities are concentrated. Current migration patterns indicate that such mobility is more prevalent within countries than across borders in Europe, which will affect how companies recruit talent. The future labour market in Germany faces significant challenges related to geographic mobility, exacerbated by technological advancements and regional disparities. Geographic mobility refers to the ability of the workforce to relocate to different regions for employment opportunities. (Landmann & Heumann, 2016)

In Germany, the labour market exhibits a stark contrast between thriving urban centres and struggling rural areas. Many highly skilled professionals are attracted to metropolitan regions where digital industries flourish, while rural areas suffer from a brain drain, leading to high unemployment rates and economic stagnation. This discrepancy creates a situation where vacancies in urban hubs exist alongside a surplus of labour in less favourable regions, highlighting a significant geographic mismatch between job availability and qualified applicants. The digital infrastructure plays a critical role in this dynamic. Regions with advanced connectivity and resources tend to attract talent and foster industry growth, while those lacking such infrastructure struggle to compete. This results in an uneven distribution of digital skills across the country, where booming regions invest in digital education while weaker areas lag behind, perpetuating the cycle of low mobility and economic disparity. Geographic mobility presents a critical challenge for Germany's labour market, driven by regional disparities and an increasingly digitized economy. Addressing this challenge necessitates a concerted effort from both governmental and educational institutions to facilitate better distribution of opportunities across geographical boundaries.

By supporting local enterprises and startups in rural areas, the labour market can stimulate economic growth that retains talent within these regions. Initiatives that promote local entrepreneurship can create jobs and decrease the reliance on cities for employment. This could include cultivating local networks and providing resources for small business development. Federal policies must be coordinated with regional governments to tailor approaches that cater to the unique challenges faced by different areas. An emphasis on collaboration will ensure that strategies are effective and appropriate for stimulating growth in areas that are currently lagging behind. Addressing the challenges posed by geographic mobility in the German labour market requires a multifaceted strategy that encompasses infrastructure investment, education reform, economic development, and cohesive policy-making. These efforts will enable a more

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balanced labour market that can respond effectively to future challenges. Increasing investment in infrastructure in rural areas and promoting policies that encourage relocation for jobs can help bridge the gap. Initiatives to enhance digital literacy and vocational training in underprivileged regions are essential for preparing the workforce to meet the evolving demands of the labour market, thereby enhancing geographic mobility and overall labour market effectiveness (Landmann & Heumann, 2016).

Improved Access to Jobs

There is a pressing need to enhance access to job opportunities, particularly in dynamic growth hubs. Employers may need to expand operations into lower-cost regions or offer remote working options, which could alleviate the talent shortages in rapidly growing urban areas that face housing and commuting challenges. The challenge of improving access to job opportunities is particularly evident in rapidly growing urban areas, where high demand for labour is met with significant housing and commuting obstacles. As highlighted in the scenarios, there is a recognition that employers may need to adapt their operations to address these challenges effectively. This could involve expanding business activities into lower-cost regions or implementing flexible work arrangements such as remote working options. Such strategic moves could not only alleviate talent shortages in congested urban centres but also promote a more equitable distribution of employment opportunities across different geographic areas. Booming regions benefit from a strong infrastructure and educational systems that equip workers with the necessary skills for the digital economy. In contrast, areas that have failed to embrace digital transformation or invest in necessary training find themselves lagging behind, leading to a lack of available jobs for both high and low-qualification workers and exacerbating existing inequalities. This situation calls for targeted policies that incentivize businesses to create jobs in underserved regions, ensuring a more balanced development across the labour market. Advancements in digital infrastructure are crucial for improving job access. The effective implementation of broadband networks, especially in rural and economically weaker regions, could facilitate remote working. This would not only allow employees from those regions to access jobs located in urban centres without the burden of commuting but also help businesses tap into a wider pool of talent, thereby enhancing overall productivity and support for growth. (Landmann & Heumann, 2016)

To address these challenges, a collaborative approach between government, businesses, and educational institutions is essential. Strategies could include enhancing vocational training that

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matches market needs, providing incentives for businesses to relocate or expand operations into lower-cost regions, and fostering remote work policies that enable employees to thrive regardless of their geographic location. Policymakers must recognize the urgent need to create equitable conditions that enhance job accessibility for all individuals within the labour market. (Landmann & Heumann, 2016)

The German labour market policy employs several strategies to improve access to jobs and enhance equal opportunities for all individuals. These strategies focus on both regulatory frameworks and initiatives aimed at specific groups facing barriers to employment. Firstly, the government emphasizes the need for fair and inclusive recruitment practices within companies. Organizations are encouraged to adapt their recruiting strategies and working conditions to foster participation among diverse individuals, including those from disadvantaged backgrounds. This includes the removal of unnecessary requirements that may deter potential applicants, such as rigid educational qualifications or excessive application documentation requirements. The European Commission has initiated programs to expand the talent pool by facilitating connections between employers and job seekers from third countries. This initiative also includes efforts to recognize qualifications acquired abroad more easily, broadening the scope for diverse talent in the workforce. The German government supports career guidance programs aimed at individuals to navigate the job market effectively. These programs help job seekers identify suitable job opportunities and provide information on career planning. Another approach is the focus on further education and training matched to labour market needs. This helps ensure that individuals, particularly those with lower educational qualifications or from migrant backgrounds, have access to resources that improve their employability. Flexibility in working conditions, such as adaptable working hours and locations, is promoted to accommodate the needs of individuals with caregiving responsibilities. This flexibility aims to improve job accessibility for those who might otherwise face challenges in maintaining employment due to personal circumstances (Schnaller, 2004).

Focus on Education and Training

Education systems must evolve to equip future graduates with skills relevant to the labour market. This includes promoting STEM fields, vocational training, and partnerships between educational institutions and industries. Effective career counselling and apprenticeship programs will also be vital to bridge the skills gap among the youth. (Landmann & Heumann, 2016)

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The concept of lifelong learning is increasingly emphasized. As digital transformation progresses, workers must continuously update their skills to remain relevant in a rapidly changing job market. The responsibility for ongoing education is increasingly placed on individuals, which can lead to disparities, particularly for those who are less mobile or who work in industries less impacted by digitization. Therefore, there is a call for government intervention to provide accessible training programs that align with technological changes and meet the needs of both workers and employers (Landmann & Heumann, 2016). Employers are recognizing the importance of training in enhancing workforce productivity. There is a pressing need to address the mismatch between available jobs and the skills of job seekers. This situation necessitates not only investment in new training programs but also a re-evaluation of existing ones to ensure they are effectively preparing individuals for the demands of the future labour market (Garnitz, Schaller & Selleng, 2024). The demographic shift, particularly an aging population, accentuates the need for tailored educational programs that can accommodate older workers and help integrate underrepresented groups, such as women and migrants, into the workforce. Such initiatives could mitigate the anticipated shortage of qualified labour and help improve job prospects for a broader demographic (Fitzenberger, Holleitner & Kager, 2024).

The German government has prioritized funding for digital education, instigating programs that embed digital training within the curriculum of schools. This initiative aims to ensure that students acquire necessary digital competencies from a young age, thus preparing them for the demands of the future labour market. One of the key policies is to foster a culture of lifelong learning. The German government encourages continuous education and training as vital for adapting to rapid technological advancements, ensuring workers can keep pace with industry changes. The government supports VET systems that provide practical skills through dual education, combining classroom learning with hands-on experience in the workplace. This system is designed to bridge the skills gap by creating a workforce that meets the demands of employers. The introduction of vocational training measures allows greater access to training for adults, particularly those who are unemployed or seeking to switch careers.

VET in Germany

Vocational Education and Training in Germany is characterized by its dual system, which combines theoretical classroom instruction with practical training in a workplace setting. One of the key features of VET is the Dual System Structure. The VET system is divided between schools and companies, where apprentices spend part of their time in vocational schools learning

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theoretical knowledge and the other part in workplaces gaining hands-on experience. This model ensures that students learn relevant skills that are directly applicable in the job market. VET encompasses a wide range of fields, including technology, health, and services, providing pathways for students into numerous professions. This diversity supports the need for highly-skilled professionals across different industries. The German VET system is also well-respected and recognized for producing skilled workers. Graduates often enjoy high employment rates, as companies value the practical experience gained through apprenticeships. This system has contributed to Germany's strong industrial base and economic resilience. In response to digital transformation, the curriculum in vocational training programs is continuously updated to include new technologies and practices. This adaptability helps prepare students for the future labour market, where digital skills will be increasingly essential.

Policies like Digital Strategy 2025 aim to offer government-funded training programs that align with technological advancements. The government fosters partnerships between educational institutions and industries to ensure that the training provided meets the evolving needs of the labour market. This collaboration includes developing curricula that reflect current practices in various fields, especially in technology (Landmann & Heumann, 2016).

Support for Declining Regions

Many regions may experience declining job opportunities, necessitating targeted economic development strategies to revitalize these areas. Governments will need to invest in local educational institutions and provide incentives for skilled workers to move to these regions. The support for declining regions in Germany is increasingly critical in light of future labour market needs. As the labour market transforms due to digitalization, demographic changes, and an aging population, rural and declining areas face significant challenges in attracting and retaining talent. This is partly due to a lack of investment in infrastructure and opportunities compared to booming metropolitan areas (Landmann & Heumann, 2016)

To improve the situation, there is a pressing need for enhanced digital infrastructure in declining regions. The ongoing digital divide between urban centres and rural areas hampers competitiveness and economic growth (Landmann & Heumann, 2016) High-speed internet and better digital services are necessary to enable businesses to operate efficiently and attract remote workers who are no longer tied to physical office spaces. Significant investment in broadband networks is required to ensure that these regions can compete for skilled labour. A

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strategic focus on education and training is vital for equipping residents in declining areas with the skills needed for future jobs, especially in digital sectors. Educational institutions must adapt their curricula to meet the evolving demands of the labour market, emphasizing digital skills and lifelong learning. The establishment of vocational training programs and partnerships with local industries can bridge the skills gap and provide pathways for employment in technology-driven roles. Fair labour policies encouraging mobility among workers can alleviate labour shortages in declining regions. Tailored programs that incentivize migration to less populated areas could be explored. For instance, financial support for relocation or housing in these regions may attract younger workers and families. Additionally, attracting international talent can help fill skills shortages exacerbated by the retirement of the baby boomer generation. There is a need for targeted economic support initiatives to encourage the establishment of businesses and startups in declining regions. Providing grants, tax incentives, and support for local entrepreneurship can stimulate job creation and economic revitalization in these areas. Moreover, enhancing quality of life through investments in public services, health care, and community amenities can make these regions more attractive to potential newcomers and returning residents (Landmann & Heumann, 2016).

Conclusions

The German VET system trains young people for various skilled professions through apprenticeships and formal education. This established framework aims to bridge the skills gap, ensuring that the workforce meets industry demands. Recent strategies, such as the skilled worker immigration law, are focused on attracting foreign talent to compensate for demographic declines. Encouraging high-skilled migration while facilitating integration is central to these policies. Current policies promote forms of employment that accommodate flexible working conditions, including part-time work and remote job opportunities which are increasingly favoured. Looking towards 2035, several factors will likely impact the demand for labour in Germany, necessitating adjustments in labour policies. The projected decreases in the overall labour force, with demographics indicating an aging population and declining birth rates, highlight the urgency for adaptable labour policies.

Germany's existing labour policies offer a solid foundation to address immediate labour market challenges; however, substantial strategic modifications must be undertaken to meet anticipated future demands. Collaboration between educational institutions, employers, and policymakers is crucial. With forward-thinking approaches that embrace digitalization, demographic changes,

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and evolving economic demands, Germany can secure a competent and adaptable workforce that meets the challenges of the future labour market successfully. Embracing these changes will be vital not only for economic stability but also for nurturing a resilient social fabric that accommodates the diverse needs of its populace.

This analysis highlights the critical intersections between current labour policies and anticipated labour market needs in Germany. It serves as a guiding framework for policymakers and stakeholders aiming to forge a responsive and effective labour market strategy for the future. The gap between current labour market practices and future needs is notable and poses challenges and opportunities. To better align practices and policies with anticipated changes, stakeholders must foster collaborative efforts across educational systems, industries, and policymakers. A shift towards adaptive learning, emphasis on sustainability, inclusivity, and agility in labour policies will be imperative for addressing the future workforce landscape effectively. Active measures must be taken to prepare for a labour market characterized by rapid technological advancements and dynamic economic shifts to ensure a sustainable and competent workforce for the years to come.

Labour policies in Greece

Fenia Kalantzi

Greece, as a member of the European Union, aligns its labour policies with the principles established in the European Social Charter and the EU's strategic objectives. The primary legislative framework governing employment in Greece includes the Labour Law (N. 4808/2021) (Eurofound. 2021), which addresses employment contracts, working conditions, rights, and obligations of both employers and employees, alongside various collective agreements (Συλλογικές Συμβάσεις Εργασίας) in specific sectors.

In recent years, the Greek government has recognized the critical importance of addressing technological advancements and their impact on the labour market. The ongoing digital transformation necessitates a shift in workforce skills, leading to initiatives that promote upskilling and reskilling. For example, the Labour Law (Eurofound, 2021) emphasizes the protection of workers' rights in the context of remote work, setting guidelines for teleworking arrangements, including work hours, monitoring, and data protection, thereby promoting a healthy work-life balance.

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The rise of remote work during the COVID-19 pandemic has accelerated the need for adaptable labour policies. Amendments to the Labour Law have been introduced to enhance flexibility in working arrangements, allowing employees to work from home while ensuring their rights and safety. The regulation of telework includes requirements for written agreements detailing working hours, duties, and the provision of necessary tools and equipment by employers.

Greece has launched its National Digital Strategy (Ψηφιακή Στρατηγική 2021-2025) (Digital Governance Ministry of Greece, n.d.), aiming to enhance digital literacy and skills across the population. The strategy includes initiatives to integrate digital skills into educational curricula, promoting lifelong learning and vocational training to prepare the workforce for a digitized economy.

In alignment with the EU's Digital Decade, Greece is implementing policies to advance its digital economy and infrastructure, such as European Digital Agenda (EU4Digital, n.d.). This includes investments in digital education and training programs to equip workers with skills necessary for emerging technologies, particularly in sectors such as AI, information technology, and cybersecurity.

The Greek government, in collaboration with the Ministry of Education and relevant stakeholders, has initiated various skills development programs, focusing on upskilling workers in sectors like green technologies, healthcare, and digital services. The National Employment Agency (Δημόσια Υπηρεσία Απασχόλησης)[30] offers programs targeting youth and long-term unemployed individuals to enhance their employability through training and vocational guidance.

The government has also committed to the European Green Deal, promoting sustainable development through a Green Growth Strategy (Εθνική Στρατηγική για την Πράσινη Ανάπτυξη) (Leidecker, Bulman, Levin, & Blake, 2023). This strategy identifies sectors such as renewable energy, waste management, and sustainable agriculture as crucial areas for job creation, emphasizing the need for a skilled workforce capable of adapting to green technologies.

The country has implemented Active Labour Market Policies (Αναπτυξιακή Πολιτική Απασχόλησης) (Government of Greece, 2023d)[31] aimed at improving employment

[30] See further in: https://www.dypa.gov.gr/.
[31] See further in: OECD (2024).

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opportunities for disadvantaged groups, including youth, women, and individuals with disabilities. These programs provide training and incentives for employers to hire and train individuals in high-demand sectors.

The VET system in Greece is undergoing reforms to create stronger links between education and industry needs (Government of Greece, 2023e). This includes updating curricula to emphasize STEM (science, technology, engineering, and mathematics) education and aligning training programs with labour market demands.

Greece's Recovery and Resilience Plan (European Comission, n.d.d.), in response to the COVID-19 pandemic, is focused on digital transformation and green transition. The plan allocates significant funding for projects aimed at enhancing digital skills, infrastructure development, and the promotion of sustainable jobs in the economy.

Labour policies in Italy

Chiara Cristini, Federico Bianchi, Morena Mauro

In response to the 2008 economic crisis, Italy had initiated a series of labour market reforms aimed at strengthening active policy measures (training, employment services, monitoring of income support recipients) with a focus on young people and - to some extent - women. These reforms were drawn up under the impetus of European employment strategies. The main labour market reforms in Italy, aimed at innovating the public and private systems by introducing new provisions (e.g. smart working), were the following:

- Decree-Law No 112 of 25 June 2008, No 112 (Gazzeta Ufficiale, 2008) Urgent Provisions for Economic Development, Simplification, Competitiveness, Stabilisation of Public Finance and Tax Equalisation;
- Law of 28 June 2012, No 92, Provisions on labour market reform in a growth perspective (Fornero Reform Law) (Gazzeta Ufficiale, 2012)
- Enabling act of 10 December 2014, No 183 (Jobs Act) (Gazzeta Ufficiale, 2014)

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Following the Covid Crisis 19 labour policies are closely linked to the EU Strategies and in particular:

-National Recovery and Resilience Plan ("NRRP") approved by ECOFIN Council Decision of 13 July 2021 and notified to Italy by the General Secretariat of the Council by note LT161/21, dated 14 July 2021 (Minsterio del Lavoro e dell Politice Sociali, 2020). This program includes measures and interventions to support the development and competitiveness of enterprises. Under Mission 1.1—Digitalization, Innovation, and Competitiveness of the Production System—Italy's Resilience Plan includes targeted initiatives related to Transition 4.0, along with specific plans focused on Continuous Vocational Education and Training (CVET).

The strengthening of the New Skills Fund, established in 2020, promotes training activities based on specific collective agreements with trade unions (Minsterio del Lavoro e dell Politice Sociali, 2020). The fund finances the cost of the hours spent in training, while companies are responsible for the costs of training, for which recourse to Interprofessional funds is possible. In September 2022, the decree regulating the New Skills Fund, the guiding programme for training workers employed under the National New Skills Plan, was adopted, orienting it towards supporting digital and ecological transitions. The reference framework for digital competencies will be the DigiComp (the European reference framework for digital competencies), while for competencies useful for ecological transition the Esco classification will be used. The fund covers the costs of one hundred per cent of welfare and social security contributions and 60% of the hourly wage for the hours allocated to training. The Interprofessional funds will be the privileged access channel to the New Skills Fund. For companies not participating in the Inter-professional funds, training will have to be provided by nationally or regionally accredited bodies.

The missions and lines of action of the Italian NRRP dedicated to the development of the skills of workers in enterprises (re-skilling and up-skilling) are those outlined in Mission 5C1: Reform of active policies and vocational training (Minsterio del Lavoro e dell Politice Sociali, 2020), supporting pathways for the re training and reintegration of workers in transition and the unemployed. The reform is structured in two lines of action. Firtly, the "National Programme for Workers' Employment Guarantee (GOL)" for the provision of specific services and customised vocational planning (Gazzeta Ufficiale, 2021);

Reform of active labour policies that pursues, among others, the objectives of integrating fully integrating labour policies with training policies, involving local economic operators, strengthen the tools for analysing local labour systems in order to anticipate new skills needs and thus neutralise the skills mismatch. Secondly, the 'National New Skills Plan' (up-skilling and re-skilling).

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In this sense, career guidance (career guidance), which today is a key element in the new perspectives of digital and green transitions, finds more space in the most innovative enterprises.

This Plan (PNCT), in coherence with and in addition to what is already envisaged in the context of the National Recovery and Resilience Plan (PNRR), aims to introduce mechanisms to contain and counteract the phenomenon of misalignment between supply and demand in the labour market, i.e. the mismatch between demand and supply in the labour market; the mismatch between the skills and competences required by companies and those actually possessed by the companies and those actually possessed by jobseekers or those already in employment (so-called skills mismatch), also and with particular attention to the key sectors of smart and sustainable growth, including the including the green and digital sector.

AI and digital transformation

Following the approval of the European AI Act (March 2024), the Italian government has prepared a draft law on artificial intelligence, for the introduction of AI provisions (Counseil of Ministres n. 78 dd. 23.4.2023) (Presidenza del Consiglio dei Ministri, 2024) that intends to outline the guidelines for the use of AI in various fields, from the economy to digital security, focusing on the protection of citizens and democratic values as well as supporting training on AI-related skills, especially for the younger generations.

On the other hand, it was developed the Italian Strategy for Artificial Intelligence 2024-2026 (Edited: 22/07/2024) (AgID, 2024), which outlines a detailed plan to integrate AI in various key sectors of the country. The strategy is primarily articulated along four lines: Public Administration, Business, Education and Scientific Research. In the educational sphere, the strategy envisages the introduction of educational paths that have artificial intelligence at their core at all levels, from high schools to universities, to prepare the new generations for the conscious use of these technologies. Specialised training is promoted through reskilling and upskilling programmes to update workers' skills, aligning them with the new requirements dictated by technological evolution.

There is also the MIMIT's Industry 5.0 Transition Decree (Measure PNRR M7- Investment 15 'Transition 5.0' financed by the Next Generation EU-Italy Fund) (reference), a natural evolution of Industry 4.0 and is based on the development of increasingly powerful 4.0 technologies, particularly in the areas of ICT, AI and robotics, which are leading to increasingly powerful Cyber Physical Systems (CPS) and IoT devices. Industry 5.0 is characterised by being a model of Collaborative Industry, i.e. an example of an enterprise characterised by the cooperation

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between machines and human beings, with the ultimate goal of adding value to production, creating customised products that meet consumers' needs. Article 8 of the decree provides for the possibility of economically supporting staff training activities aimed at the acquisition or consolidation of skills in technologies relevant to the digital transition of production processes (e.g. artificial intelligence and machine learning, advanced and collaborative robotics).

Finaly, Provisions for the implementation of the PNRR - Article 38 of DL 19/2024 (Transition 5.0) (AgID, 2024) were developed, where the purpose of the article in question is to support the digital transition process of enterprises in implementation of the provisions of the Ecofin Council decision and, in particular, of the provisions concerning investment 15 - Transition 5.0. The provision in question provides for the possibility for companies that invest in Transition 5.0 (and thus also in terms of artificial intelligence) to access the tax credit to support, in addition to interventions for the purchase of tangible and intangible assets, also the training of personnel aimed at the acquisition or consolidation of skills in technologies relevant to the digital transition.

Gender impact

The 2021-2026 (July 2021) (Dipartimento per le Pari Opportunità, 2021), which is inspired by the European Union's Gender Equality Strategy 2020-2025, with a long-term perspective, represents the outline of values, the direction of the policies to be implemented and the end point in terms of gender equality. The Strategy is one of the cross-cutting priorities of the National Recovery and Resilience Plan and the reference for the implementation of the Family Act reform. The plan includes incentives for the use of smart working (especially for parents) and a series of (fiscal) measures to encourage companies to promote the training of women in digital skills. In addition, it includes measures to increase the presence of women in STEM studies.

Elderly workers

The legislative decree on policies in favour of the elderly (published on the Senate website on 5 February 2024) (Gazzetta Ufficiale, 2024) is currently being discussed in Parliament. The text considers the condition of the elderly in a general sense, but deals only marginally with the participation of the elderly in employed or self-employed activities. Among the measures, there is a focus on smart working, occupational National Strategy for Gender Equality health and safety, and provides for the training of digital skills of the elderly, but especially in the use of digital services of public administrations.

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Labour policies in Malta

NCPE

Malta has established a range of labour policies and strategies to address employment needs and support workforce development in a rapidly changing environment. One of the key ones is the National Employment Strategy (2021 – 2030) (Ministry for Education and Employment, 2021), which is foundational, defining fundamental worker rights, including conditions of employment, working hours, and provisions for employee protection and representation in Malta.

Focusing on employment facilitation, the Jobsplus Act (Jobsplus Act, n.d.) provides critical employment services and reskilling programs aimed at integrating vulnerable groups into the workforce. Jobsplus is the primary national entity dedicated to enhancing employment opportunities and supporting career development. Employment & Industrial Relations Act

Malta Diġitali (2022 – 2027) (Malta Digitali, 2022) is an initiative establishes Malta's national strategy for digital transformation. It emphasizes enhancing digital skills, integrating advanced technologies, and fostering innovation to improve workforce capabilities in a digital economy.

A comprehensive strategy is the National Employment Strategy (2021 – 2030) (Government of Malta, n.d.), which assesses Malta's current labour market landscape while identifying global and local forces driving change. It highlights goals for increasing workforce adaptability, supporting job creation, and addressing skill mismatches to improve overall employment prospects.

Finally, the National Lifelong Learning Strategy (2023 – 2030) (Ministry for Education and Employment, 2023) aims to promote inclusivity and accessibility, this strategy offers a wide range of lifelong learning opportunities. It seeks to empower Malta's most vulnerable populations by enhancing skills and providing continuous educational resources to improve career readiness and quality of life.

Labour policies in Poland

Kamil Hałas

Poland's labour market has undergone significant transformations since the fall of the communist regime in 1989. Under communism, labour policies were tightly controlled by the state, limiting

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worker autonomy and relying on centralized economic planning. However, with the country's transition to a market economy and its accession to the European Union in 2004, Poland implemented comprehensive labour reforms to align with EU standards and global economic trends. The Polish Labour Code, originally enacted in 1974 (The Labour Code Act of 26 June 1974, Dz. U. 1974 No 24, item 141, as amended), has since undergone numerous amendments and remains the cornerstone of employment regulation. It governs key areas such as employment contracts, working conditions, wages, and workers' rights, and is complemented by collective agreements (pl. *Układy zbiorowe pracy*) in various sectors. Additionally, the 2007 Act on the National Labour Inspectorate (pl. *Ustawa o Państwowej Inspekcji Pracy*) (Dz.U. Review of current policies and initiatives that address the future needs of the labour market 2007 no 89 item 589, as amended) outlines the role of labour inspections in enforcing these standards.

In recent years, Poland's labour policies have increasingly focused on addressing the challenges posed by automation, digital transformation, and global economic changes. The Labour Code (The Labour Code Act of 26 June 1974) mandates employers to provide safe and healthy working conditions (Art. 207), while also defining working hours and rest periods (Art. 129-151) to protect workers across both traditional and emerging sectors. As industries embrace new technologies, legal frameworks are being reassessed to accommodate the impact of automation, digitization, and workplace restructuring. However, specific legislative measures to manage these technological shifts are still evolving, signalling an ongoing adaptation process.

Alongside these technological developments, Poland has responded to broader societal trends with significant legislative changes. For instance, in 2023, amendments to the Labour Code were implemented to align with the EU's Work-Life Balance Directive (European Parliament & Council of the European Union, 2019b). These amendments, aimed at improving work-life balance for parents and caregivers, replaced existing telework regulations with more comprehensive remote work provisions (Ministry of Family, Labour and Social Policy, 2023). New rules prohibit discrimination against remote workers, require employers to agree on the location of remote work, and oblige them to accommodate requests from specific groups, such as parents of young children and caregivers for disabled family members. Employers must also cover costs related to remote work tools and connectivity while ensuring data protection procedures are in place (Serwin, 2023). These changes reflect not only Poland's adaptation to evolving workforce needs but also a growing recognition of the benefits of flexible work arrangements. Entrepreneurs see flexible work as an effective tool for attracting and retaining talent, while also boosting employee productivity (Ministry of Economic Development and Technology, 2024). This focus on work-life balance is especially important as Poland currently ranks at the lower end of EU

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countries in this area (Dębkowska et al., 2024, p. 6). The recent amendments underscore an increasing emphasis on gender equality and accommodating the evolving needs of the modern labour market, demonstrating Poland's commitment to balancing professional and family responsibilities.

In parallel with these reforms, Poland has long been working to enhance student competencies to meet the demands of the economy, labour market, and society. Efforts have focused on adapting educational programs—both general and practical—to align with current socio-economic needs (Narodowe Centrum Badań i Rozwoju, n.d.). Building on the success of earlier initiatives such as the Operational Programme Knowledge Education Development (pl. *Program Operacyjny Wiedza Edukacja Rozwój*), which had a significant positive impact on the labour market (Sochańska-Kawiecka et al, 2024), Poland has introduced new programs like the European Funds for Social Development (pl. *Fundusze Europejskie dla Rozwoju Społecznego 2021-2027*). The aim of these funds is to facilitate the adaptation to dynamic changes in the labour market by financing projects that develop the skills and competencies of workers and job seekers (Ministerstwo Funduszy i Polityki Regionalnej, 2023, pp. 12-13). With funding from the European Social Fund Plus (ESF+) and other funds, it is possible to organize training tailored to current market needs, such as vocational courses, digital skills development programs, and green technology training. The funds also support projects aimed at reskilling and upskilling, which allows workers to effectively transition to new professional roles in response to changing economic and technological conditions.

Another key regulatory framework shaping the future of Poland's labour market is the General Data Protection Regulation (GDPR), which has been incorporated into Polish law through the 2018 Act on the Protection of Personal Data (pl. *Ustawa o ochronie danych osobowych*) (Dz.U. 2018 item 1000, as amended). The GDPR regulates how personal data is collected, processed, and used in the workplace, particularly in relation to employee monitoring and workplace automation. This legal framework plays a crucial role in ensuring that workers' privacy rights are upheld as employers adopt new technologies to enhance productivity and management.

The importance of the GDPR has grown in the context of machine learning and automation, which present both challenges and opportunities for the labour market. To address future market demands, Poland has developed strategic documents such as the Integrated Skills Strategy 2030 (pl. *Zintegrowana Strategia Umiejętności 2030*) (Ministerstwo Edukacji Narodowej, 2019) and the 2030 Human Capital Development Strategy (pl. *Strategia Rozwoju Kapitału Ludzkiego 2030*) (Ministerstwo Rozwoju, Pracy i Technologii, 2020). These plans focus on improving the

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quality of human capital and promoting education and lifelong learning (Eurydice, 2024). Such initiatives have become a priority in light of forecasts predicting rapid labour market shifts and increasing skill gaps. The growing influence of AI development and the adoption of automation may lead to the elimination of certain jobs while simultaneously creating new ones, though these new roles will often require different and more advanced skills (Ministerstwo Rozwoju, Pracy i Technologii, 2020, pp. 50-51).

Poland's labour policy concerning AI and automation focuses on the sustainable implementation of new technologies while safeguarding the labour market (Symela & Stępnikowski, 2021, pp. 21-23). Key strategies include investments in education and digital skills, legal regulations to ensure the ethical use of AI, and fostering social dialogue on the challenges posed by digital transformation (Council of Ministers, 2020, pp. 6-7). The government is actively working to transform these challenges into opportunities for economic and social growth. A pivotal document in this area is the Policy for the Development of Artificial Intelligence in Poland (pl. *Polityka dla rozwoju sztucznej inteligencji w Polsce*), which outlines the actions from 2020 to 2027. It predicts that AI and automation will significantly reshape the labour market. While short-term unemployment may arise in some sectors, the long-term effects are expected to include improved job quality and a net increase in employment, with 130 new jobs created for every 100 jobs lost (Council of Ministers, 2020, p. 13).

Efforts to help the workforce adapt to technological advancements are supported by initiatives like the Digital Competence Development Program (pl. *Program Rozwoju Kompetencji Cyfrowych*), which aims to continuously improve digital skills across all age groups—from preschool children to seniors. The program offers support to teachers, entrepreneurs, workers in various sectors, and individuals with disabilities, helping to reduce digital exclusion (Ministerstwo Cyfryzacji, 2020). It seeks to create an inclusive, modern society by promoting digital literacy and raising awareness about the safe, responsible use of technology. By 2030, the program's goals include ensuring that 80% of Poland's residents possess at least basic digital competencies, 40% have above-basic digital skills, 6% of workers are ICT specialists, and that women account for at least 29% of those specialists (Kancelaria Prezesa Rady Ministrów, 2023, p. 62). Complementing these efforts, the 2030 Integrated Skills Strategy focuses on enhancing key skills among children, youth, and adults, promoting a culture of continuous learning and increasing employer engagement in skill development and utilization. The strategy also seeks to improve learner mobility through international cooperation, ensuring that Poland's workforce remains competitive in an evolving global economy (Ministerstwo Edukacji Narodowej, 2019, p. 62).

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The Polish National Recovery and Resilience Plan (pl. *Krajowy Plan Odbudowy i Zwiększania Odporności*) (Ministerstwo Funduszy i Polityki Regionalnej, 2022), developed in response to the economic challenges posed by the COVID-19 pandemic, is a key element of the EU's Recovery and Resilience Facility (RRF). As the third-largest recipient of RRF funding, Poland is set to receive €59.8 billion in support, including €25.3 billion in grants and €34.5 billion in loans—a 69% increase over the initial allocation. The plan focuses on addressing post-pandemic labour market challenges through sustainability and technological innovation, with key investments targeting sectors such as renewable energy, the circular economy, and advanced digital technologies. Among its 55 reforms and 56 investments, 26% of the total funding is allocated to green energy projects, while 42% is dedicated to implementing the REPowerEU initiative (Sapala & Szczepański, 2024, pp. 1-2). A significant portion of the KPO is dedicated to workforce development, equipping workers with the skills necessary for a rapidly evolving economic landscape. To ensure transparency and accountability, the European Parliament will provide oversight when helping Poland emerge from the pandemic with a more resilient, future-ready workforce (Lilyanova, 2023, pp. 9-10).

Labour policies in Portugal

Sara Ramos

Regarding labour policies related to remote work, the Portuguese Labour Code already had provisions for Telework since its creation in 2009 (article 165. to 171.) (Diário da República, 2009). After the pandemics, the Portuguese Labour Code suffered the following alterations. One of the was in 2021 with the Telework Regime Alteration (Law 83/2021 of 6 December 2021) (Diário da República, 2021). Furthermore, the Right to Disconnect (Diário da República, 2021) imposed a duty on employers to refrain from contacting employees outside regular working hours. It also modified the telework regime introducing minimum conditions for the telework agreement between worker and employer. Finally, it introduced the principle of more favourable treatment for teleworking

In 2022, Visas for Digital Nomads were developed. This program has been developed for workers with professional activities carried out remotely outside national territory (Law 18/2022 of 25 August 2022) (Diário da República, 2022).

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In 2023, the Decent Work Agenda (Law 13/2023 of April 3, 2023) stands out (Diário da República, 2023). This law legislates the Right to telework, without the need for an agreement, is extended to parents of children with disabilities and chronic or oncological illnesses; the Right to telework, to part time working and to flexible time for informal caregivers; The agreement for teleworking must set the amount of compensation due to the employee for additional expenses incurred while working remotely; the presumption of an employment contract for digital platform workers; as well as tax exemption for telework expenses (up to 22€ per month or 33€ if collective bargaining is provided for).

Thus, Portugal was a pioneer in recognizing remote work, and all legal changes have been highlighted by European organizations (EU-OSHA, 2023), and are perfectly aligned with the European Commission recommendations (European Commission, 2021; European Commission, 2024f).

Considering specific policies related to working time, the Portuguese Labour Code already had provisions allowing for the following flexible work arrangements:

- Group adaptability (Articles 204.° and 206.°): definition in average terms of the normal working period for the workers covered by an instrument of collective bargaining

  The daily limit of the normal working period may be increased up to four hours and the weekly working time may reach sixty hours.

- Individual adaptability (Article 205.): definition in average terms of the normal working period for a single worker

  The daily limit of the normal working period may be increased up to two hours and the weekly working time may reach fifty hours.

- Time Bank (Article 208.): organization of working time in which the normal working period can be increased daily and weekly by an instrument of collective bargaining or a group agreement

  The daily limit of the normal working period may be increased up to four hours and the weekly working time may reach sixty hours.

- Concentrated Schedule (Article 209.): the normal weekly working period is concentrated to a maximum of four working days, increasing the daily limit of the normal working period up to four hours

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• Exemption from working hours (Article 218.): for certain situations, workers may have a working time exemption, having the right to an increment of their remuneration.

• Shift Work (Article 220.): organization of workload in which workers occupy the same jobs successively, at a given pace, including rotating, continuous or discontinuous, and may work at different times over a given period of days or weeks having the right to an increment of their remuneration.

On the other hand, Portugal recently conducted a Pilot study between 2022 and 2024, on the implementation of a four-day work week pilot in the private sector without a loss in pay and with a meaningful reduction of the working hours. The study by Gomes and Fontinha (2024). evaluated 41 companies, with over 1000 employees, that implemented organizational changes to accommodate the four day week. The final report (Gomes & Fontinha, 2024) stresses the evidence of benefits of this practice, both for workers and for organizations:

- Benefits for Workers: 95% reported a positive appraisal of the trial; better work-life balance (decrease from 46% to 17% in the percentage of workers struggling to balance work and family and from 50% to 16% in the percentage of workers struggling to balance work and personal life; and better health (decrease in exhaustion, sleep increase, reduced stress levels, reported mental health doubled from 15% to 30% and physical health increased from 20% to 27%).
- Benefits for Managers: reduced absenteeism and staff turnover; improved recruitment ability and worker commitment, benefiting team functioning, internal processes and interpersonal relationships; neutral financial impact for 80% of managers with 40% identifying savings in office expenses or in reducing some benefits.

However, we must keep in mind that all companies were voluntary in the pilot, so it was expected to have a positive tendency on the evaluation. Some organizations related as main difficulties: the re-organization of working hours; the potential HR hiring costs in organizations where activity requires the continuous provision of services (e.g., social, health, or education sectors); introduction of inequalities (implications for the calculation of meal allowances and the accounting of vacation days, with potential perceptions of unfairness between workers in/out the pilot); communication difficulties with clients and partners that remains working five days.

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Considering specific policies related to digital skills, Portugal has invested on digital competencies, showing very significant improvements as highlighted in the country report (EU-COM, 2024).

To address this need, a Digital Transition Action Plan for Portugal was developed, which includes the INCoDe project[32] and other initiatives aimed at various sectoral areas. Specifically in the area of work and skills development, here are concrete examples of Portuguese Active Labour Market Policies related to skills shortages and the green transition:

- Green Skills & Jobs: a training programme for workers and job-seekers, in order to prevent unemployment, promote job retention, provide companies with the capacity to invest in energy efficiency and decarbonisation solutions and stimulate the creation of new jobs as part of accelerating the energy transition.
- Upskill: the programme aims to retrain people - unemployed or underemployed - in the various areas of Information and Communication Technologies (ICT). It is the companies active in the national market that identify the technological areas and job vacancies, according to their actual talent needs.
- Pro Mov: a national programme that forms part of the European Reskilling 4 Employment initiative, conceived by the European Round Table for Industry, a European forum of executives whose mission is to promote competitiveness and prosperity in Europe by promoting the training of professionals for the jobs of the future through retraining and integration into the labour market.
- Pego's Fair Energy Transition Project: an initiative for the unemployed workers due to the government imposed closing of the thermoelectric power plant in a strategic partnership with Endesa, a green energy company, that will retrain workers in order to fulfil its recruitment needs.

In addition to these measures, within the framework of the Recovery and Resilience Plan, the Investment TD-C16-i01: Digital Empowerment of Enterprises was developed (reference). The objectives of the measure are to increase the digital skills of the employed workforce, including employees and managers, with a particular focus on enterprises in the industry, commerce,

[32] See further in: (https://www.incode2030.gov.pt/).

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services, tourism and agriculture sectors, in order to increase the number of digitally skilled workers and improve the competitiveness and resilience of enterprises, thereby also contributing to maintaining and creating jobs. According to the Council of the European Union (2021, p. 144), this investment shall help increase the number of skilled jobs in existing companies and foster the creation of new businesses. The investment shall consist of two interlinked training programmes that shall be set up to address gaps in the digital skills of workers (employees and managers) and businesses. The investment is expected to influence new policies and to contribute to the development of lifelong vocational skills and training practices. The investment is also expected to improve the ability of companies to face challenges and seize the opportunities brought by technology.

Two actions are included:

- Academy Portugal Digital: with the target to reach 800 000 participants in online, blended, and face to face digital skills training;
- Employment + Digital 2025: with the target to offer to 200 000 participants a deeper face to face and blended digital skills training. The programme consists of four measures:
- Employment + Digital Training for all workers
- Training + Digital Voucher to which recipients can apply directly
- Trainer + Digital for training trainers
- Leader + Digital for managers

The implementation of the investment shall be completed by 31 September 2025.

Respecting specific policies regarding equality, Portugal has its National Strategy for Equality and Non-Discrimination 2018-2030 (Resolution of the Council of Ministers No. 61/2018) (Diário da República, 2018a), a Notification by the National Authority for Labour Conditions of companies (with more than 50 workers) that report significative gender differences on wages: a financial top-up and/or priority in the access to employment measures for certain groups:

- Sub represented gender in the job
- People with disabilities
- Youngsters
- Long term unemployed people

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The Initiative "Engineers for one day" (Diário da República, 2018b) [33], aims to incentive girls to choose technologies courses

Labour policies in Slovenia

Dr. Nadia Molek (FOŠ)

Labour market challenges in Slovenia

The current labour market in Slovenia is facing a variety of challenges, with significant impacts stemming from broader global trends such as digitalization and demographic shifts. One of the key issues is a mismatch between the skills available in the labour force and the demands of an increasingly digital and service-oriented economy. As Slovenia adapts to the rapid pace of technological advancement, there is a growing need for workers with digital skills, particularly in the context of Industry 4.0, which emphasizes the integration of AI, automation, and digital competencies into the workforce (Cedefop, 2020).

A significant challenge lies in the aging population, which further complicates labour shortages. This demographic trend means that Slovenia will face an increasingly constrained workforce, putting additional pressure on both the private and public sectors to fill gaps in critical skill areas, especially in STEM fields. Although Slovenia has a highly educated workforce, its relatively small pool of specialists in fields such as information and communication technology (ICT) means that further efforts are needed to meet future labour market demands (OECD, 2020).

On the other hand, the Slovenian government has recognized the need to improve the digital skills of both the current workforce and future generations. Educational reforms aimed at integrating digital literacy and other key competencies into the school curriculum are ongoing, with vocational education and training (VET) programs playing an essential role in this transition (Cedefop, 2020).

Another major challenge is ensuring equitable access to these emerging opportunities, as there remains a risk of widening inequality between high-skilled and low-skilled workers, particularly as automation replaces certain routine jobs. To counter these trends, Slovenia is focusing on

[33] More information at: https://engenheirasporumdia.pt/.

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lifelong learning initiatives, as well as policies that encourage continuous professional development (OECD, 2020).

Current Policies on the "Future Needs of the Labour Market" in Slovenia

Slovenia, as a member of the European Union, adheres to the basic principles outlined in the European Social Charter. Its labour regulatory framework is primarily governed by the Employment relationship act (*Zakon o delovnih razmerjih* - ZDR-1) (Uradni list RS, št. 21/13, 78/13, 2013), the core legislation governing employment contracts, working hours, wages, and other fundamental aspects of the employer-employee relationship, in connection with diverse collective agreements according to sector (*Kolektivne pogodbe*) and The Act on Labour Inspection (*Zakon o inšpekciji dela* - ZID-1) (Uradni list RS, št. 19/14 in 55/17, 2014).

While the Slovenian labour regulatory framework does not explicitly address technological advances in detail, several provisions are relevant. Like many other European nations, is actively working to align its labour market policies with anticipated needs linked to the digitization of work. For example, The Employment Relationship Act places a duty on employers to provide a safe and healthy working environment (ZDR – 1). The same act sets limits on working hours and provides for rest periods. Trade unions and employers' organizations negotiate collective agreements by sector (*Kolektivne pogodbe*) addressing specific issues related to technological advancements, such as the introduction of new technologies or the impact on jobs, as well as protecting workers from potential job displacement due to automation.

One central policy relevant to the use of technology in the workplace, particularly in terms of employee monitoring and data collection is the General Data Protection Regulation (ZVOP-2) (Uradni list RS, št. 163/22, 2014). This regulation governs the protection of personal data by establishing obligations, principles, and procedures to ensure the lawful and justified processing of personal data, safeguarding individuals' privacy, dignity, and data self-determination. It also sets rules for the free movement of personal data while ensuring compliance with constitutional rights. On the other hand, Slovenia is been active in the implementation of the European Artificial Intelligence Act from the beginning (Gov.si, 2024d).

The rise of AI and automation, combined with the global shift toward remote work during the COVID-19 pandemic, has accelerated the need for flexible work arrangements in Slovenia. National policies have been adapted to accommodate these changes, with a particular emphasis on work-life balance, telecommuting, and the digital economy. One of these updates has been the Amendments to the Labour Market Regulation Act (*Zakon o delovnih razmerjih*)

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(Uradni list RS, št. 114/23, 2023), aligning national legislation with EU requirements. In response to changing work trends, Slovenia has introduced amendments to its labour law to support flexible work arrangements, which must be clarified by the employer with Homeworking rules. These amendments promote flexible working hours, telework, remote work initiatives and the use of digital tools to facilitate remote work (Articles 68 to 72). Under the Slovenian ZDR-1 labour law, work from home is defined with the following key elements Workplace Location, Working Hours, Scope of Work and Work Equipment. The law stresses, that work can be performed either at the employee's home or at a location chosen by the employee, with approval from an inspector, ensuring the work is not hazardous. The employer and employee must agree on specific working hours, including breaks and rest periods. Alternatively, they may agree on different terms according to Article 157 of ZDR-1. Both parties must define whether the work will be performed entirely at home, partially, or on specific days, allowing for flexibility in scheduling. If the employee uses personal equipment, the employer must compensate them. Otherwise, the employer is responsible for providing the necessary tools for home-based work.

The Amendment of the Employment Relationships Act (Uradni list RS, št. 114/23, 2023), looks to improve working conditions by promoting greater transparency and predictability in employment. Additionally, the amendments aim to enhance worker access to information about their employment terms, while maintaining flexibility and the right to work-life balance in the labour market (Gov.si, 2023). It also provides safeguards against unjustified dismissals and ensures that workers are given fair compensation. The amendment mandates that employers invest in the retraining of workers.

In 2024, the Right to Disconnect (amendment ZDR-1D) (Uradni list RS, št. 114/23, 2023)) was adopted, which, starting from November 16, 2024, grants workers the right to ensure that their employer does not interfere with their free time during daily or weekly rest periods, annual leave, or other justified absences from work (Gov.si, 2024c).

One key Slovenian initiative that respond directly to the rise of automation and AI, digital transformation is the "Slovenian Digital Strategy" (*Krovna strategija digitalne preobrazbe Slovenije do leta 2030*) (Vlada Republike Slovenije, 2023). It is a is the overarching strategic document, aligned with the European Union's Digital Compass for 2030, aims to develop digital skills across the population. It emphasizes the importance of lifelong learning and continuous reskilling to enhance the adaptability of workers. The strategy focuses on digital literacy as a core competency, ensuring that workers at all levels, from manual labour to technical and

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managerial roles, can adapt to the digitization of industries. The strategy outlines the importance of equipping the workforce with the skills necessary to work alongside AI and automated systems. Key areas include promoting digital skills through formal education, vocational training, and lifelong learning, supporting research and development (R&D) in AI and robotics to create high-value jobs, fostering collaboration between businesses, educational institutions, and government bodies to ensure that digital skills align with industry needs.

Smart Specialization Strategy (*Slovenska strategija pametne specializacije*) (Gov.si, 2024b) prioritizes sectors where Slovenia can develop a competitive edge, many of which are closely related to automation, AI, and robotics. It's focus on automation technology is coupled with initiatives to ensure that workers in traditional industries, such as manufacturing, are reskilled for emerging jobs in automated industries.

There are also national labour programs focus on improvement of employability, particularly for the long-term unemployed and disadvantaged groups (Active Employment Policy Programs (*Aktivna politika zaposlovanja*, APZ) (Gov.si, 2024a), a program that includes various incentives focused on future skills and training such as information technology, green jobs, and healthcare designed to improve employability. The Active Ageing Strategy (*Ukrepi za spodbujanje aktivnega staranja*) (Ministrstvo za delo, družino, socialne zadeve in enake možnosti, 2016), focuses on extending the working life of older employees through various measures, such as adapting workplaces, offering reskilling opportunities for older workers. The Youth faster entry into the labour market Project (*Hitrejši vtop mladih na trg dela*) (Zavod RS za zaposlovanje, 2024) focuses, among other things, on providing young people with skills that match the needs of emerging industries, particularly in the digital and green economy sectors.

On the other hand, the Slovenian government, together with relevant stakeholders such as various ministries, the Employment Service of Slovenia (ESS), and employers' organizations, has recognized the critical role that education plays in preparing the future workforce. In alignment with European Union guidelines, Slovenia has been modernizing its VET system to offer more flexible and modular courses (CPI, n.d.). These reforms aim to create stronger links between education providers and employers, ensuring that the curriculum reflects current industry demands. There is a particular focus on STEM (science, technology, engineering, and mathematics) subjects and promoting technical as well as AI literacy. Additionally, recognizing that the pace of technological change requires constant adaptation, the government supports lifelong learning initiatives (Eurydice, 2024). These include adult education programs, online

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learning platforms, and partnerships between universities and industries to offer tailored reskilling programs.

The European Green Deal and the Digital Decade initiative have greatly influenced Slovenia's national policies, with the understanding that future labour market needs will be shaped by sustainability and technological innovation. Slovenian Industrial Strategy 2021–2030 is an approach that emphasizes the need for sustainable growth and job creation in the green and digital economies (Gov.si, 2022). It identifies key sectors, such as renewable energy, circular economy practices, and advanced manufacturing, which will require skilled workers trained in both traditional and emerging fields. The strategy includes incentives for businesses to invest in workforce development, particularly in green technologies and smart industries. Furthermore, , aligned with the EU's Next Generation EU recovery package, includes substantial funding for projects that aim to promote digital transformation and the green transition (Gov.si, 2024e). Investments are being made in digital infrastructure, renewable energy projects, and smart mobility solutions, all of which will require workers with new skills in digital and green technologies.

Considering gender equality, Slovenia has made significant progress in establishing a legislative framework that promotes equal opportunities for all genders. The Act on Equal Opportunities for Women and Men (*Zakon o enakih možnostih žensk in moških*) was adopted in 2002 (Uradni list RS, št. 59/02, 110/06, 50/14, 2002a), providing a foundation for gender equality policies and aiming to eliminate discrimination. Additionally, the Parental Protection and Family Benefits Act (*Zakon o starševskem varstvu in družinskih prejemkih*) (Uradni list RS, št. 110/06, 2006) supports balanced participation in family life, allowing both parents to share responsibilities more equally. Slovenia has also implemented the Equal Opportunities Act (*Zakon o enakih možnostih*) (Uradni list RS, št. 59/02, 110/06, 50/14 (2002b) to further enforce gender equality across public and private sectors, including employment, education, and political representation (Uradni list RS, št. 59/02, 110/06, 50/14). These laws align with EU directives.

Labour policies in Sweden

Ieva Ugne Ulianskaite

Sweden has established itself as a leader in creating forward-thinking labour policies, grounded in a strong legislative framework that emphasises the wellbeing of its workforce. In response to

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rapid technological advancements, particularly the integration of AI, automation, and digitization, the Swedish government has developed comprehensive strategies that address both the opportunities and challenges these changes bring. In addition to the paper Workspaces with Heart: Envisioning the Human-Centric Evolution this text aims to elaborate on Sweden's key policies concerning work and technological advancements, with a particular focus on the Work Environment Act (SFS 1977:1160) and the Government's Work Environment Strategy 2021–2025. These documents form the framework through which Sweden is adapting its labour market to meet the demands of a rapidly evolving technological landscape.

The Legal Framework: The Work Environment Act (1977:1160)

The Swedish Work Environment Act (SFS 1977:1160) serves as the cornerstone of labour policies in Sweden, ensuring that workplaces are safe and healthy. Originally introduced in 1977, the Act has evolved to address modern workplace challenges, including those arising from technological advancements. Its key provisions highlight:

General Responsibilities for Employers and Employees: Employers are obligated to organise work in a way that prevents accidents, injuries, and illnesses. With the rise of AI and automation, these responsibilities now include managing risks related to new technologies. The Act mandates that employers assess technological risks, whether from automated systems or the use of AI in monitoring employee performance.

Psychosocial Work Environment: The Act places equal importance on psychosocial factors as it does on physical safety. In today's rapidly digitising world, constant connectivity and fast-paced technological changes can lead to increased stress and mental health challenges for workers. The Act encourages employers to mitigate these risks by fostering a supportive psychosocial work environment.

Employee Participation: Employees have a right to participate in decisions concerning their work environment, particularly when new technologies are introduced. Worker participation ensures that technologies such as AI are implemented transparently and in a manner that minimises risks and enhances collaboration.

The Work Environment Act continues to provide a flexible legal framework capable of adapting to new challenges posed by technological advancements. As the pace of change accelerates, there may be a need for ongoing revisions, particularly in areas such as data privacy, AI monitoring, and the use of automated decision-making systems in workplaces.

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The Government's Work Environment Strategy 2021–2025

To complement the legislative framework, the Government's Work Environment Strategy 2021–2025 (Löfven et al. 2021) addresses emerging challenges linked to technological advancements, with a focus on digitalization. The strategy outlines four key priority areas:

- Sustainable Working Life for All Ages: As technology transforms industries, the strategy emphasises the importance of creating a sustainable work environment for workers across all age groups. Ensuring that older workers are not disproportionately affected by technological changes is a priority, and lifelong learning is encouraged to help all employees remain competitive in an increasingly digital labour market.
- Psychosocial Health and Work-Related Stress: The increased use of digital tools and AI monitoring can lead to higher levels of stress and a diminished work-life balance. The strategy addresses these risks by encouraging employers to implement measures that support mental health, including the right to disconnect and clearer boundaries between work and personal time.
- Safe and Inclusive Workplaces: The strategy emphasises that technological advancements must not compromise workplace safety. AI and automation should enhance safety rather than introduce new risks. The involvement of workers in shaping the integration of these technologies is critical to promoting an inclusive and transparent process.
- Innovation and Adaptation in the Work Environment: The strategy encourages employers to innovate and adapt their work environments in response to technological changes. Flexible working arrangements, such as remote work, are promoted, but employers must ensure that these innovations align with the core principles of workplace safety and health.

Managing Technological Advancements in the Workplace

Sweden's approach to managing technological advancements in the workplace is characterised by a proactive stance. The Work Environment Strategy (Löfven et al. 2021) recognizes both the benefits and risks of technologies such as AI, automation, and digital tools, focusing on the following areas:

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- Job Displacement and Automation: Automation offers increased efficiency, but there are concerns about its potential to displace jobs, especially in sectors reliant on manual or routine tasks. The Work Environment Strategy encourages employers to adopt measures that anticipate these disruptions, including workforce retraining and reskilling programs. These initiatives aim to ensure that workers displaced by automation can transition into new roles, particularly in industries requiring advanced digital and technical skills.
- Health and Safety in a Technological Workplace: As workplaces become more reliant on robotics, AI, and other forms of automation, ensuring the health and safety of workers remains paramount. The Work Environment Act requires employers to assess the risks associated with new technologies and take steps to protect workers from both physical and mental health hazards. Preventing over-reliance on automated systems, which can diminish human oversight, is also a critical consideration for workplace safety.
- Psychosocial Impacts of AI and Automation: The psychosocial impacts of technological advancements, such as stress from constant connectivity and fears of job displacement, are central concerns within Swedish labour policies. The Work Environment Strategy encourages employers to mitigate these risks by allowing employees more control over how new technologies are used in their roles and ensuring that these tools enhance, rather than replace, human capabilities.

Lifelong Learning and Skills Development

A cornerstone of Sweden's response to technological advancements is its focus on lifelong learning and skills development. As technology evolves, the need for workers to continuously update their skills has become crucial for maintaining employability and competitiveness. The Work Environment Strategy 2021–2025 (Löfven et al. 2021) explicitly supports lifelong learning initiatives, promoting collaboration between employers, educational institutions, and government agencies to provide workers with the skills they need for a digitised labour market.

The strategy also emphasises the need for skilling and reskilling programs to help workers transition from roles that are becoming obsolete due to automation. Upskilling initiatives ensure that workers can meet the demands of emerging industries such as AI, robotics, and data analysis.

On the other hand, lifelong learning is not only aimed at younger workers but is equally essential for older employees who may need to adapt to new technologies. The strategy promotes

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inclusive policies that ensure all workers, regardless of age or current skill level, have access to education and training.

Flexible and Remote Work in a Digitalized Labour Market

The COVID-19 pandemic significantly accelerated the adoption of remote and flexible work arrangements. Sweden has embraced these changes, incorporating them into its labour policies through the Work Environment Strategy 2021–2025 (Löfven et al. 2021). While flexible work arrangements offer many benefits, including improved work-life balance and increased job satisfaction, they also introduce challenges related to isolation, stress, and workplace safety.

Employer Responsibility: The Work Environment Act mandates that employers remain responsible for the health and safety of employees, even in remote work settings. This includes ensuring that remote workers have access to ergonomic equipment and work conditions conducive to both physical and mental health.

Managing Work-Life Balance: The strategy emphasises the need for a careful balance between flexibility and regulation to ensure that remote workers do not face greater risks of burnout or reduced job security. Measures such as the right to disconnect and clearly defined working hours help protect workers' wellbeing.

Sweden's approach to labour policies in the context of technological advancements reflects its long-standing commitment to worker welfare and progressive labour practices. Through the Work Environment Act (SFS 1977:1160) and the Government's Work Environment Strategy 2021–2025 (Löfven et al. 2021), the Swedish government has established a comprehensive framework that addresses the challenges posed by automation, AI, and digitalization while promoting a safe, inclusive, and innovative labour market.

By prioritising lifelong learning, worker participation, and mental health, Sweden ensures that its workforce remains competitive and healthy in a rapidly changing technological landscape. As the country continues to adapt to the future of work, its policies offer a model for balancing technological innovation with the need to protect and empower workers in a dynamic labour market.

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References

1. AgID. (2024). *Italian strategy for artificial intelligence 2024-2026*. Retrieved from https://www.agid.gov.it/sites/agid/files/2024-07/Italian_strategy_for_artificial_intelligence_2024-2026.pdf
2. Cedefop. (2020). *Slovenia: Skills forecast up to 2030. European Centre for the Development of Vocational Training*. https://www.cedefop.europa.eu/en/country-reports
3. Cedefop. (2021). Poland: integrated skills strategy 2030. European Centre for the Development of Vocational Training. https://www.cedefop.europa.eu/en/news/poland-integrated-skills-strategy-2030
4. Cedefop. (n.d.). *Automation risk for occupations. European Centre for the Development of Vocational Training*. https://www.cedefop.europa.eu/en/tools/skills-intelligence/automation-risk-occupation
5. Cedefop European Centre for the Development of Vocational Training. (2024). *2023 skills forecast: Germany*.
6. Council of Europe. (2024). *Council of Europe Gender Equality Strategy 2024-2029*. https://isotita.gr/wp-content/uploads/2024/06/Council-of-Europe-Gender-Equality-Strategy-2024-2029.pdf
7. Council of Ministers. (2020). *Policy for the development of artificial intelligence in Poland from 2020*.
8. Council of the European Union. (2021). *Council implementing decision: Revised annex to the council implementing decision on the approval of the assessment of the recovery and resilience plan for Portugal*. Retrieved from https://recuperarportugal.gov.pt/wp-content/uploads/2021/12/Revised-Annex.pdf
9. Dębkowska, K., Kłosiewicz-Górecka, U., Szymańska, A., Wejt-Knyżewska, A., & Zybertowicz, K. (2024). *Work-life balance a elastyczne formy organizacji pracy*. Polski Instytut Ekonomiczny. https://pie.net.pl/wp-content/uploads/2024/04/PIE-Raport_work-life-balance_2024.pdf
10. Diário da República. (2009). *Código do Trabalho - CT, Lei Nr. 7/2009 [12.2.2009]*. Retrieved from https://diariodarepublica.pt/dr/legislacao-consolidada/lei/2009-34546475-175393764
11. Diário da República. (2018a). *Resolução do Conselho de Ministros Nr. 61/2018, de [21.5.2018]*. Retrieved from https://diariodarepublica.pt/dr/detalhe/resolucao-conselho-ministros/61-2018-115360036
12. Diário da República. (2018b). *Resolução do Conselho de Ministros Nr. 61/2018: National Strategy for Equality and Non-Discrimination*. Retrieved from https://diariodarepublica.pt/dr/detalhe/resolucao-conselho-ministros/61-2018-115360036
13. Diário da República. (2021). *Lei Nr. 83/2021, [6 December 2021]*. Retrieved from https://diariodarepublica.pt/dr/detalhe/lei/83-2021-175397114
14. Diário da República. (2022). *Lei Nr. 18/2022, [25 August 2022]*. Retrieved from https://diariodarepublica.pt/dr/detalhe/lei/18-2022-200268064
15. Diário da República. (2023). *Lei Nr. 13/2023, [3 April 2023]*. Retrieved from https://diariodarepublica.pt/dr/detalhe/lei/13-2023-211340863

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

16. Diependaele, M. (2024). *Vlaanderen Radicaal Digitaal*. Vlaamse Regering.

17. Digital Governance Ministry of Greece. (n.d.). *Digital decade national roadmap*. Retrieved from https://digitalstrategy.gov.gr/website/static/website/assets/uploads/digital_decade_national_roadmap.pdf

18. Dipartimento per le Pari Opportunità. (2021). *Strategia nazionale per la parità di genere 2021-2026*. Retrieved from https://www.pariopportunita.gov.it/it/politiche-e-attivita/parita-di-genere-ed-empowerment-femminile/strategia-nazionale-per-la-parita-di-genere-2021-2026/

19. ECOFIN. (2021, July 13). *Council Decision of 13 July 2021 "National Recovery and Resilience Plan (NRRP)"*. https://www.mef.gov.it/en/focus/The-National-Recovery-and-Resilience-Plan-NRRP/

20. EU4Digital. (n.d.). *A digital agenda for Europe*. Retrieved from https://eufordigital.eu/library/a-digital-agenda-for-europe/

21. EU-COM (2024). *Digital Decade 2024 report: Country fact pages*. https://digital-strategy.ec.europa.eu/pt/factpages/digital-decade-2024-report-country-fact-pages

22. EU-OSHA. (2023). *Regulating telework in a post-COVID-19 Europe: Recent developments*. European Agency for Safety and Health at Work.

23. EU-OSHA. (n.d.a). *Directive 89/391/EEC - The OSH framework directive. EU-OSHA*. https://osha.europa.eu/pl/legislation/directives/the-osh-framework-directive/1

24. EU-OSHA. (n.d.b). *Directive 2004/37/EC - carcinogens, mutagens or reprotoxic substances at work*. EU-OSHA. https://osha.europa.eu/pl/legislation/directive/directive-200437ec-carcinogens-or-mutagens-work

25. EUR-Lex. (n.d.). *Employment and social policy*. EUR-Lex. https://eur-lex.europa.eu/summary/chapter/employment_and_social_policy.html?root_default=SUM_1_CODED%3D17

26. Eurofound. (2024). *Human–robot interaction: What changes in the workplace?* Publications Office of the European Union.

27. Eurofound. (2021). *Greek Law No. 4808/2021 on digital platform work*. Retrieved from https://apps.eurofound.europa.eu/platformeconomydb/greek-law-no-48082021-105256

28. European Commission. (2010). *Europe 2020: A strategy for smart, sustainable and inclusive growth*. https://ec.europa.eu/eu2020/pdf/COMPLET EN BARROSO%20%20007 - Europe 2020 - EN version.pdf

29. European Commission. (2020a). *Digital Agenda for Europe*. Retrieved from https://digital-strategy.ec.europa.eu/en/policies/digital-agenda

30. European Commission (2020b). *Digital Education Action Plan 2021–2027*. Retrieved from https://education.ec.europa.eu/sites/default/files/document-library-docs/deap-communication-sept2020_en.pdf

31. European Commission. (2020c). *European Green Deal*. Retrieved from https://ec.europa.eu/green-deal

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

32. European Commission. (2020d). *European Skills Agenda for sustainable competitiveness, social fairness and resilience*. Retrieved from https://migrant-integration.ec.europa.eu/sites/default/files/2020-07/SkillsAgenda.pdf

33. European Commission. (2021a). *European Pillar of Social Rights: Action Plan*. Retrieved from https://op.europa.eu/webpub/empl/european-pillar-of-social-rights/downloads/KE0921008ENN.pdf

34. European Commission. (2021b, December 9). *Proposal for a directive of the European Parliament and of the Council on improving working conditions in platform work* (COM (2021) 762 final).

35. European Commission. (2023a). *Annex to the Report From the Commission to the European Parliament and the Council on the Implementation of the Recovery and Resiliency Facility: Moving forward*. Retrieved from https://commission.europa.eu/document/download/b4915978-f42f-4fc1-a882-310844bb6816_en?filename=COM_2023_545_1_annex1-2-of2_EN.pdf&prefLang=pt

36. European Commission. (2023b). *Recovery and Resilience Facility: 30th RRF Working Group meeting*. Retrieved from https://commission.europa.eu/document/download/1647588c-9905-4b67-a4d1-251ca0d60aae_en?filename=The-RRF-2-years-on_en.pdf

37. European Commission. (2024a). *Digital Decade Country Report 2024*: Poland.

38. European Commission. (2024b). *Malta's Recovery and Resilience Plan*. Retrieved from https://commission.europa.eu/document/download/db4de0ff-6cf7-452c-9f5a-761fb891e788_en?filename=Recovery_and_resilience_FS_MT.pdf

39. European Commission. (2024c). *Mid-term evaluation of the Recovery and Resilience Facility*. Retrieved from https://commission.europa.eu/document/download/17c82840-518c-4c3d-ba98-7dae436b3a70_en?filename=SWD_2024_70_1_EN_autre_document_travail_service_part1_v4.pdf

40. European Commission. (2024d). Slovenia's Recovery and Resilience Plan. Retrieved from https://commission.europa.eu/document/download/d32781cc-e58c-4f8a-9fe5-adb40431f0b0_en?filename=Recovery_and_resilience_FS_SI_0.pdf

41. European Commission. (2024e, March 20). *Tackling labour and skills shortages in the EU*. Retrieved from https://commission.europa.eu/news/tackling-labour-and-skills-shortages-eu-2024-03-20_en

42. European Commission. (2024f, April 30). *First-phase consultation of social partners under Article 154 TFEU on possible EU action in the area of telework and workers' right to disconnect* (COM(2024) 2990 final).

43. European Commission (n.d.a). *European Semester*. European Commission. Retrieved from https://commission.europa.eu/business-economy-euro/european-semester_en

44. European Commission. (n.d.b). *What are the 20 principles of the European Pillar of Social Rights?* (easy-to-read version). European Commission. Retrieved from https://ec.europa.eu/social/main.jsp?catId=1567&langId=en

45. European Commission. (n.d.c). *What is ESF+? European Social Fund Plus*. Retrieved from https://european-social-fund-plus.ec.europa.eu/en/what-esf

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

46. European Commission. (n.d.d.). *Greece's recovery and resilience plan*. Retrieved from https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility/country-pages/greeces-recovery-and-resilience-plan_en

47. European Commission: Joint Research Centre. (2022). *Towards a green & digital future : key requirements for successful twin transitions in the European Union*, Publications Office of the European Union. Retrieved from https://data.europa.eu/doi/10.2760/977331

48. European Parliament. (2022). *Gender equality in the Recovery and Resilience Facility* (EPRS Briefing No. 698757). Retrieved from https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698757/EPRS_BRI(2021)698757_EN.pdf

49. European Parliament. (n.d.a). *Employment policy. European Parliament*. Retrieved from https://www.europarl.europa.eu/factsheets/en/sheet/54/employment-policy

50. European Parliament. (n.d.b). *Free movement of workers. European Parliament*. Retrieved from https://www.europarl.europa.eu/factsheets/en/sheet/41/free-movement-of-workers

51. European Parliament. (n.d.c). *Health and safety at work. European Parliament*. Retrieved from https://www.europarl.europa.eu/factsheets/en/sheet/56/health-and-safety-at-work

52. European Parliament. (n.d.d). *Posting of workers. European Parliament*. Retrieved from https://www.europarl.europa.eu/factsheets/en/sheet/37/posting-of-workers

53. European Parliament. (n.d.e). *The fight against poverty, social exclusion, and discrimination. European Parliament*. Retrieved from https://www.europarl.europa.eu/factsheets/en/sheet/60/the-fight-against-poverty-social-exclusion-and-discrimination

54. European Parliament. (n.d.f). *Workers' right to information, consultation, and participation. European Parliament*. Retrieved from https://www.europarl.europa.eu/factsheets/en/sheet/57/workers-right-to-information-consultation-and-participation

55. European Parliament & Council of the European Union. (2019a). *Directive (EU) 2019/1152 of the European Parliament and of the Council of 20 June 2019 on transparent and predictable working conditions in the European Union. Official Journal of the European Union. EUR-Lex*. https://eur-lex.europa.eu/eli/dir/2019/1152/oj

56. European Parliament & Council of the European Union. (2019b). *Directive (EU) 2019/1158 of the European Parliament and of the Council of 20 June 2019 on work-life balance for parents and carers and repealing Council Directive 2010/18/EU. Official Journal of the European Union. EUR-Lex*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32019L1158

57. European Parliament & Council of the European Union. (2021). *Consolidated text: Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Facility (as amended on 29 February 2024). Official Journal of the European Union. EUR-Lex*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02021R0241-20240301

58. European Parliament & Council of the European Union. (2024). *Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU)*

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2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act). *Official Journal of the European Union*. *EUR-Lex*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32024R1689

59. European Training Foundation. (n.d.). *Green skills*. Retrieved from https://www.etf.europa.eu/en/what-we-do/green-skills
60. European Union. (2012a). Consolidated Version of the Treaty on European Union, Oct. 26, 2012, 2012 O.J. (C 326) 13. EUR-Lex. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12012M%2FTXT
61. European Union. (2012b), Consolidated Version of the Treaty on the Functioning of the European Union, Oct. 26, 2012, 2012 O.J. (C 326) 47. EUR-Lex. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12012E/TXT
62. Eurostat. (2022). *Gender pay gap statistics*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Gender_pay_gap_statistics
63. Eurostat (2023). *56% of EU people have basic digital skills*. Retrieved from https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20231215-3
64. Eurostat. (2024a, April 25). *EU's employment rate exceeds 75% in 2023*. Retrieved from https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240425-1
65. Eurostat. (2024b, September 2). *Social Scoreboard: track social progress across Europe*. Retrieved from https://ec.europa.eu/eurostat/web/products-eurostat-news/w/edn-20240902-1
66. Eurydice. (2024). *Developments and current policy priorities*. European Commission. Retrieved from https://eurydice.eacea.ec.europa.eu/national-education-systems/poland/developments-and-current-policy-priorities
67. Fitzenberger B. Holleitner J., Kager Ch, (2024) Herausforderungen für die Arbeitsmärkte der Zukunft am Beispiel Deutschland (Challenges for Future Labour Markets Using the German Example), In: Wirtschaftsdienst, 104(8), 519-523, ZBW – Leibniz- Informationszentrum Wirtschaft 519 Zeitgespräch, Springer Verlag
68. Future of Life Institute. (2024, February 27). *High-level summary of the AI Act*. High-level summary of the AI Act | EU Artificial Intelligence Act.
69. Garnitz J., Schaller D., Selleng N. (2024) Arbeitswelt im Wandel: Herausforderungen des Arbeitskräftemangels und die Dynamik des hybriden Arbeitens, ifo Institut, München.
70. Gazzetta Ufficiale. (2008). Decree-Law No. 112 of 25 June 2008. Retrieved from https://www.gazzettaufficiale.it/eli/id/2008/08/21/08A05897/sg
71. Gazzetta Ufficiale. (2012). Law of 28 June 2012, No. 92. Retrieved from https://www.gazzettaufficiale.it/eli/id/2012/07/03/012G0115/sg
72. Gazzetta Ufficiale. (2014). *Law of 10 December 2014, No. 183*. Retrieved from https://www.gazzettaufficiale.it/eli/gu/2014/12/15/290/sg/pdf
73. Gazzetta Ufficiale. (2021). *Decree of 5 November 2021: Adoption of National Programme for Workers' Employment Guarantee (GOL)*. Retrieved from https://www.gazzettaufficiale.it/eli/id/2021/12/27/21A07646/sg
74. Gazzetta Ufficiale. (2024). *Law of 18 March 2024, No. 50*. Retrieved from https://www.gazzettaufficiale.it/eli/id/2024/03/18/24G00050/SG

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

75. Gomes, P., & Fontinha, R. (2024). *Four-day week pilot project: Final report*. Lisboa: IEFP. Retrieved from https://www.4dayweek.com/portugal-2024-pilot-report-form

76. Gov.si. (2022, May 3). Slovenian Industrial Strategy 2021 – 2030. Portal GOV.SI. Retrieved from https://www.gov.si/en/news/2022-05-03-slovenian-industrial-strategy-2021-2030/

77. Gov.si. (2023, October 19). *76th Regular Meeting of the Government of the Republic of Slovenia*. Portal GOV.SI. Retrieved from https://www.gov.si/en/news/2023-10-19-76th-regular-meeting-of-the-government-of-the-republic-of-slovenia/

78. Gov.si. (2024a). *Aktivna politika zaposlovanja*. Portal GOV.SI. Retrieved from https://www.gov.si/teme/aktivna-politika-zaposlovanja/

79. Gov.si. (2024b *Slovenska strategija pametne specializacije*). EU Skladi. Retrieved from https://www.gov.si/zbirke/projekti-in-programi/izvajanje-slovenske-strategije-pametne-specializacije/

80. Gov.si. (2024c, July 29). *Pravica do odklopa*. Portal GOV.SI. Retrieved from https://www.gov.si/novice/2024-07-29-pravica-do-odklopa/

81. Gov.si. (2024d, September 12). *Slovenija aktivna pri implementaciji Akta o umetni inteligenci*. Portal GOV.SI. Retrieved from https://www.gov.si/novice/2024-09-12-slovenija-aktivna-pri-implementaciji-akta-o-umetni-inteligenci/

82. Gov.si. (2024e, September 16). *The Recovery and Resilience Plan*. Portal GOV.SI. Retrieved from https://www.gov.si/en/registries/projects/the-recovery-and-resilience-plan/

83. Government of Greece. (2021a). *Green Growth Strategy*. Ministry of Environment and Energy. Retrieved from https://www.ypen.gr

84. Government of Greece. (2021b). *Labor Law N. 4808/2021 on employment rights and working conditions*. Ministry of Labor and Social Affairs. Retrieved from https://www.labor.gov.gr

85. Government of Greece. (2021c). *National Digital Strategy 2021-2025*. Ministry of Digital Governance. Retrieved from https://digitalstrategy.gov.gr

86. Government of Greece (2023d). *Active Labor Market Policies* (Αναπτυξιακή Πολιτική Απασχόλησης) to promote employment. Ministry of Labor and Social Affairs. Retrieved from https://www.labor.gov.gr

87. Government of Greece. (2023e). *Reform of Vocational Education and Training* (VET) System in Greece. Ministry of Education and Religious Affairs. Retrieved from https://www.minedu.gov.gr

88. Government of Malta. (n.d.). *Employment & Industrial Relations Act*, Cap. 452.

89. Government Offices of Sweden. (1977). Work Environment Act (SFS 1977:1160). Retrieved from https://www.government.se/contentassets/86e9091526644e90b78d2ff937318530/sfs-19771160-work-environment-act/.

90. Italian Agency for Digital Agenda. (2024, July 22). *The Italian Strategy for Artificial Intelligence 2024-2026*. Retrieved from https://www.agid.gov.it/en/agenzia/stampa-e-comunicazione/notizie/2024/07/22/italian-strategy-artificial-intelligence-2024-2026

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91. Italian Council of Ministries. (2020). *Decree-Law No. 24 of 19 May 2020, No. 34 converted with law No. 77 of July 17, 2020, as amended by Article 4 of the decree-law August 14, 2020 No. 104, converted with amendments by the law October 13, 2020, No. 126 and regulated by the Decree of the Minister of Labor and Social Policies in concert with the Minister of Economy and Finance of 09.10.2020: National New Skills Plan*. Retrieved from https://www.anpal.gov.it/avviso-fondo-nuove-competenze

92. Italian Government. (2012, June 28). *Law No. 92, Reform of the labour market that lays the foundation for increased productivity, economic growth, and employment*. Retrieved from https://www.gazzettaufficiale.it/eli/id/2012/07/03/012G0115/sg

93. Italian Ministry of Labour and Social Policies. (2021, November 5). *Decree of 5 November 2021: Adoption of National Programme for Workers' Employment Guarantee (GOL)*. Retrieved from https://www.gazzettaufficiale.it/eli/id/2021/12/27/21A07646/sg

94. Italian Presidency of the Council of Ministries. (2021). *National Strategy for Gender Equality 2021-2026*. Retrieved from https://www.pariopportunita.gov.it/media/2051/strategia_parita-_genere.pdf

95. Italian Presidency of the Council of Ministries. (2024, March 2). *Decree-Law No. 19, converted with amendments by law of April 29, 2024, No. 56: Further urgent provisions for the implementation of the National Recovery and Resilience Plan (PNRR)*.

96. Italian President of the Republic. (2008, June 25). *Decree-Law No. 112 of 25 June: Urgent provisions for economic development, simplification, competitiveness, stabilization of public finance, and tax equalization*. Retrieved from https://www.gazzettaufficiale.it/eli/id/2008/08/21/08A05897/sg

97. Italian Senate. (2024). *Provisions and delegation to the Government regarding artificial intelligence, Act n. 1146*. Retrieved from https://www.senato.it/leg/19/BGT/Schede/Ddliter/58262.htm

98. Jobsplus Act, Cap. 594. (n.d.). Government of Malta.

99. Kancelaria Prezesa Rady Ministrów. (2023). Program Rozwoju Kompetencji Cyfrowych. Retrieved from https://isap.sejm.gov.pl/isap.nsf/download.xsp/WMP20230000318/O/M20230318.pdf

100. Landmann J., Heumann E. (2016) Toward the Labour Market 4.0. Potential impacts of digitization on labor and employment in Germany until 2030, Bertelsmann Stiftung.

101. Leidecker, T., Bulman, T., Levin, I., & Blake, H. (2023). *Transitioning to a green economy in Greece* (Economics Department Working Papers No. 1757). OECD Publishing. Retrieved from https://www.oecd.org

102. Lilyanova, V. (2023). Governance and oversight of the Recovery and Resilience Facility. European Parliamentary Research Service, NGEU Monitoring Service, Members' Research Service PE 747.883.

103. Löfven, S., Nordmark, E., & Arbetsmarknadsdepartementet. (2021). *A good work environment for the future – the Government's work environment strategy 2021–2025*. Retrieved from https://www.government.se/contentassets/7a8a3957c3364717971a18ac3ed1d94d/a-good-work-environment-for-the-future--the-governments-work-environment-strategy-20212025.pdf

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104. Malta Digitali. (2022). *Malta Digital Strategy 2022-2027*. Retrieved from https://www.maltadigitali.mt

105. McKinsey & Company (2021). The future of work in Europe: Discussion paper. https://www.mckinsey.com/~/media/mckinsey/featured%20insights/future%20of%20organizations/the%20future%20of%20work%20in%20europe/mgi-the-future-of-work-in-europe-discussion-paper.pdf

106. Ministerstwo Cyfryzacji. (2020, January 23). Kompetencje cyfrowe. Retrieved from https://www.gov.pl/web/cyfryzacja/kompetencje-cyfrowe

107. Ministerstwo Edukacji Narodowej. (2019). *Zintegrowana Strategia Umiejętności 2030 (część ogólna)*. Retrieved from https://kwalifikacje.gov.pl/images/zsu.pdf

108. Minsterio del Lavoro e dell Politice Sociali. (2020). *Decree-Law No. 24 of 19 May 2020, No. 34, converted with Law No. 77 of 17 July 2020, as amended by Article 4 of Decree-Law No. 104 of 14 August 2020, converted with amendments by Law No. 126 of 13 October 2020, and regulated by the Decree of the Minister of Labor and Social Policies in concert with the Minister of Economy and Finance of 9 October 2020: National New Skills Plan*. Retrieved from https://www.anpal.gov.it/avviso-fondo-nuove-competenze

109. Ministerstwo Funduszy i Polityki Regionalnej. (2023). *Krajowy Plan Odbudowy i Zwiększania Odporności*. https://www.funduszeeuropejskie.gov.pl/media/109762/KPO.pdf

110. Ministerstwo Funduszy i Polityki Regionalnej. (2023). Otwórz się na nowe możliwości! Fundusze Europejskie dla Polski na lata 2021-2027. https://www.funduszeeuropejskie.gov.pl/media/120636/Dodatek_eFEkty_www.pdf

111. Ministerstwo Rozwoju, Pracy i Technologii. (2020). *Strategia Rozwoju Kapitału Ludzkiego 2030*. https://www.gov.pl/attachment/1f26c734-51d1-436b-9954-6938994ca46c

112. Ministry for the Economy and Industry. (2022). Malta Diġitali Strategy 2022 – 2027. Government of Malta.

113. Ministry for Education and Employment. (2021). National Employment Strategy 2021 – 2030. Government of Malta.

114. Ministry for Education and Employment. (2023). National Lifelong Learning Strategy 2023 – 2030. Government of Malta.

115. Ministerstwo Rozwoju, Pracy i Technologii. (2020). Strategia Rozwoju Kapitału Ludzkiego 2030. Retrieved from https://www.gov.pl/attachment/1f26c734-51d1-436b-9954-6938994ca46c

116. Ministry of Economic Development and Technology. (2024, May 07). The work-life balance of busy Poles. Retrieved from https://www.trade.gov.pl/en/news/the-work-life-balance-of-busy-poles/

117. Ministry of Family, Labour and Social Policy. (23 March, 2023). Parental and Work-Life Balance Directives. President signed the Labour Code amendment. Website of the Republic of Poland. Retrieved from https://www.gov.pl/web/family/parental-and-work-life-balance-directives-president-signed-the-labour-code-amendment

118. Ministrstvo za delo, družino, socialne zadeve in enake možnosti. (2016). Starejši in trg dela v Sloveniji. Ministrstvo za delo, družino, socialne zadeve in enake možnosti.

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119. Narodowe Centrum Badań i Rozwoju (n.d.) Program Operacyjny Wiedza Edukacja Rozwój. Gov.pl. Retrieved from https://www.gov.pl/web/ncbr/program-operacyjny-wiedza-edukacja-rozwoj

120. OECD (2024), "Recent trends in Greece's labour market and the set-up of active labour market policies", in *Impact Evaluation of Training and Wage Subsidies for the Unemployed in Greece*, OECD Publishing, Paris. Retrieved from DOI: https://doi.org/10.1787/16c1b234-en

121. Presidenza del Consiglio dei Ministri. (2024, April 23). *Comunicato stampa del Consiglio dei Ministri n. 78*. Retrieved from https://www.governo.it/it/articolo/comunicato-stampa-del-consiglio-dei-ministri-n-78/25501

122. Public Employment Service of Greece. (Δημόσια Υπηρεσία Απασχόλησης). (2023). *Programs for skills development and employability enhancement*. Retrieved from https://www.dypa.gov.gr

123. Sapala, M., Szczepański, M. (2024). *Poland's National Recovery and Resilience Plan: Latest state of play. European Parliamentary Research Service*, Next Generation EU Monitoring Service, Members' Research Service PE 733.665. Retrieved from https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733665/EPRS_BRI(2022)733665_EN.pdf

124. Schnaller D. (2004). *Chancengerechtigkeit am Arbeitsmarkt als Teil der HR - Strategie gegen Arbeits- und Fachkräftemangel*, ifo Institut, München.

125. Serwin, K. (2023, March 9). *Praca zdalna w Kodeksie pracy – czy zmiany zapewnią pracownikom elastyczność?* Kancelarie RP. Retrieved from https://kancelarierp.pl/praca-zdalna-w-kodeksie-pracy-czy-zmiany-zapewnia-pracownikom-elastycznosc/?doing_wp_cron=1725782263.0314280986785888671875

126. Sochańska-Kawiecka, M., Kusideł, E., Gajewski, M., Szuicki, J., Kubajek, R., Kołakowska-Seroczyńska, Z., Witkowska, J., Milczarek, D., Studzińska, M., Schimanek, T., & Pietrzak, B. (2024). *Ewaluacja ex-post PO WER: Executive summary*. Ministry of Development Funds and Regional Policy. https://www.ewaluacja.gov.pl/media/131299/Executive_summary.pdf

127. Symela, K., & Stępnikowski, A. (2021). Wyzwania kompetencyjne w rozwoju sztucznej inteligencji w polsce. *Polityka Społeczna*, 568(7), 21-28. https://doi.org/10.5604/01.3001.0015.3356

128. Uradni list RS, št. 114/23. (2023). Zakon o spremembah in dopolnitvah Zakona o delovnih razmerjih (ZDR-1D). Retrieved from https://pisrs.si/pregledPredpisa?id=ZAKO8708

129. Uradni list RS, št. 19/14 in 55/17. (2014). Zakon o inšpekciji dela (ZID-1). Retrieved from https://pisrs.si/pregledPredpisa?id=ZAKO6711

130. Uradni list RS, št. 163/22. (2014). ZVOP-2. Retrieved from https://pisrs.si/pregledPredpisa?id=ZAKO6711

131. Uradni list RS, št. 21/13, 78/13. (2013). Zakon o delovnih razmerjih (ZDR-1). Retrieved from https://pisrs.si/pregledPredpisa?id=ZAKO5944

132. Uradni list RS, št. 110/06 (2006) *Zakon o starševskem varstvu in družinskih prejemkih*. Retrieved from https://pisrs.si/pregledPredpisa?id=ZAKO6688

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133. Uradni list RS, št. 59/02, 110/06, 50/14 (2002a) *Zakon o enakih možnostih žensk in moških*. Retrieved from https://pisrs.si/pregledPredpisa?id=ZAKO3418

134. Uradni list RS, št. 59/02, 110/06, 50/14 (2002b) *Zakon o enakih možnostih*. https://pisrs.si/pregledPredpisa?id=ZAKO3418

135. Vlada Republike Slovenije (2023). Krovna strategija digitalne preobrazbe Slovenije do leta 2030. Vlada Republike Slovenije. https://www.gov.si/assets/ministrstva/MDP/Dokumenti/DSI2030-potrjena-na-Vladi-RS_marec-2023.pdf

136. The Act of 13 April 2007 on National Labor Inspectorate [Poland], Dz.U. 2007 no 89 item 589 (as amended on June 26, 2024).

137. The Act of 10 May 2018 on the Protection of Personal Data [Poland], Dz.U. 2018 item 1000 (as amended on October 10, 2019).

138. The Labour Code Act of 26 June 1974 [Poland], Dz. U. 1974 No 24, item 141 (as amended on September 11, 2024).

139. Zavod RS za zaposlovanje. (2024). Hitrejši vstop mladih na trg dela. Zavod RS za zaposlovanje. https://www.ess.gov.si/fileadmin/user_upload/Delodajalci/Javna_povabila/JP_Zaposlovanje/Hitrejsi_vstop_mladih/Javno_povabilo_3_Hitrejsi_vstop_mladih_HVMTD.pdf

140. Zeitlin, J., and Bokhorst, D. & Eihmanis, E. (2023). Governing the RRF: Drafting, Implementing, and Monitoring National Recovery and Resilience Plans as an Interactive Multilevel Process. Centre for European Studies Research Paper No. 2023/1, Amsterdam. SSRN: https://ssrn.com/abstract=4611541, DOI: http://dx.doi.org/10.2139/ssrn.4611541

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CHAPTER 10

Comparative analysis of good and weak practices in Europe with anticipated future needs of the labour market

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Abstract:

This article offers a comprehensive comparative analysis of vocational education, labour market adaptation, and digital transformation practices across various European countries, including Belgium, Germany, Greece, and Italy. The analysis identifies best practice and weak practices, emphasizing the need for targeted policies to enhance workforce readiness in Europe's rapidly evolving labour markets, the study examines case studies that illuminate effective strategies and areas for improvement.

It is stressed that transitioning to a more flexible and digitally skilled labour market requires collective action to modernize vocational training and employment practices. By enhancing transparency, fostering digital inclusivity, and aligning training systems with current market demands, nations can strengthen economic resilience and global competitiveness. Case studies in this article further underscore both strengths and areas for improvement, offering actionable insights for policy and practice in preparing for a rapidly evolving economic landscape.

Keywords:. Vocational Training, Digital Competencies, Labour Market, Inclusivity, Economic Growth. Technological Advancement, Workforce, Employment Practices, Digital Transition.

Introduction

This article provides a comparative analysis of strong and weak practices in vocational education, labour market adaptation, and digital transformation across European countries like Belgium, Germany, Greece, Italy, and others. It highlights best practices such as Belgium's dual learning approach, while also addressing weaknesses like low digital intensity in Greece's SMEs and Italy's labour market disconnection. The article emphasizes the need for targeted policies to improve workforce readiness and adaptability in Europe's rapidly evolving labour markets. It will be worth analyzing and going through several case studies. Each one of these case studies will lay bare a good practice and a weakness relevantly linked to the main issue of this article. These case studies will show a good practice and a weakness relevant to the central issues of the TRANSFORM project.

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Belgium

Good practice: Vocational Education and Training (VET) Learners

Belgium's vocational training system exemplifies a strong alignment with market needs, which is considered a best practice (Cedefop, n.d.). The system incorporates dual learning approaches, combining theoretical education with practical, work-based experiences. This ensures that learners acquire both academic knowledge and hands-on skills, making them highly relevant to employers' requirements.

Various training providers, including specialized vocational schools and adult education centers, cater to a diverse range of learners, including young individuals and adults seeking to enhance their skills. By focusing on sectors in demand, the training programs directly address labour market gaps (Cedefop, n.d.).

Additionally, continuous engagement with employers allows for the ongoing adaptation of curricula to keep pace with evolving industry trends. This proactive alignment fosters a skilled workforce that's readily employable, thus enhancing economic competitiveness in Belgium. Overall, Belgium's vocational training system serves as a model for effectively responding to market dynamics and workforce development.

Weak practice: Low Inclusivity within the Belgian Labour Market

The Belgian labour market exhibits considerable challenges related to inclusivity, particularly for citizens with a migration background. Systematic reviews indicate (Devos, et al., 2024) that first- and second-generation migrants experience significantly poorer labour market outcomes compared to native counterparts. Discrimination, differences in human and social capital, and individual preferences also contribute to this disparity (Devos et al., 2024).

Despite the ongoing trend towards diversity, the mechanisms reinforcing these inequalities persist, undermining the potential for a truly inclusive labour environment. Employers are encouraged to adopt anti-discrimination policies and affirmative actions, while employees are advised to invest in their human capital and seek recognition for their competencies. This lack of inclusivity significantly impacts individual livelihoods. It is also stifles overall economic growth, posing a critical challenge for policymakers aiming to refine approaches that mitigate biases in employment practices and open alternative pathways to work opportunities.

The urgent need for effective strategies to enhance labour market inclusivity in Belgium cannot be overstated.

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Germany

Good practice: New Quality of Work Initiative

The New Quality of Work Initiative (INQA) in Germany promotes a forward-looking workplace culture where people are central to organizational success. Launched to enhance employee well-being and productivity, INQA provides a range of practical resources, consultations, and networking opportunities for businesses. The initiative focuses on key areas such as leadership, diversity, health, and competency, helping organizations adapt to changing work environments effectively. (Initiative Neue Qualität der Arbeit -INQA-, 2024)

One of the standout features of INQA is its emphasis on mental health, offering tools and strategies for reducing workplace stress and fostering a healthy work-life balance. Additionally, INQA facilitates workshops and events that encourage continuous learning and adaptation in response to digital transformations. By supporting small and medium enterprises (SMEs) to innovate and secure their workforce, INQA evinces a successful collaborative approach to improving job quality and sustaining economic viability in Germany.

Weak practice: New Skilled Immigration Law and New opportunity card (Chancenkarte)

Germany's new Skilled Immigration Law and the introduction of the opportunity card are seen by some as weak practices in addressing the urgent labour shortages in the country. While the law aims to simplify the immigration process for skilled workers, critics argue that it does not sufficiently address the main barriers faced by non-EU professionals. They shed light on bureaucracy and recognition of foreign qualifications as blatant barriers. The opportunity card, which uses a points-based system to attract foreign talent, may not be compelling enough since many skilled workers still require a job offer before relocating. (Angenendt et al., 2023)

Moreover, the focus on vocational training overlooks the diversity of skills available globally, potentially limiting the pool of talent. The scheme's requirements, such as securing basic living expenses before entry, may deter potential applicants. Overall, while these reforms attempt to modernize Germany's labour market, they may fall short of effectively attracting the necessary skilled workforce amid escalating competition from other countries (Euronews, 2023).

Greece

Good practice: Greek Digital Transformation Plan

The Greek Digital Transformation Plan unveils a comprehensive approach to advancing digitalization across the country. This initiative focuses on enhancing connectivity, improving

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digital skills, and streamlining e-government services. A cornerstone of the plan is the integration of digital services into daily public interactions, aiming to improve efficiency and accessibility for citizens. (European Commission, n.d.b)

The plan fosters collaboration among public and private sectors, ensuring that technological advancements benefit the wider economy. This is mainly due to the marked investments in digital infrastructure. Furthermore, the upskilling programs under this initiative address the digital skills gap, equipping the workforce for the demands of the digital economy.

The combination of strategic policy frameworks, tangible investments, and a notable focus on citizen engagement introduces Greece as a model for other countries seeking to implement effective digital transformation strategies. It ensures sustainable economic growth and improved quality of life for its citizens.

Weak practice: Low overall digital intensity of SMEs

The low overall digital intensity of Small and Medium Enterprises (SMEs) in Greece is a significant weakness impacting their competitiveness and growth potential. Despite the increasing importance of digital transformation, many SMEs lag in adopting essential digital technologies due to various factors, including limited financial resources, lack of digital skills, and resistance to change. This situation hinders their ability to leverage digital tools for operational efficiency, customer engagement, and innovation. (European Commission, n.d.b), Greece in the Digital Economy and Society Index -DESI-, 2024)

Furthermore, the slow adaptation to digital practices restricts SMEs from accessing new markets and opportunities, especially in a fast-evolving digital economy. The lack of a robust digital infrastructure exacerbates this issue, placing Greek SMEs at a disadvantage compared to their counterparts in other EU member states. Addressing this challenge is crucial for enhancing the resilience and competitiveness of the Greek SME sector in the broader context of the Digital Decade initiative.

Italy

Good practice: National Strategy for Digital Skills

The National Strategy for Digital Skills in Italy brings to light a relevant good practice by addressing the cultural digital divide and fostering digital inclusion among its population. Launched in July 2020, the strategy aims to enhance e-skills across various demographics, including students, the active workforce, and ICT specialists. By engaging multiple stakeholders,

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such as ministries, universities, and public organizations, it aligns with the European Coalition for Digital Skills and Jobs. The strategy outlines four key intervention areas: Higher Education and Training, Active Workforce, ICT Specialist Skills, and Citizens, each with focused actions and measurable targets. Notably, the operational plan aspires to equip 70% of the population with basic digital skills by 2025 and aims to increase the share of women in ICT education. This structured approach, including six-monthly evaluations and stakeholder involvement, ensures adaptability and effectiveness in promoting digital competencies across Italy. (European Commission, n.d.a.); Sgueo, 2022)

Weak practice: Disconnected, not anticipatory, and not collaborative approach to labour market preparation

The approach to labour market preparation in Italy has been criticized for being disconnected, not anticipatory, and lacking collaboration. This disconnectedness manifests in the failure to align educational systems with labour market demands, leading to a mismatch between graduates' skills and employer needs. The preparation strategies do not adequately anticipate changes in the labour market, particularly in light of technological advancements and evolving industries. Consequently, the system remains reactive rather than proactive, hindering effective workforce development.

Furthermore, collaboration among key stakeholders—including government, educational institutions, and businesses—is insufficient. This lack of synergy prevents the sharing of insights and resources necessary for creating comprehensive and effective employment strategies. The consequences of these weaknesses contribute to an ineffective labour market, where both job seekers and employers struggle to find the right fits, ultimately impacting Italy's economic growth and workforce readiness. (Casano, 2022)

Malta

Good practice: National Curriculum Framework of the Maltese Ministry for Education and Employment

The National Curriculum Framework (NCF) of the Maltese Ministry for Education and Employment exemplifies a strategic commitment to enhancing educational outcomes across Malta. It aims to provide quality education that fosters critical thinking, creativity, and social skills among students. Central to the NCF is the integration of various educational dimensions, including academic, vocational, and lifelong learning, ensuring that curricula are responsive to the diverse needs of learners. (National Curriculum Framework for All, 2012)

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The framework promotes inclusive education, ensuring access for all students, including those from vulnerable backgrounds. Furthermore, it emphasizes the importance of collaboration between educators, parents, and community stakeholders to create a supportive learning environment. The NCF aligns with EU policy recommendations, focusing on reducing early school-leaving rates and improving student retention in further education. This holistic approach contributes to greater social cohesion and prepares students for active participation in the labour market and society at large. (Camilleri et al., 2023)

Weak practice: Vertical Gender Segregation in the Labour Market

Despite the considerable increase in women's participation in the labour market, women are still under-represented in decision-making positions. Women comprise 32% of the managers in Malta (Malta NSO, 2024), and 17% of the members of boards of the largest listed companies, one of the lowest representations across the EU (EiGe, n.d.). Patriarchal expectations and "the glass ceiling in decision-making processes" are barriers for women in the labour market (Commission for the Promotion of Equality, 2024). The National Commission for the Promotion of Equality (NCPE) promotes equal opportunities at the workplace including in decision-making positions through: the Directory of Professional Women that gives visibility to professional women; awarding the Equality Mark Certification to companies that foster gender equality in their work policies and practices. The NCPE is committed to continue working on this topic particularly as delineated in the Women on Boards Directive.

Poland

Good practice: Labour Code amendments on remote working of 2023

The 2023 amendments to the Labour Code in Poland reflect a significant step towards modernizing work practices, particularly in relation to remote working. These changes offer a clearer framework for remote work arrangements, benefiting both employees and employers. (Grupa Pracuj S.A., 2024).

Firstly, the amendments establish the right of employees to request remote work, fostering flexibility and work-life balance. Employers are now required to consider these requests seriously, enhancing employee satisfaction and retention.

Additionally, the legislation outlines specific health and safety obligations for remote working environments, ensuring that employees have a safe and ergonomic workspace. This focus on well-being demonstrates a commitment to protecting workers in non-traditional setups.

Furthermore, the amendments promote transparency by mandating that remote work conditions be explicitly defined in employment contracts, minimizing ambiguities and potential disputes.

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Overall, these practices not only adapt to the needs of a modern workforce but also align with global trends towards flexible work arrangements, marking a progressive shift in Polish labour law.

Weak practice: Poor and outdated vocational training system

Poland's vocational training system is characterized by obsolescence and inefficiency, representing a significant weakness in its economic framework. The existing model often relies on traditional academic disciplines without adequately integrating practical skill sets responsive to current industry demands. This disconnect results in a workforce that is ill-prepared for the rigorous challenges of a rapidly digitizing economy. Many training programs do not focus on digital competencies, leading to a surplus of graduates lacking essential skills, particularly in the fields of technology and innovation. Consequently, this gap hinders Poland's ability to compete effectively on a global scale, as businesses struggle to find qualified candidates who meet their operational needs. Moreover, the vocational training system fails to leverage advancements in technology and adapt to the evolving labour market, leaving numerous potential workers excluded from meaningful employment opportunities and exacerbating issues of digital exclusion within the country. (Hetmańczyk, 2024)

Portugal

Good practice: Portugal's Action Plan for Digital Transition

Portugal's Action Plan for Digital Transition serves as an exemplary model of how a nation can strategically harness digitization for economic growth and societal inclusion. Endorsed by the Portuguese government, the plan focuses on three pivotal pillars: capacity building and digital inclusion, digital transformation of businesses, and digitization of public services. Guided by principles such as pragmatism, ambition, and transversal focus, the plan aims to make Portugal a competitive international reference by enhancing digital skills across various sectors. (Portugal Ministry of Economy and Digital Transition, 2020)

The coordinating body, the "Portugal Digital Mission Structure," ensures the successful implementation and monitoring of prioritized initiatives. These initiatives not only draw from existing strategies but also address gaps in digital literacy and infrastructure. By prioritizing inclusivity and leveraging public-private partnerships, this Action Plan stands as a benchmark for other nations aiming for comprehensive digital transformation while ensuring no citizen is left behind.

Weak practice: Low managerial skills among firm owners

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Low managerial skills among firm owners in Portugal represent a significant weakness affecting the performance of businesses. Many Portuguese firms, particularly small and domestically-owned enterprises, are managed by individuals with low educational attainment. This lack of professional management leads to underdeveloped organizational practices, hindering growth and overall productivity. Poorly managed firms often fail to utilize the full potential of high-skilled professionals, limiting their contributions to enhancing performance. Consequently, this deficiency in managerial capacity contributes to a productivity gap, with estimates suggesting it accounts for around 30% of the productivity disparities between Portugal and the United States. The ineffective management also restricts the adoption of modern management techniques and technologies, further diminishing the demand for specialized professionals and perpetuating a cycle of low productivity and high unemployment in the labour market. (Araújo, 2017)

Slovenia

Good practice: Slovene Enterprise Fund

The Slovene Enterprise Fund (SEF) is recognized as a good practice in Slovenia for its vital role in fostering entrepreneurship and supporting small and medium-sized enterprises (SMEs). Established to enhance the country's economic development, SEF provides financial assistance through grants, loans, and equity investments. (Podjetniški Sklad, n.d.)

A key aspect of SEF's success is its tailored support for innovative startups and businesses, promoting the creation of jobs and contributing to regional development. It acts as a facilitator of access to funding, enabling entrepreneurs to bring their ideas to market more effectively.

Moreover, SEF collaborates with various stakeholders, including government bodies and private investors, to create a comprehensive ecosystem for business development. This synergy not only enhances the competitiveness of Slovene enterprises but also encourages a culture of innovation, making SEF a cornerstone in Slovenia's economic landscape and a model for best practices in enterprise support.

Weak practice: Insufficient focus on lifelong learning and skills development

In Slovenia, there is an insufficient emphasis on lifelong learning and skills development, which has emerged as a critical weakness in addressing the evolving demands of the workforce. Despite rising educational attainment, the pace of enhancing human resources to meet the requirements of a green and smart economy is inadequate. Key indicators, such as literacy and vocational training levels, reveal concerning declines, particularly among vulnerable groups. The

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lack of a comprehensive system to identify and forecast skills needs exacerbates labour market mismatches, leading to underemployment and job insecurity. Existing adult training programs do not adequately promote up-skilling or re-skilling, leaving many workers ill-prepared for changing industry landscapes. To effectively tackle these challenges, Slovenia must prioritize a holistic approach to lifelong learning that recognizes the importance of continuous skill development for both personal growth and economic resilience. (Statistical Office of the Republic of Slovenia, 2024; European Commission, n.d.))

Despite the overall positive trends in lifelong learning participation, there is still a low level of engagement in learning activities for these specific demographics, necessitating further support to enhance upskilling and reskilling efforts. Slovenia has set ambitious targets in its strategies to improve lifelong learning for various vulnerable groups, such as those over 65 and those with lower skill levels, yet challenges include ensuring adequate outreach and sufficient financial resources to support these initiatives.

Sweden

Good practice: Regulatory framework for the protection of the digital platform workers

Sweden's regulatory framework for digital platform workers exemplifies a proactive approach to labour rights and protections. Recognizing the emergent nature of digital labour platforms, Swedish public authorities and stakeholders have determined that existing labour laws adequately cover platform workers. Contracts and terms of service primarily define their employment status, which can range from self-employed to dependent employees (Anxo, 2021).

Collective agreements, notably with platforms like Foodora, have been established to secure rights such as minimum wages, compensation for work-related expenses, and safety measures, showcasing a collaborative approach involving trade unions. Additionally, regulatory compliance for health and safety is enforced by the Swedish Work Environment Authority, ensuring that platforms maintain safe working conditions. This framework fosters dialogue between social partners, promoting fairness and adaptability within the labour market, making Sweden a model for protecting the rights of digital platform workers.

Weak practice: Need for Comprehensive Policy Measures

The need for comprehensive policy measures emerges as a significant weak practice in Sweden's digital welfare state, as highlighted by ongoing discussions about the adequacy of existing frameworks. While Sweden demonstrates strong advancements in digitalization, there remain

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gaps in effectively addressing inequalities and potential risks arising from digital welfare applications. Critics emphasize that without thorough policy measures, the digital transformation could exacerbate social divides, potentially leaving vulnerable populations without adequate support. Furthermore, issues surrounding data privacy, algorithmic biases, and a lack of inclusivity in digital services raise concerns about the overall efficacy of current strategies. Thus, it is imperative for policymakers to engage in a comprehensive evaluation of digital welfare practices to ensure equitable access, eliminate biases, and fortify the social safety net to cater to the diverse needs of the population in an increasingly digital landscape (Özkan, 2023).

Conclusions

To conclude, the landscape of modern labour markets necessitates a transformative approach to workforce preparation and employment practices. As economies increasingly embrace digitization and flexible work arrangements, it becomes essential for businesses and governments to adapt their strategies to meet these evolving demands. One of the key components in this transformation is the need for transparency in employment conditions, particularly regarding remote work. Clearly defined terms in employment contracts can minimize ambiguities and potential disputes, fostering a healthier work environment that aligns with the expectations of a contemporary workforce. This shift is indicative of a broader movement towards flexible work arrangements that are increasingly becoming the norm rather than the exception across the globe.

Moreover, the state of vocational training plays a critical role in enabling workers to thrive in an increasingly competitive market. Traditional vocational training systems often lag behind due to inflexible structures that do not adequately incorporate practical skills geared towards the demands of emerging industries. This disconnect between education and industry requirements results in an inadequately skilled workforce, ill-prepared for the challenges posed by a rapidly evolving economy. Consequently, there is a pressing need to modernize vocational training to ensure that it includes digital competencies and responds to current labour market trends. Without this modernization, countries may find themselves struggling to compete on a global scale, as businesses will increasingly find it challenging to locate qualified candidates who align with their operational needs.

Furthermore, it is paramount that vocational training systems embrace advancements in technology and adapt accordingly. This adaptation is vital to prevent the exclusion of potential workers from meaningful employment opportunities. As a matter of course, it is also relevant to address the rising concerns surrounding digital discrimination and inequity. The integration of

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technology in training programs can foster inclusivity and help bridge the skill gap that exists within many statistics on unemployment and underemployment.

In contrast, countries that implement strategic plans for digital transition often serve as exemplary models for others. These initiatives focus on capacity building, digital transformation of businesses, and the digitization of public services, which create inclusive economic growth and societal engagement. By ensuring that all citizens have access to digital literacy and infrastructure, these nations create a balanced framework where the workforce is both ready for technological advancement and empowered to participate in the global economy. These actionable steps elevate a country's competitive edge and can be adopted as a blueprint for achieving comprehensive digital transformation while safeguarding equitable opportunities for all.

Ultimately, the transition to a more flexible and technologically adept labour market requires collective efforts from stakeholders to re-evaluate and redefine training and employment practices. Transparency in employment conditions and the modernization of vocational training systems are crucial in preparing a workforce that can navigate the complexities of a digitilazing world. Collaboration and strategic action plans can help eliminate barriers to both employment and digital participation, which significantly foster a resilient and competitive economic environment. By addressing these critical areas, nations can both corroborate that they are prepared for current market demands and notably positioned for future success.

References

1. Angenendt, S., Koch, A., & Pawlak, M. (2023). Fachkräftemigration nach Deutschland: Eckpunkte eines neuen Punktesystems. Stiftung Wissenschaft und Politik (SWP). https://doi.org/10.18449/2023RP03
2. Anxo, D. (2021). Digital labour platforms in Sweden. ResearchGate. Retrieved from https://www.researchgate.net/publication/354852181_Digital_Labour_Platforms_in_Sweden
3. Araújo G.S., 2017, Raising skills in Portugal", OECD Economics Department Working Papers, Nr. 1405, OECD Publishing, Paris, Retrieved from https://www.oecd-ilibrary.org/economics/raising-skills-in-portugal_fca87bb4-en
4. Casano, L. (2022). Telework and union responses: A comparative analysis in Europe. European Journal of Comparative Law and Industrial Relations, 11(3), 1–30. Retrieved from https://ejcls.adapt.it/index.php/ejcls_adapt/article/view/543
5. Devos, L., Lippens, L., Lens, D., Rycx, F., Volral, M., & Baert, S. (2024). Labour market disadvantages of citizens with a migration background in Belgium: A systematic review. IZA Institute of Labor Economics. Retrieved from https://ssrn.com/abstract=4759861:contentReference[oaicite:0]{index=0}

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

6. Commission for the Promotion of Equality. (2024). *Gender Equality Strategy and Action Plan 2024*. Retrieved from https://humanrights.gov.mt/wp-content/uploads/2024/04/Gender-Equality.pdf
7. EiGE (European Institute for Gender Equality). (n.d.). *Proportion of women and men in managerial positions*. Retrieved from https://eige.europa.eu/gender-statistics/dgs/indicator/wmidm_bus_bus__wmid_comp_compbm
8. Euronews. (2023, October 16). Skilled workers are in demand as Germany tackles labour shortage with new points-based visa. Euronews. Retrieved from https://www.euronews.com/travel/2023/10/16/skilled-workers-are-in-demand-as-germany-tackles-labour-shortage-with-new-points-based-vis
9. European Centre for the Development of Vocational Training (Cedefop). (n.d.). Vocational education and training in Belgium (U2). Retrieved October 9, 2024, from https://www.cedefop.europa.eu/en/tools/vet-in-europe/systems/belgium-u2
10. European Commission. (n.d.a). Italy: National strategy for digital skills. Digital Skills and Jobs Platform. Retrieved October 9, 2024, from https://digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/italy-national-strategy-digital-skills
11. European Commission. (n.d.b). Greece in the Digital Economy and Society Index (DESI). Retrieved October 9, 2024, from https://digital-strategy.ec.europa.eu/en/policies/desi-greece
12. European Commission. (n.d.). Education and Training Monitor 2023. Slovenia, Retrieved October 2024, from https://op.europa.eu/webpub/eac/education-and-training-monitor-2023/en/country-reports/slovenia.html#3-school-education
13. European Commission. (2024). Digital Decade Country Report 2024: Greece. Retrieved from https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-country-reports
14. Grupa Pracuj S.A. (2024, March 21). *Podsumowanie rynku pracy w 2023 roku*. Pracuj. Retrieved from https://dlafirm.pracuj.pl/blog/rynek-pracy-w-polsce-2023
15. Haist, K., Fuchs, J., Heß, B., Horstmann, S., Kreuter, F., Rehn, T., & Vogt, M. (2023). *Demografischer Wandel – bekannte Herausforderungen, neue Gestaltungsmöglichkeiten. ifo Schnelldienst, 76*(11), 3-32. ifo Institut – Leibniz-Institut für Wirtschaftsforschung an der Universität München.
16. Hetmańczyk, P. (2024). Digitalization and its impact on labour market and education: Selected aspects. Education and Information Technologies, 29(1), 11119–11134. https://doi.org/10.1007/s10639-023-12203-8:contentReference[oaicite:0]{index=0}.
17. Initiative Neue Qualität der Arbeit (INQA). (n.d.). *Startseite. Bundesministerium für Arbeit und Soziales*. https://www.inqa.de/DE/startseite/startseite.html, 2024 October 16.
18. International Trade Administration. (2022). *Greece: Digital transformation plan*. U.S. Department of Commerce. Retrieved from https://www.trade.gov/market-intelligence/greece-digital-transformation-plan
19. National Curriculum Framework for All, 2012. Retrieved from https://curriculum.gov.mt/en/Resources/The-NCF/Documents/NCF.pdf

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20. National Statistics Office (NSO). (2024). *Labour Force Survey Q1 2024*. Retrieved from https://nso.gov.mt/labour-force-survey-q1-2024/

21. Özkan, G. (2023). The effect of digitalization on labor markets and employment in Turkey. *International Journal of Social Sciences and Education Research, 9*(1), 55-68. Retrieved from https://dergipark.org.tr/en/download/article-file/3357721

22. Podjetniški Sklad. (n.d.). *Role of the Slovenian Enterprise Fund*. Retrieved October 9, 2024, from https://www.podjetniskisklad.si/en/o-nas/kdo-smo/vloga-sklada/

23. Portugal Ministry of Economy and Digital Transition. (2020). *Action plan for digital transition*. Retrieved from https://portugaldigital.gov.pt/wp-content/uploads/2022/01/Portugal_Action_Plan_for_Digital_Transition.pdf

24. Sgueo E. (2022), *Italy's Digital Strategy, in: Digitalisation for Sustainable Infrastructure: the road Ahead 2022*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4268059, SSRN.

25. Statistical Office of the Republic of Slovenia. (2024). Development report 2024: Slowdown in Umar (2024). Slovenia's real convergence process during the epidemic and the energy crisis: Development challenges in productivity, decarbonisation of the economy, social protection systems, and governance of public institutions. Retrieved October 9, 2024, from https://www.umar.gov.si/en/news/news/release/development-report-2024-slowdown-in-slovenias-real-convergence-process-during-the-epidemic-and-the-energy-crisis-development-challenges-in-productivity-decarbonisation-of-the-economy-social-protection-systems-and-governance-of-public-institutions

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CONCLUSIONS

Nadia Molek, Alexander van Biezen; Lejla Imamović Lerić, Reinhilde Pulinx

In this report we aimed to we aimed to analyse the evolving dynamics of labour markets across Europe, examining the essential competencies and structural adaptations required for workforce readiness in an increasingly digitalized environment. Through comparative insights from various European countries, including Belgium, Germany, Greece, Malta, Portugal, Poland, Sweden, Slovenia and Italy, the findings highlight both exemplary practices and critical gaps in areas like digital transformation, vocational education, and labour market policies. The study identifies the urgent need for targeted strategies that not only address skill gaps but also foster inclusive and adaptive employment practices aligned with technological advancements.

The state of the art highlighted that emerging technologies are redefining labour markets, leading to a significant reconfiguration of skill demands (chapter 2). This analysis reveals that while these technologies create new job opportunities, they also introduce challenges related to inequality and the potential exclusion of less-skilled workers. It underscores the crucial role of inclusive policies and the need for training to prevent the benefits of automation from widening social and economic gaps.

Technology opens up possibilities like the adoption of remote work, accelerated by the COVID-19 pandemic, transforming work dynamics (chapter 5). While remote work allows for greater flexibility, it also poses risks of isolation and sustainability in terms of productivity and long-term wellbeing. This chapter suggests support policies that promote a healthy work-life balance. As noted in chapter 7, workplace wellbeing is essential in contexts where productivity demands and technology create high stress. The need for strategies to improve wellbeing, manage stress, and prevent burnout is emphasized. Policies that promote mental health and work flexibility will be crucial in this process. Meanwhile, chapter 8 concludes that inclusion and gender equality are priorities for a fair transformation of the labour market. There is a lack of equity in many technology sectors, suggesting a need for policies that address these gender disparities and promote an inclusive, accessible environment for all workers.

The review of emerging skills, in turn, highlights that analytical and creative thinking, along with resilience and agility, are essential (chapter 3). The importance of developing digital skills and soft skills, such as empathy and emotional intelligence, necessary for collaboration with AI, is emphasized. In conclusion, emotional intelligence is best utilized when it is paired with artificial intelligence. The division of labour between AI and EI is relatively clean and simple: AI would

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take over the routine tasks and EI would manage the non-routine tasks. The great power of AI in performing routine tasks is that it frees people to excel in performing non-routine tasks. This connection should help connect digital and soft skills to better results in the labour market.It is suggested that countries should invest in lifelong learning programs to prepare their workers for automation.

Labour policies need to be agile and responsive to technological and global changes. Chapter 9 concludes and recommends reviewing and adapting regulations to protect workers from the effects of automation and digitalization while promoting the development of digital skills. Additionally, reskilling programs have emerged as critical mechanisms for adjusting labour skills to new demands. However, unequal access to training poses a challenge, especially for low-income workers and older individuals. The recommendation is to improve training accessibility in sectors like the green economy, climate change, and digital technology to ensure that labour transitions are inclusive.

The combination of these insights reveals the need for a multidimensional approach to labour market transformation. Emerging technologies and future skills must be accompanied by inclusive policies and equitable access to training. Addressing inequality and skill gaps requires coordinated efforts between public and private sectors. Collaborative initiatives can ensure that labor market transformations benefit diverse population segments. Additionally, fostering workforce well-being through holistic approaches—integrating physical and mental health considerations—is imperative. Inclusive policies promoting gender equality and social inclusion remain critical to building a resilient workforce.

From the review of the state of the question, we found a special need to improve inclusion in access to digital and green training. There is also a need to increase research on the impact of automation, robotics, and AI on the long-term sustainability of jobs. It is also crucial to develop policies that ensure automation does not lead to the exclusion of lower-skilled workers.

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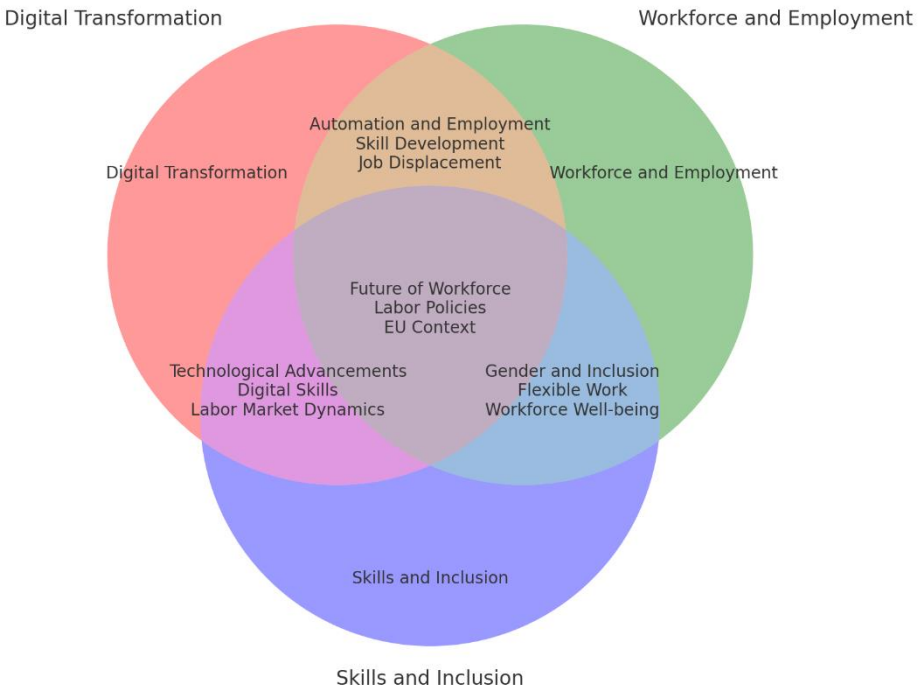

Figure 13: Venn diagram representing the intersection of key themes: Digital Transformation, Workforce and Employment, and Skills and Inclusion. Each section highlights the focus areas derived from the keywords, illustrating how these themes overlap in topics such as automation, job displacement, skill development, flexible work arrangements, labour market policies, and the future workforce

Finally, the categories identified in this critical review process are demographic changes (aging/youth, gender, migration), technology (automation, robotics, AI, flexible work arrangements, remote work), green transition and climate change, labour shortages (lack of skilled workers, low birth rates), and wellbeing (health, work-life balance) (See Figure 13).

The consortium countries exhibit varying levels of preparedness and action in response to the labour and social challenges arising from digital transformation, sustainability, and demographic changes. Sweden and Germany primarily face significant challenges due to their aging populations, which creates an urgent demand for young talents and skilled workers in sectors such as high-tech and healthcare. Both countries have implemented immigration policies that facilitate the integration of foreign workers to mitigate local labour shortages. Italy and Portugal, on the other hand, are affected by low birth rates and the migration of young professionals to other EU countries. They are designing policies to mitigate this "brain drain" through incentives to encourage workers to return or settle in less populated regions of the country. Poland, despite having a relatively younger population, has launched programs to encourage lifelong learning for adults and the integration of immigrants, especially in industrial sectors. Slovenia also faces an aging population that is beginning to strain its labour market,

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particularly in sectors requiring young, skilled workers. The country has implemented incentives to retain older workers and attract young talent, although its efforts are still limited compared to other consortium countries.

Regarding technology and digitalization, Germany leads in digital infrastructure and the adoption of advanced technologies, though it suffers from a digital skills gap, especially among its older population. Training in digital skills for older workers and technical education for youth are key priorities. Sweden, one of the most advanced countries in digitalization, actively promotes education in artificial intelligence (AI), even in non-technical programs, to ensure the population is prepared for technological changes. Greece and Malta, though less advanced, have adopted digitalization strategies in education and training, focusing on preparing youth for jobs in technology and digital services. Portugal has launched the “Digital Academy Portugal”, which promotes digital skill development, especially among adults and workers in low-tech sectors. Slovenia has also made strides in digitalization, particularly in education and VET, though it faces challenges in large-scale adoption of advanced technologies and digital training for its workforce.

In relation to the green transition and climate change, Sweden and Germany are committed to ambitious sustainability goals and heavily invest in green technologies, including renewable energy and energy efficiency. Germany, though still dependent on coal, is progressing with plans for a transition to clean energy. Malta and Greece, with tourism-based economies, are adopting sustainable practices in sectors like construction and tourism, though they rely on EU funds to implement these changes. Italy and Portugal have initiated sustainability efforts in critical sectors such as agriculture and tourism, promoting green jobs and sustainable management practices, especially through the "Portugal 2030 Strategy”. Poland, somewhat behind in this aspect, has launched incentive programs to modernize its energy infrastructure towards renewable sources. Slovenia, with a strong commitment to the green transition, has invested in renewable energy and energy efficiency, although it faces challenges in implementing sustainable practices in sectors like industry and transportation.

Regarding labour shortages, Germany and Sweden face an acute labour shortage due to high retirement rates and insufficient growth in the young workforce. Both countries have launched programs to attract foreign workers and improve retention with welfare and professional development policies. Greece, with a high youth unemployment rate, faces a paradox, as it also suffers from a shortage of personnel in specialized sectors. Its strategy focuses on strengthening vocational education and training to reduce this gap. Italy and Portugal also face a skills

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mismatch in technology and healthcare sectors due to the emigration of qualified youth, with Italy seeking to reverse this phenomenon by offering tax incentives for talent return. Malta relies on foreign workers to meet needs in technology and services, adjusting its labour policy to facilitate the integration of these employees. In this regard, Portugal has developed programs such as tax incentives for returnees (the "*Regressar*" Program) and tax incentives for young people (the "*IRS Jovem*" measure) to promote their retention within the country. Slovenia faces a shortage of skilled workers in technology and healthcare sectors, exacerbated by a moderate brain drain to other EU countries. To counter this, it has implemented incentives and is strengthening its education and vocational training system to improve local employability.

Sweden leads in gender equality with strong policies for inclusion and pay parity, and has implemented strict legislation to ensure equal opportunities, promoting female participation in STEM (science, technology, engineering, and mathematics) sectors. Germany has also advanced in gender equality, although it faces challenges in male-dominated sectors, such as engineering. Shared parental leave policies have improved women's participation in the labour market. Italy and Poland, with significant structural barriers, face low female participation, particularly in technology. Both countries have begun implementing policies to reduce this gap, although progress is slow. Malta and Portugal have made advances but still face challenges, such as female representation in leadership positions, promoting the inclusion of women in male-dominated sectors. Slovenia has also made strides in gender equality policies, promoting female participation in the labour market and encouraging women's entry into STEM fields.

Finally, in terms of wellbeing, Sweden and Germany stand out, having established high standards for workplace wellbeing, with stress management policies and flexible hours that have been effective in reducing burnout and improving job satisfaction, promoting a holistic approach to wellbeing that includes support for mental and physical health. Italy and Greece face wellbeing challenges in high-demand, low-pay sectors, with high levels of stress and burnout. Policies are being developed to improve work-life balance. Malta has begun implementing workplace wellbeing programs, though it remains focused on promoting skills development and reducing workload in sectors like tourism and technology. Poland is adopting workplace wellbeing practices, albeit at a slower pace; its efforts focus on reducing excessive work hours and improving health and safety conditions. Slovenia has also begun adopting workplace wellbeing policies that promote work-life balance, although the implementation of specific programs remains uneven across sectors.

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In conclusion, the consortium countries can collaborate and share best practices, especially in digital training, inclusion policies, and wellbeing development, allowing for collective improvement and advancement towards a fairer, digitalized, and sustainable labour market. Shared experiences and innovative quality solutions can build a resilient and adaptable labour market that prioritizes fairness, (economic, social and environmental) sustainability, and digital transformation. Emphasizing cross-border cooperation in research, capacity building, and policymaking can ensure alignment with evolving global standards and challenges. These efforts empower individuals and organizations to thrive in an equitable, future-ready labour system. redictions suggest that within the next decade, labour markets will see more hybrid job models, with greater integration of digital tools in daily work life. This shift could lead to higher productivity and work-life balance, but only if mental health and well-being remain a central focus. Furthermore, technological advancements such as artificial intelligence and automation will demand constant adaptation and upskilling programs. A proactive approach in these areas will allow the countries to not only adapt to changes but also to lead the way in creating a labour market that is resilient, inclusive, and sustainable for future generations.

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Dominik Kubas - Senior expert/advisor/researcher with a PhD in Social Science and completed postgraduate studies in the following areas: (1) Advisor for EU Projects (2009), (2) Internal Control and Internal Audit (2011), (3) Data Analysis (2014), (4) Career Counselling (2015), and (5) Human Resource Management (2020). A certified career counsellor with 16 years of experience in preparing, implementing, coordinating, and accounting for more than 30 projects in education, labour market, career counselling, social inclusion, and vocational training, including transnational projects such as Grundtvig, Leonardo da Vinci, and Erasmus+. His research interests focus on flexicurity in the European labour market.

Morena Mauro is a senior researcher, graduated in Economics and Business. Since 2005, at IRES FVG, she has held roles of responsibility in the development and management of training and socio-economic research projects, in particular on issues relating to innovation (technological and organisational) and the typical problems of corporate, economic and social contexts. She has developed specific expertise in the use of both quantitative and qualitative research techniques. Skills that have constantly been updated and expanded thanks to roles held in other contexts. In fact, since 2016 she has been an effective member of the CTV - Technical Evaluation Committee, in the FVG Region about evaluating innovation and research projects within the main regional financing instruments (e.g. ERDF , Regional Industry, Commerce and Tertiary Laws) and since 2022 she has been a Board Member of Prima Cassa del FVG (Cooperative Credit Bank). One of the latest research activities was carried out for Inapp on the topics of industry 4.0 processes.

Nadia Molek Holds a PhD in Anthropological Sciences from the Universidad de Buenos Aires. In 2013 and 2023, she was awarded first prize by the Government Office for Slovenians Abroad for her licentiate and PhD thesis on Slovenian heterogeneous identity constructions in Argentina. She currently works as a researcher and assistant professor of Management and Organization at the Faculty of Organisation Studies and as an assistant professor in Anthropology at the University of Ljubljana. She is a member of the editorial committee of the Journal of Universal Excellence and Challenges of the Future and is a member of the Inštitut za organizacijske študije. Additionally, she is an invited collaborator at the Slovenian Migration Institute. In Argentina, she has worked as a researcher, advisor, and lecturer at the Universidad Pedagógica Nacional – UNIPE and Universidad del Salvador, and as a visiting researcher at the University of Stavanger (Norway) and the University of Primorska (Slovenia). She has also participated in various research projects focused on indigenous peoples in Argentina. Her research interests and publications include topics such as identity processes, migration and mobility, transnationalism, ethical inclusion of artificial intelligence in organizational contexts, sustainable development, diversity and inclusion, gender balance, and workplace wellbeing.

Ieva Ugne Ulianskaite holds an MS in Law from Vilnius University, Lithuania, and is a student at Mindvalley University. She is a certified mindfulness instructor from the Dhammakaya Meditation School and has also received yoga certification from the Transformational Yoga School. With over 11 years of experience as a project manager in non-formal education, her work focuses on integrating alternative well-being practices into educational frameworks. Additionally, she has six years of experience leading non-profit organizations, combining non-formal education with mindfulness and holistic well-being initiatives.

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NCPE - The National Commission for the Promotion of Equality (NCPE) is Malta's national equality body with a remit covering the following grounds of discrimination: gender and family responsibilities, age, race/ethnic origin, religion/belief, sexual orientation and gender identity, gender expression and sex characteristics, as well as the freedom of movement for workers in the EU. The NCPE's role in this project is two-fold; primarily, the NCPE will be taking on a horizontal role by ensuring that equality is mainstreamed throughout the project. Secondly, the NCPE shall take on a panel discussion which will focus on "The Meaning of Work and the importance of ensuring Equality: Bridging Contemporary Views with Future Vision". The workforce is continuously changing especially in relation to the digital component which has become significant in today's workforce. The digital aspect of work is influencing the work of both women and men and the NCPE deems it important to understand what is happening presently and what will happen in the future with regards to conditions of work. The NCPE has also observed the gig economy whereby everyone works individually with unknown conditions of work. Another point of concern which may be addressed through this project is the effect that digitalisation is having on women's jobs. It was recently reported that "nearly 80% of women's jobs <are> at risk form generative AI" Digitalisation presents a new challenge to equality, one which may be analysed in the context of this project. The NCPE foresees the need for re-skilling of jobs and is also concerned with women in poverty. As an equality body, the NCPE will bring its expertise in the field of equality to each aspect of the workforce which is identified through this project. It is therefore highly significant that the NCPE as a national equality body forms part of this consortium to ensure an equality perspective throughout the project, thereby yielding more significant results and equality-mainstreamed recommendations

Sara Ramos holds a PhD in Psychology in 2006, specializing in Work Psychology at the Faculty of Psychology and Educational Sciences-University of Porto, with a thesis on aging and work. Post-Doctorate in Ergonomics in 2009 at the Faculty of Human Kinetics-University of Lisbon. Associate Professor at ISCTE-IUL since 2007, within the Department of Human Resources and Organizational Behavior, teaching in the areas of Work Psychology, Occupational Health and Safety, Organizational Behavior, and Qualitative Methods across various study cycles, having supervised numerous master and doctoral theses. She is also a researcher at Dinâmia'CET-ISCTE, conducting research on the relationship between health, age, and work, particularly on working conditions, psychosocial risk factors, teleworking, aging, and age diversity in the workplace, with national and international publications in these areas. She is Specialist Advisor in the Office of the Secretary of State for Labour in the XXIII Constitutional Government (2022/23) and Executive Director of the National Plan for the Implementation of a Youth Guarantee (2023/24).

Agnieszka Stawiszyńska is a Senior expert/advisor/researcher with an MA in Political Science. She completed postgraduate studies in the following areas: (1) Human Resource Management, (2) Social and Market Research, (3) Economic and Commercial Law, (4) Coaching, and (5) Career Counselling, as well as third-cycle (doctoral) studies in Political Science. She has contributed to several notable publications, including "The Lublin Government Activity in raising funds from the European Social Fund", featured in Direct democracy in territorial government (UMCS, 2012), and "Gender Mainstreaming in the Framework of the ESF in Poland After 2007", presented at the international scientific conference on feminism. She is also a certified career counsellor and coach with 18 years of experience in creating, implementing, and coordinating social projects, as well as a former university lecturer.

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Alexander van Biezen is a philosopher of science, graduated from the Free University of Brussels-VUB as a Doctor in Philosophy. He specialized in the philosophy of cosmology, with a doctoral dissertation on the cosmological models of Stephen Hawking and Thomas Hertog. He has additional diplomas in theology and religious studies and in computer science. At first, he worked for a number of years in the IT sector. Then he decided to make a career change and switched to education and academic research. After having worked as a teacher in secondary education, he is now enrolled as a researcher and lecturer at the UCLL University of Applied Sciences in Leuven, Belgium, working on several projects for UCLL's research center Inclusive Society.

Katarzyna Wlusek graduated from Institute of Economic Sciences, University of Wrocław, Faculty of Law, Administration and Economics with a master thesis on credit insurance. She has worked at CRN since 2020 and is involved in projects about inclusion and empowerment of migrant organisations in main society, gamification on well-being and second language as a strength on the labour market of migrants.

Maria João Velez Phd in Management at Nova School of Business and Economics. Assistant Professor in the Department of Human Resources and Organizational Behavior, she has been teaching courses related with Human Resources Management in several Undergraduate Degrees, Master and PhD, mainly in Psychology and Management Degrees. She also supervises master and Phd students mainly in the field of Leadership and Human Resources Management. Researcher at BRU-ISCTE, her main research interests are in the field of human resources management and organizational behavior, covering topics such as leadership (both positive and destructive forms), human resources management practices, emotions in the work context or work-family interface. She has published in international journals, including *Journal of Occupational Health Psychology, Journal of Occupational and Organizational Psychology or The Leadership Quarterly*.

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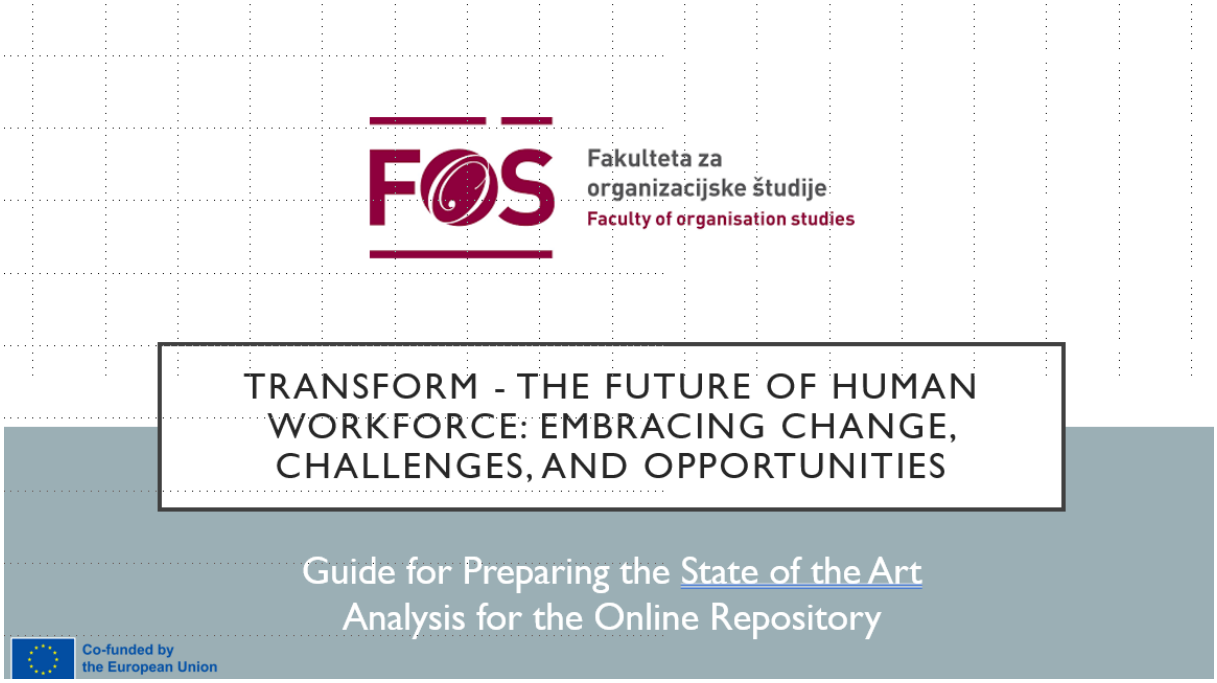
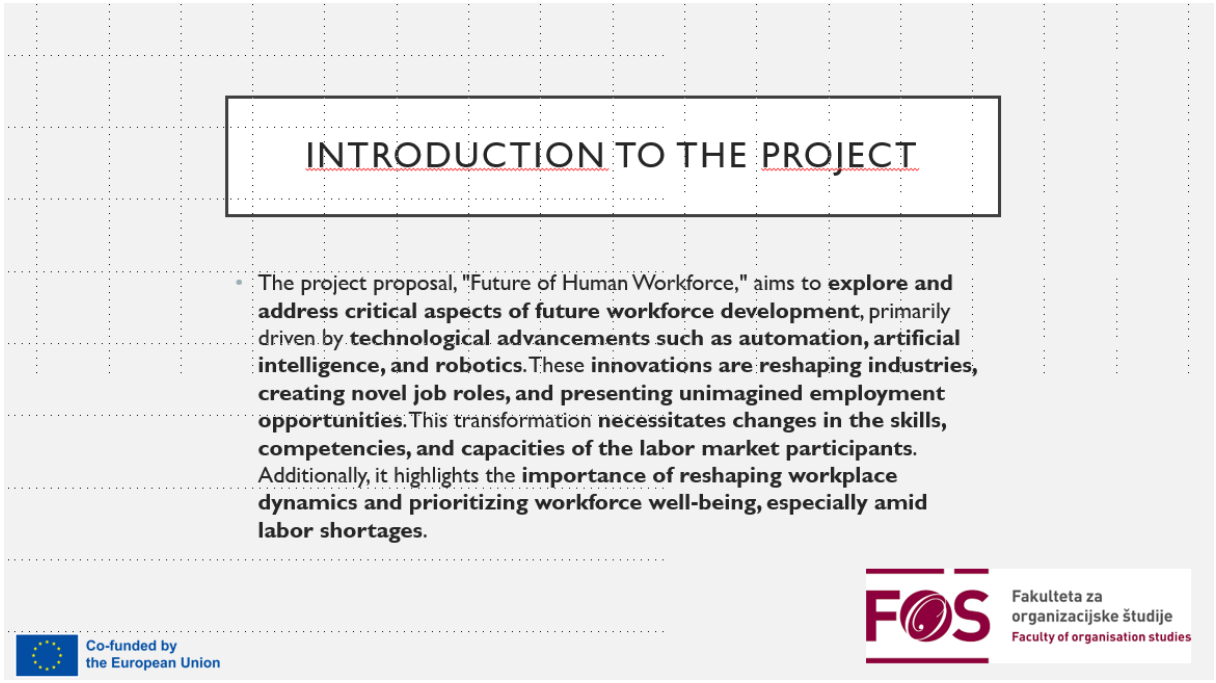
Annexes

Annex A





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OBJECTIVES OF THE STATE OF THE ART ANALYSIS

- **Identify relevant technological advances**: Explore how automation, artificial intelligence, and robotics are transforming the labor market.
- **Evaluate changes in skills and competencies**: Identify emerging skills and competencies necessary for the future workforce.
- **Examine workplace dynamics**: Analyze how workplace dynamics are changing and the importance of workforce well-being.
- **Review current policies and good/weak practices**: Compare and contrast current practices and policies with future labor market needs.

Please keep in mind that these objectives are part of the accepted project, so we must fulfil them!

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RESEARCH DIVISION BY TOPICS

- ***Identify Relevant Technological Advances:***
- *RQ1: How are automation, artificial intelligence, and robotics transforming the EU and partner's labor market?*

FOŠ: Artificial intelligence (AI) and its impact on the labor market; Automation of industrial processes and manufacturing; Robotics and its application in various industrial sectors.

- ***Evaluate Changes in Skills and Competencies:***
- *RQ2: What are the emerging skills and competencies necessary for the future workforce?*

UCLL: Research on emerging digital skills and adaptation to new technologies; Evaluation of the necessary skills in traditional and emerging sectors.

IRES FVG: Training and professional retraining to adapt to the new demands of the labor market.

Examine Workplace Dynamics:

- *RQ3: How are workplace dynamics changing and what is the importance of workforce well-being in this context?*

ISCTE: Analysis of remote work trends and flexible work arrangments.
Wellbeing Lab: Study of the evolution of working conditions and employee well-being. Research on stress management and mental health in the workplace.
NCPE: Analysis of current practices related to inclusion and gender equality.
Innovation Hive: Employment and vocational training policies in the context of digitalization and globalization.

Review Current Policies and Practices:

- *RQ4: How do current practices and policies compare and contrast with the future needs of the labor market?*

FFI: EU level labor policies and guidelines regarding the future needs of the labor market.
All partners: National labor policies (partner's country level).
CRN: Good and weak practices

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STEPS

- Since the goal of the State of the Art is to identify relevant technological advances, evaluate changes in skills and competencies, examine workplace dynamics, and review current policies and good/weak practices, **each partner has to identify 5 to 10 most important publications, preferably in English, on the topic assigned** (*comming next*), **and be able to construct updated, localized (EU+partner's countries) and scientific based knowledge about it.**
- The **report on the State of the Art has to depict what is happening regarding technological advances, evaluate changes in skills and competencies, and workplace dynamics.** The **partner in charge of a thematic core** (*comming next*) **must ensure this is addressed in the EU as well as in each partner's country (Belgium, Slovenia, Portugal, Greece, Italy, Sweden, Germany, Poland, Malta).**
- **Each partner** must review their own **current national policies** about this issues.

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STEPS

- The scope of the articles **should be based „at last" 10 years and should be mainly focused on literature on EU** (member states, including UK).
- Literature review should **include quality scientific or professional materials (scientific quality articles prefered)**, it should be based on **indexed jounals, relevant documents ad national or international professional reports.**
- **Quantitative, qualitative and mixed-method studies should be included.**

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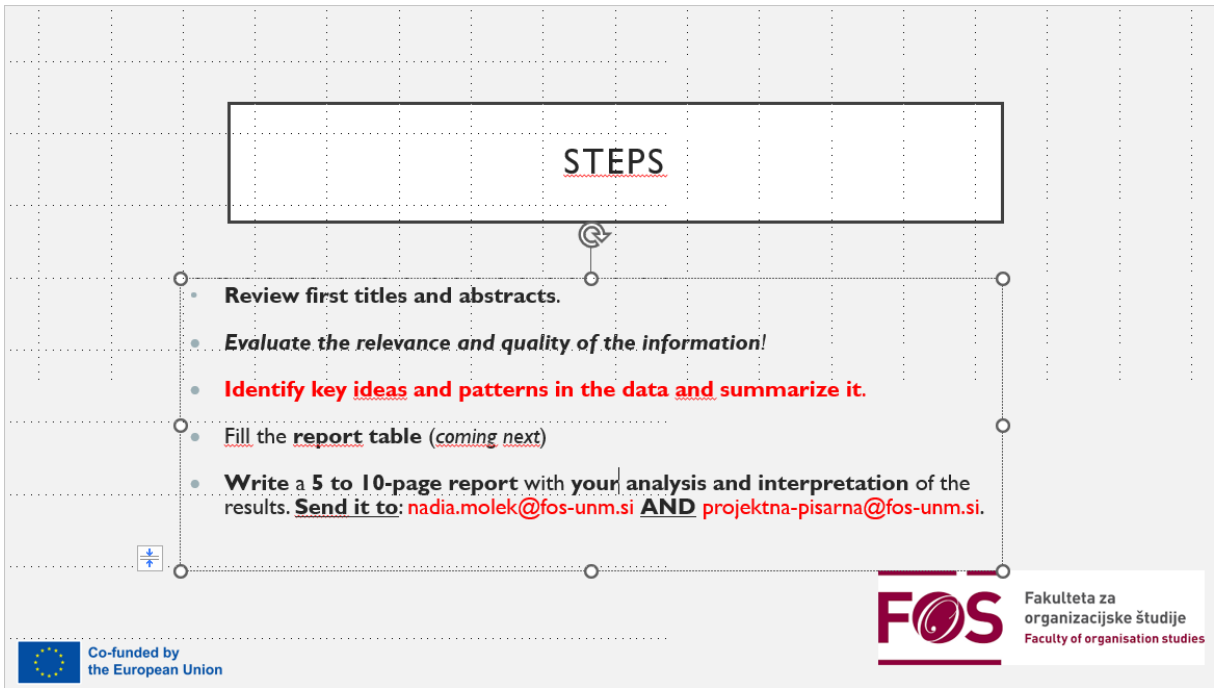

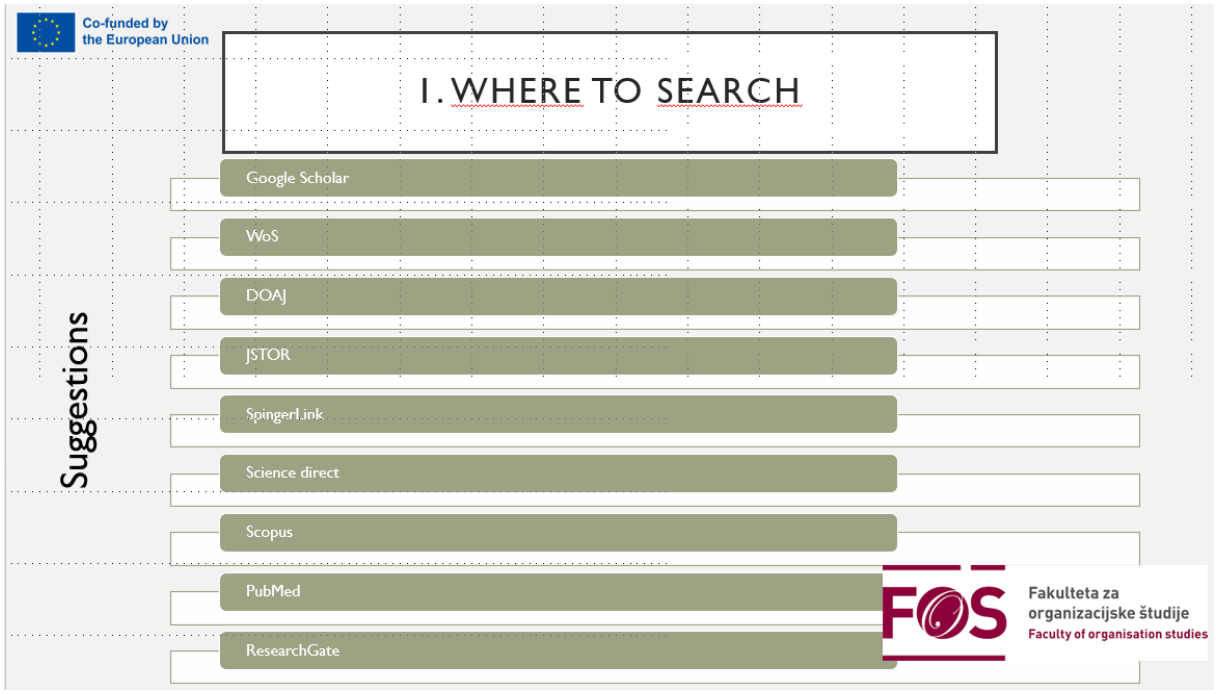

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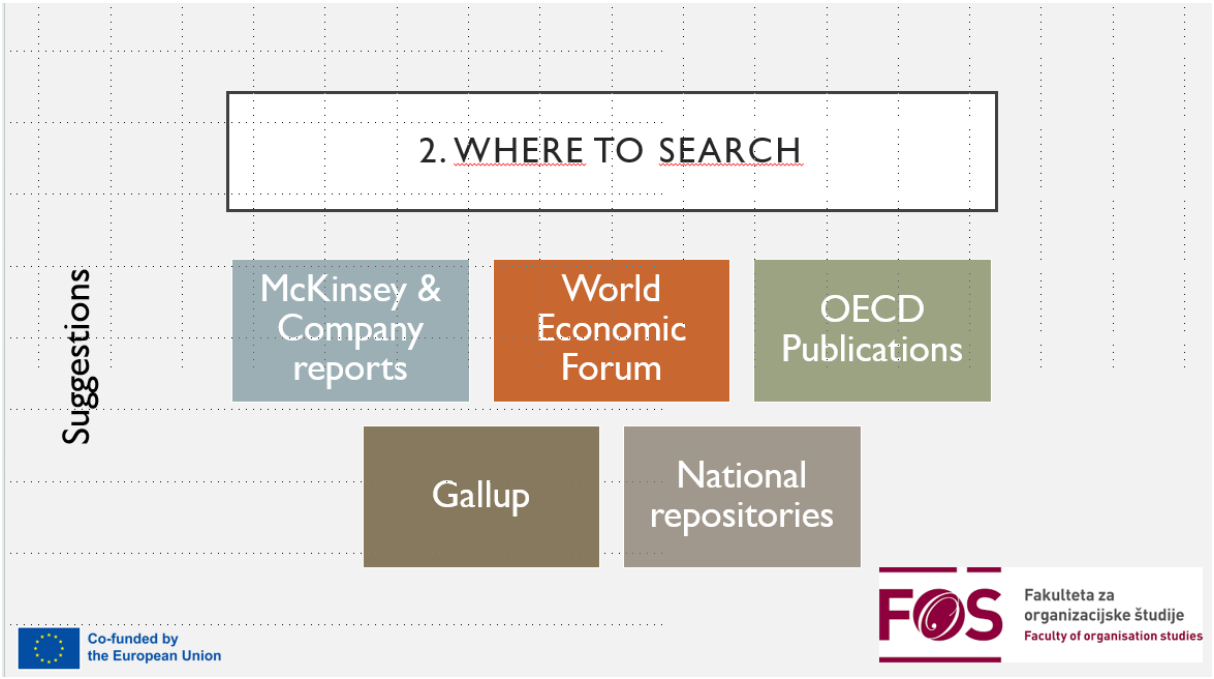

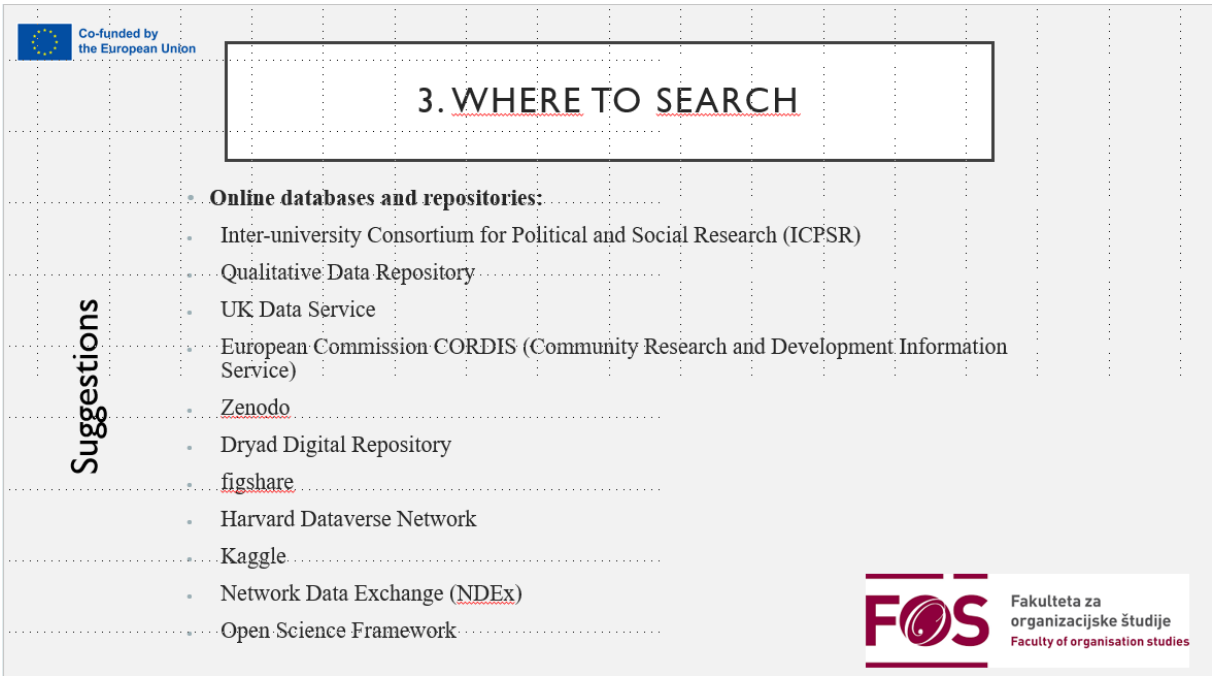

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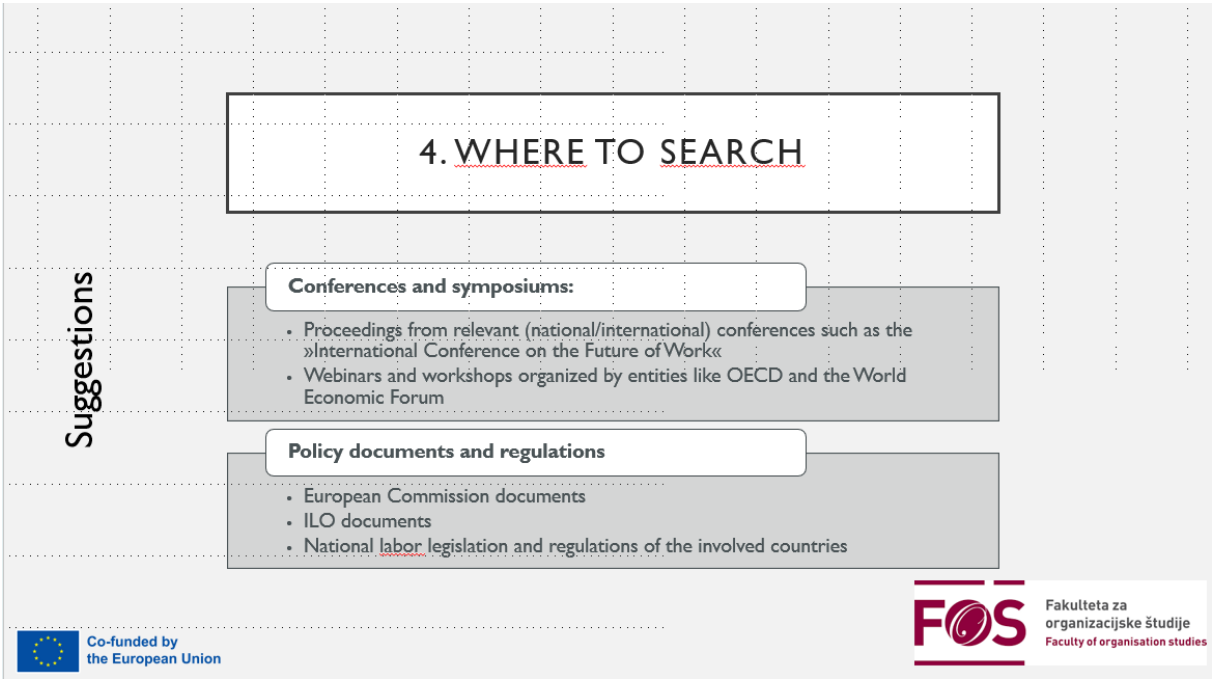

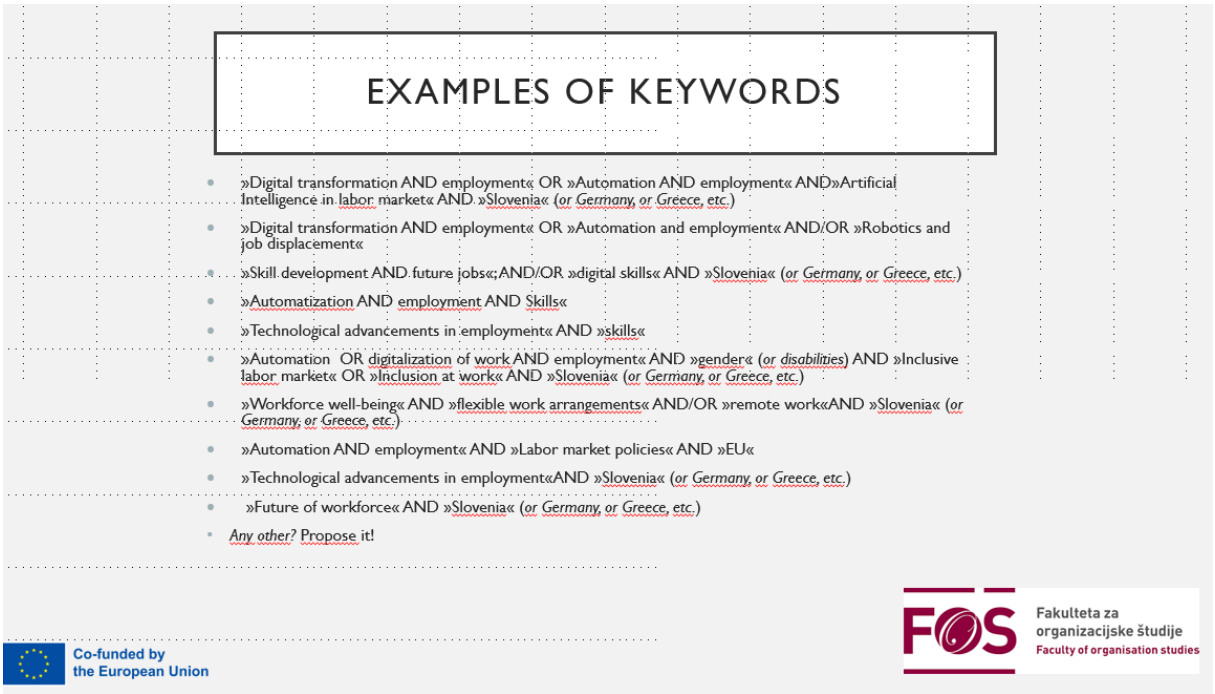

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REVIEW AND EVALUATION

- Read and summarize the collected documents, desegregating the information collected during the State of the Art research. Use the APA 7th edition citation format
- *The table is going to be included in the WP's final report.*

AUTHORS AND YEAR	TITLE OF WORK	TYPE OF WORK	SUMMARY
AUTHOR1, AUTHOR2 (2023)	Title of the Article	Theoretical	Key ideas, important content, or good/weak practices, or a legislation summary.
AUTHOR3 (2022)	Title of the Chapter	Empirical	Key ideas, important content, or good/weak practices, or a legislation summary.
AUTHOR4 (2021)	Title of the Regulation	Regulation	- Key ideas, important content, or good/weak practices, or a legislation summary.
AUTHOR5, AUTHOR6 (2020)	Title of the Report	Practices	Key ideas, important content, or good/weak practices, or a legislation summary.
AUTHOR7 (2019)	Title of the Book	Theoretical/Empirical	Key ideas, important content, or good/weak practices, or a legislation summary.
AUTHOR8 (2018)	Title of the Article	Theoretical	Key ideas, important content, or good/weak practices, or a legislation summary.

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Example of table for disaggregating information in review and evaluation

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Annex B

Table 4 (for Chapter 2)

Overview and summary of key sources and main findings[34]

RQ	Author(s) & Year	Title	Type	Summary
RQ1: How are automation, artificial intelligence, and robotics transforming the EU and partner's labour market?	**Acemoglu & Restrepo (2019)**	**Automation and New Tasks: How Technology Displaces and Reinstates Labour**	Theoretical study /Scientific	The study shows how automation allows capital to take over tasks previously performed by labour, reducing the labour share and potentially decreasing labour demand despite productivity gains. This is particularly evident in sectors like manufacturing, where automation has displaced significant amounts of labour over recent decades. New tasks that favour human labour can offset the displacement effect. When new technologies create jobs that require skills where labour has a comparative advantage (e.g., creativity, problem-solving), labour demand and labour share increase. The dual effects of technology on labour markets, with a focus on job destruction and job creation (capitalization effect) in highlighted.
	Brynjolfsson & McAfee (2014)	**The second machine age: work, progress, and prosperity in a time of brilliant technologies**	Theoretical study/Scientific	It introduces important concepts of the object of study like **technological unemployment caused by automation, which displaces workers in routine jobs and leads to job polarization, with middle-income roles disappearing and a divide forming between low-wage manual jobs and high-wage cognitive ones**. While **lower-skilled workers are most affected, automation also impacts routine cognitive tasks in higher-skilled roles**. Non-routine cognitive and social jobs still favour humans, but the **changing market requires continuous skill development. Despite technological progress boosting productivity, labour's share of income has fallen, increasing inequality between skilled and unskilled workers**. Job **creation has slowed, and improving education is crucial for equipping workers with the skills needed in a technology-driven economy to reduce inequality**. Their "Second Machine Age" concept is key to understanding the broader context of digital transformation and its impact on labour.
	Carbonero et al (2018)	**Robots worldwide: The impact of automation on employment and trade**	Empirical/Scientific	There is **no clear consensus on the impact of automation on employment. While automation boosts efficiency, it disproportionately affects labour markets in emerging economies, worsening job displacement**. This highlights the **need for policies like retraining programs and labour protections, especially in labour-intensive sectors**. Robots **reduced global employment by about 1.3% between 2005 and 2014**, with **emerging economies most affected**. It is noted that **job losses in emerging economies are often not offset by new job creation or productivity gains, revealing a gap in labour market strategies.**

[34] In Table 4 we have left the bold highlights indicated by each author when submitting their table separately.

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	Chiacchio et al (2018)	**The impact of industrial robots on EU employment and wages: A local labour market approach**	Empirical/Scientific	The study **explores the dual effect of robots: displacement (replacing workers in specific tasks) and productivity (increasing labour demand by boosting production efficiency) and wages, analysing holistically the impact of AI systems on the industrial production.** It finds that **the displacement effect dominates,** reducing employment by 0.16-0.20 percentage points per additional robot per 1,000 workers.
	Cséfalvay (2019)	**Robotization in Central and Eastern Europe: catching up or dependence?**	Empirical/Scientific	The **adoption of industrial robots** in **Central and Eastern Europe** (CEE) (e.g. Portugal, Slovenia) has **grown significantly in the past decade, with over 30,000 robots operational by 2019.** This growth has contributed to **economic convergence with Western Europe, though CEE remains highly dependent on the automotive sector.** Falling robot prices and higher wages have driven robot adoption, with large global companies, particularly in automotive, playing a crucial role. However, **over-reliance on a single industry poses risks, as changes in the automotive sector could disrupt local economies. The uneven distribution of robot density highlights disparities, with CEE lagging behind countries like Germany and Sweden.**
	Dauth et al. (2017)	**German Robots - The Impact of Industrial Robots on Workers**	Empirical/Scientific	While **industrial robots have a negative impact on employment in the German manufacturing sector, there is a positive and significant spillover effect as employment in the non-manufacturing sectors increases** and, overall, **counterbalances the negative effect.**
	Doorley et al (2023)	**Automation and income inequality in Europe**	Empirical/Scientific	The study finds that **automation, driven by the adoption of industrial robots, negatively affected wages and employment for workers exposed to routine tasks.** The adverse impact was more pronounced on wages than employment. **Taxation and welfare policies in many European countries played a significant role in mitigating the effects of automation on income inequality.** While wage inequality widened, these **policies absorbed much of the labour market shocks, limiting the overall impact on disposable household income.**
	Eurofound (2024)	**Human–robot interaction: what changes in the workplace?**	Empirical – EU report	The **introduction of robots in the workplace has boosted productivity and safety, but its effects on workers are mixed. Technologically skilled workers benefit, while those in manual and routine jobs face higher risks of replacement. Robots reduce physical strain and enhance ergonomics but may increase work intensity, surveillance, and stress. Advanced robotics and AI are reshaping roles and business models, with collaborative robots (co-bots) changing how work is organized. Larger companies,** especially in manufacturing, **lead robot adoption,** while **smaller firms struggle with high investment costs. The rise of robotics demands new skills, particularly in digital literacy and collaboration with AI.** The **EU** has implemented **policies,** like the **AI Act,** to **promote human-centric AI and address occupational safety and health risks related to human-robot interaction.**

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	Fernández-Macías, Klener & Anton (2021)	**Not so disruptive yet? Characteristics, distribution and determinants of robots in Europe**	Empirical/Scientific	**Industrial robots** in Europe are mainly used in **routine, manual tasks within manufacturing sectors,** especially in the **automotive industry,** with **Germany leading** in robot adoption. **Robots are concentrated in a few countries and sectors, with more than 50% in the automotive industry**. The adoption is driven by high labour costs and routine task content, with limited impact from digitalization or R&D investments. **The increase in robot use has been gradual rather than disruptive, focusing primarily on automating repetitive tasks in large-scale industries, particularly in scale-intensive sectors like automotive.**
	Georgieff (2024)	**Artificial intelligence and wage inequality**	Empirical - OECD report	AI **primarily impacts wage inequality within occupations by reducing productivity differences, allowing lower-skilled workers to catch up. While earlier technologies increased inequality by displacing routine jobs, AI now affects high-skill roles too, though it can raise wages through productivity gains. Poland and other Eastern European countries reduced wage inequality, while Greece and Norway saw increases. Germany, Belgium, and Sweden show rising demand for AI-related skills like creativity, while Poland faces widening wage gaps in industrial sectors due to uneven AI skill distribution.**
	Gmyrek (2023)	**Generative AI and jobs: a global analysis of potential effects on job quantity and quality**	Empirical – ILO report	The study underscores that **while AI can potentially improve productivity and job augmentation, it poses significant risks of exacerbating income inequality, particularly between high- and low-income countries, and between genders.**
	International Bank for Reconstruction and Development (2019)	**The changing nature of work**	Empirical - Report	Their analysis highlights the broader economic shifts due to automation and predicts new job roles, particularly in digital economies.
	IFR (2024)	**World Robotics Report**	Empirical – IFR report	The World Robotics report (February 2024) highlights that robot density globally reached a new high of 151 robots per 10,000 workers. **The European Union leads with an average of 208 units, with Germany standing out with 415 robots per 10,000 workers, primarily in the automotive, electronics, and machinery sectors. Sweden follows with 343 robots per 10,000 employees, placing it sixth globally. Slovenia** ranks 11th with 284, while **Italy and Belgium** have densities of 219 and 216, respectively. **Poland** lags behind with 42 robots per 10,000 workers, with most automation found in automotive and metal industries. Countries like **Portugal** (86 robots) and **Greece** (15-20 robots) have lower robot densities, while **Malta** has fewer than 10 robots per 10,000 workers. **Germany leads the European market with a 5% annual growth rate, driven by strategic partnerships and advancements in AI and robotics, particularly in industries like automotive and pharmaceuticals. Poland's potential for automation** remains significant, with high growth expectations in sectors like food processing and transportation. However, **limited governmental support** and low current automation rates pose challenges.

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	Klenert et al. (2023):	**Do robots really destroy jobs? Evidence from Europe**	Empirical/Scientific	This study evaluates the relationship between robot adoption and employment in Europe. This study provides valuable insights into the use of industrial robots and their positive association with employment in Europe, since **contrary to some earlier studies, it does not show a reduction in low-skill worker employment.** The **findings are primarily relevant to the manufacturing context but remain robust even when including non-manufacturing sectors.** These conclusions challenge the assumption that automation reduces low-skill jobs, presenting a more nuanced understanding of robot adoption's labour market impact.
	OECD (2024)	**Using AI in the workplace**	Empirical – OECD report	The report highlights **AI's significant impact on labour markets, with 27% of jobs at risk of automation, particularly affecting both low- and high-skilled workers. Rapid AI adoption raises concerns about job displacement, urging policies focused on reskilling vulnerable workers. AI boosts productivity but may widen inequality, especially in countries with weaker social safety nets like Greece, Poland, and Slovenia.** Countries like **Germany, Belgium, and Sweden lead AI adoption in high-skill sectors and focus on reducing inequality through strong labour laws. Privacy and bias concerns arise due to AI's data use, with the EU's GDPR offering better protections.** AI **can also enhance physical safety but increase mental health risks, like stress from constant monitoring.**
	Rydzik & Kissoon (2022)	**Decent work and tourism workers in the age of intelligent automation and digital surveillance**	Empirical	**Automation, AI, and digitization, on tourism labour markets, especially in lower-skilled and lower-paid roles like waiters, kitchen staff, receptionists, and cleaners, poses a significant risk of job displacement.** Up to 78% of certain tourism roles are at risk of automation by 2030, disproportionately affecting women, migrants, and younger workers. **Technology adoption in tourism involves not only replacing workers but also increasing digital surveillance, creating a power shift towards employers.** This undermines worker autonomy and could lead to **job churn, reduced job quality, and increased precarity. Lower-skilled roles in tourism, particularly those involving routine tasks, are most at risk of automation.**

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	Siemon & Kedziora (2023)	**From Accountant to Software Developer – Transforming Employees with Robotic Process Automation (RPA)**	Empirical	**Retraining employees from non-technical roles, such as accountants, into technical roles like Robotic Process Automation (RPA) developers is crucial for adapting to these technological shifts.** Employees must acquire **new skills to stay relevant in increasingly automated industries. RPA is highlighted as a transformative technology that automates repetitive tasks.** RPA should be viewed as an **augmentation of human capabilities rather than a replacement.** The retraining of accountants to become RPA developers demonstrates the **importance of blending domain-specific knowledge (accounting) with software development skills.** This combination allows employees to develop effective automation solutions, **increasing productivity and adding value to the organization.** The transformation process involves **overcoming skepticism, anxiety, and fear of job replacement due to automation.** There are challenges related to the time and availability of employees, potential technical mindset barriers, and the risk of employees leaving the company after acquiring new skills.
	Smit et al. 2020	**The future of work in Europe: Automation, workforce transitions, and the shifting geography of employment**	Empirical – McKinsley report	**Automation is expected to significantly reshape Europe's labour market by 2030, with 22% of work activities potentially automated, particularly affecting middle-skill, routine jobs like office support and production roles.** This **will lead to a polarized labour market, with growth in high-skill cognitive jobs and low-skill manual roles, while middle-skill positions decline.** Job growth is concentrated in dynamic cities like London and Paris, while **Eastern and Southern Europe face job losses due to aging populations and migration. Knowledge-intensive sectors are expanding, while manufacturing and agriculture are in decline.** By 2030, 94 million workers, particularly in declining sectors with low education, will require retraining. **The COVID-19 pandemic is accelerating automation in industries like retail and hospitality, increasing risks for jobs involving physical proximity.**
	Squicciarini & Staccioli (2022)	**Labour-saving technologies and employment levels**	Empirical	**The report examines the impact of labour-saving (LS) technologies, particularly robotics, on employment** across OECD countries, using data from the European Patent Office. **Despite the rise in LS patents, there is no significant evidence of widespread job losses or reduced employment levels due to these technologies over the past decade. Both low-skill blue-collar and high-skill cognitive jobs are exposed to these technologies, but no large-scale displacement has been observed. Italy holds more LS patents than Germany, and Sweden shows strong innovation in the field. The report stresses the importance of reskilling and upskilling to mitigate potential job displacement caused by automation.**

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	The world Bank (2019)	**The changing nature of work**	Combines theoretical and empirical	**Digital technologies are transforming labour markets by automating routine, low-skilled jobs, especially in manufacturing and services. While technology displaces certain roles, it also creates new opportunities in tech development, the gig economy, and platform-based services. High-order cognitive and socio-behavioural skills, such as problem-solving and teamwork, are becoming more valuable as they are less susceptible to automation.** The report emphasizes the **need for continuous skill development, particularly in digital literacy and adaptability, to succeed in the evolving job market.** However, **technological advancements are exacerbating inequality, benefiting high-skill workers while displacing low-skill ones. Governments must invest in education, lifelong learning, and social protections to bridge the gap between skilled and unskilled workers, especially in developing economies.** Early childhood education, tertiary education, and adult reskilling programs are key to preparing workers for a technology-driven future.
RQ2: What are the emerging skills and competencies necessary for the future workforce? Research on emerging digital skills and adaptation to new technologies; Evaluation of the necessary skills in traditional and emerging sectors.	**Adalet McGowan, M., et al. (2020)**	**Addressing labour market challenges in Belgium**	**Empirical /Scientific**	**This research pinpoints as one of the main challenges with regard to the future of the labour market in Belgium a coincidence of two factors: (1) regardless of recent improvements in this respect, employment rates remain low in Belgium, reflecting barriers to finding a job such as low levels of skills and weak work incentives; (2) a growing awareness of the fact that the changing nature of work will require a faster adaptation of workers in general. Drawing notably on insights from the OECD Jobs Strategy, the report focuses on the overall priority that each worker should have access to lifelong training, "with additional allowances targeted to disadvantaged workers".**
	Bankins, S., Hu, X., Yuan, Y. (2024)	**Artificial Intelligence, workers, and future of work skills**	Theoretical study/Scientific	The aim of this research is to show that, from an historical point of view, the use of technology in organizations has always reshaped the nature of human work. In this article, the authors overview how current waves of artificially intelligent (AI) technologies are following this trend, showing how its uses can both automate and complement human labour, alongside creating new forms of human work. However, AI can also generate both upsides and downsides for workers' experiences, which are dependent upon a range of factors such as how the technology is used and the support employees receive during digital transitions. The study concludes by outlining how AI literacy and other human-centered skills will play an increasingly important role in future workplaces.

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	Borms, L. (2024)	**Out with jobs and in with skills: measuring current circular jobs and analyzing future necessary skills.**	Theoretical study/Scientific	The circular economy (CE) is presented not merely as an end goal, but rather as a solution for sustainable materials management that aligns with the broader objective of sustainable development. This thesis aims to delve into the evolution and significance of the labour market within the context of the CE. It is anticipated that the adoption of CE principles will lead to a surge in job creation, particularly in labour-intensive sectors such as services. The research contributes to understanding the link between circularity, resilience, and circular employment, by highlighting the undervalued importance of policies like support for education and training. It calls for proactive policy measures to support companies in building resilience, especially during times of crisis. Through a comprehensive analysis of circular strategies and their impact on resilience factors, the chapter underscores the importance of adopting circular business models as a means to enhance organizational resilience.
	Caruana, H. (2019)	**Vocational education and training for the future of work: Malta.**	Empirical/Scientific	This study shows that Malta is very much aware that the crucial key to keep up with the rapidly accelerating rate of industry, technology and AI is through education and training, recognizing at the same time that education and educational change is a slow process. Inevitably, it is near to impossible for the education sector to develop at the same rate as that of technology and AI. Although, according to this report, there are still "considerable tech-skills shortages within the Maltese labour force that are being compensated for by foreign nationals" , Malta focuses all of its efforts on education and vocational training programs.
	Cedefop (2023)	**2023 skills forecast Poland**	Empirical/Scientific	Over the forecast period of the *2023 Skills Forecast Report*, 2022-2035, Poland is expected to shift towards a much higher share of highly qualified workers, consistent with an increasing demand for higher level occupations. Both competences in mathematics, science and technology and digital competence are recognized as crucial in this respect. The focus on these particular competences is clearly reflected in Poland's national policy documents and include in the national core curriculum for general educational subjects.
	Cedefop (2024c)	**Vocational education and training policy briefs 2023 – Germany.**	Empirical/Scientific	Germany's national implementation plan focuses (amongst others) on the expansion of the European education and training area in a globalized economy and emphasizes the high importance of the green and digital transition. Since 2020, several measures have been set up to facilitate the adaptation and modernization of competences and qualifications to support the digital transformation of education and the development of the digital infrastructure in education. The report concludes that Germany has progressed relatively well over the last five years, but that "further progress with digital transformation in the coming years will be crucial and may improve its position in the Digital economy and society index (DESI)".

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	Cedefop (2024d)	***Vocational education and training policy briefs 2023 – Greece. Cedefop monitoring and analysis of vocational education and training policies***	Empirical/Scientific	Greece faces specific issues with regard to a high level of youth unemployment rates. In face of these particular challenges, Greece has taken steps to improve VET (vocational education and training) labour market relevance and quality and to modernize it in terms of digitalization and infrastructure. This report also states that the number of jobs requiring a high qualification is expected to rise, as in other EU countries for that matter, as a result of the increase of automation and digitalization, moving Greece towards a more service-oriented economy.
	Cedefop (2024e)	**Vocational education and training policy briefs 2023 – Italy.**	Empirical/Scientific	According to the European report on the educational policies of Italy (Cedefop, 2024e), the main challenges that Italy faced between 2020 and 2023 include labour market shortages and mismatches, poor educational outcomes, with evident regional and local disparities, and low adult participation, especially of young adults, in education and training despite the range of training possibilities that are offered. The Italian adult population is also characterized by an insufficient level of basic digital skills. According to this report, in 2021 the Italian Recovery and Resilience Plan (PNRR) has been approved, focusing on education in general. A specific National Plan for Digital Education (PNSD) outlines the main strategy for improving learner digital skills.
	Diependaele, M. (2024)	**Samen werken aan een warm en welvarend Vlaanderen. Vlaams regeerakkoord 2024-2029.**	Empirical – Flemish Government Report (Belgium)	On 30 September 2024, a new government with Matthias Diependaele as Minister-President has been installed in Flanders which has announced quite a few new initiatives to face the current and future challenges of education and the labour market in its coalition agreement. This official Flemish Government agreement text outlines in detail which initiatives will be carried out in the next years to come.
	Digital Economy and Society Index (DESI)	**Digital Economy and Society Index (DESI) 2022**	Empirical/Scientific	The Digital Economy and Society Index (DESI) monitors Europe's overall digital performance and tracks the progress of EU countries in their digital competitiveness.
	Government Offices of Sweden (2019)	**National approach to artificial intelligence. National Implementation Plan: Sweden (2023)**	Empirical/Swedish Government Report	The Swedish government aims to be the world leader in harnessing the opportunities offered by digital transformation, identifying artificial intelligence as one of the rapidly evolving fields of digital technology. The government assesses that Swedish higher education institutions need to provide a sufficient number of people with AI education and training, particularly in continuing and further education for professionals with a university degree or equivalent. Moreover, it is recognized that Sweden needs a strong AI component in non-technical programs to create the conditions for broad and responsible application of the technology. As a result, Sweden focuses on a strong link between research, higher education and innovation in AI.
	Haase, S. (2024)	**Future Skills and (generative) AI – new era, new competencies?**	Theoretical study/Scientific	This study shows that Generative Artificial Intelligence (AI) becomes increasingly important, which is why it is crucial to develop skills that complement and exploit the capabilities of AI. In this paper, the author take a closer look at the Digital Competence Framework for Citizens (DigComp 2.2) and the Artificial Intelligence Competences framework (AICOMP), two competency models developed to face the challenges focusing on the competence elements for non-technical learners.

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	Hergan, M; Šlander, M. (2020)	**Vocational education and training for the future of work: Slovenia.**	Empirical/Scientific	This report shows that there is a high awareness in Slovenia of the importance of the challenges of the information age and the so-called Industry 4.0 and their ensuing impact on the new digital competencies needed to address these challenges accordingly.
	Imram, M. & Torralba, A. (2024)	***Future Learning with Generative AI: Critical Thinking and Cognitive Skills Development in Education*. In ResearchGate.**	Theoretical study/Scientific	This study explores how generative AI can be integrated into educational practices to address contemporary challenges and foster essential cognitive competencies. By focusing on personalized learning, interactive experiences, adaptive feedback, and collaborative support, AI tools present innovative strategies for advancing educational outcomes. Generative AI enhances personalized learning by tailoring educational content to individual student needs. Interactive learning is another significant benefit of integrating AI into education. AI can create dynamic, scenario-based experiences that immerse students in practical problem-solving and decision-making tasks. Adaptive feedback provided by AI tools offers real-time, personalized responses that support continuous improvement. AI also supports collaborative learning by facilitating effective group interactions.
	OECD (2024)	**OECD Economic Surveys: Belgium 2024**	Empirical/Scientific	This study shows that, although Belgium has seen a lowering of unemployment in recent years due to job creation, the Belgian labour market still faces a lot of challenges: employment rates remain low, accompanied by a growing need for adaptation of workers because of the changing nature of work, due to an increasing automation and digitalization.
	Olaisen, J. & Jevnaker, B. H. (2022)	**The Knowledge Work of the Future and the Future of Knowledge Work**	Theoretical study/Scientific	This paper investigates what forms the knowledge work design on a corporate level in the future. The main finding is that AI and robotics will be more advanced, but management and organizational structure will be the main changes. The work will be done more as distance work and through virtual teams. There is also predicted a lack of professionals and all types of employees in the years to come, leading both to compete for talent and increased importance in keeping the employed knowledge workers through internal career pipelines. AI and robotics will not reduce the need for professionals and employees. The skills needed are technical, information management, knowledge management, project management, collaboration, communication, rhetoric, virtual team, creativity, and green problem-solving skills. The future knowledge work will be dominated by increasingly autonomous workers co-opting automated digital systems to create and capture value.
	Siekiera, A.; Luck, A. (2016)	**Key competences in vocational education and training – Poland.**	Empirical/Scientific	According to this report, Poland's national policies on education imply a clear commitment to a lifelong learning strategy and a human capital development strategy, promoting key competences and creativity in education, aiming on "readiness to meet ecological, economic and social challenges that have an impact on the labour market needs" .

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	World Economic Forum (2023)	**The Future of Jobs Report 2023**	Empirical/Scientific	This report unequivocally concludes that analytical thinking and creative thinking remain the most important skills for workers in 2023. Analytical thinking is considered a core skill by more companies than any other skill and constitutes, on average, 9% of the core skills reported by companies. Creative thinking, another cognitive skill, ranks second, ahead of three self-efficacy skills – resilience, flexibility and agility; motivation and self-awareness; and curiosity and lifelong learning – in recognition of the importance of workers ability to adapt to disrupted workplaces.
RQ2: What are the emerging skills and competencies necessary for the future workforce? Training and professional retraining to adapt to the new demands of the labour market	**CEDEFOP 2021**	**Workplace learning: determinants and consequences: insights from the 2019 European company survey.**	Working paper	Workplace learning is a critical tool for both employees and organisations in their continuing adjustment to several global trends reshaping our workplaces, economies, and societies. This study uses the newly published data from the fourth round of the European company survey (ECS 2019) to examine key drivers and consequences of workplace learning. It shows that EU companies have several distinct workplace learning environments that di er greatly in their conduciveness to workplace learning. Findings also show that managers' perceptions of the value of workplace learning and the level of skill demand are some of the key determinants of the scope of learning opportunities. Workplace learning is found to be the most important predictor of employee wellbeing and one of the strongest correlates of company performance. Results also show that most EU companies are still not o ering optimal learning environments and opportunities to their workers, a situation that hurts both employees and companies.
	CEDEFOP 2023a	**The future of vocational education and training in Europe**	Synthesis report	This synthesis report summarises 3 years of research involving researchers and VET experts across Europe, with discussion of findings on the content and delivery of VET, assessment practices, and the link between initial and continuing VET. In addition to connecting and synthesising the series of research papers and case studies already published, it features an analysis by country. The study provides important insights into how VET in Europe has developed over the past three decades, illustrating observed trends and developments, as well as tendencies of convergence between countries and systems. The research has also shown that the development of VET does not necessarily form an unbroken chain leading in one direction but can be interrupted by changes of course and even reversals in policy and practice. This report aims to provide a stimulus for developing future research in this area.
	CEDEFOP 2023b	**Skills in transition: the way to 2035**		The challenges and opportunities the EU faces gives leverage for veering away from primarily short-term focused policy responses to immediate skills challenges, and moving towards holistic approaches that aim to achieve a more technological advanced, greener and fairer future. The evidence presented and discussed in this report points recommendations for policy and its implementation. AMong them, the Report point out the importance of VET and of synergies between enterprises and VET system.
	CEDEFOP 2023c	**Big skills for small companies**	Briefing note	The paper highlights how workers in SMEs have fewer training opportunities than those employed in large organisations. The paper recalls the main critical factors and offers an EU-wide comparative analysis of good practices.

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	CEDEFOP, EUROFOUND 2023	**Fostering skills use for sustained business performance: evidence from the European Company Survey.**	Research Report	The article highlights the data emerged from the survey (quantitative method) and emphasizes the connection between ongoing transformations, training, and the ability of leaders (managers, supervisors, etc.) to manage human resources differently. It discusses how they are learning to identify training needs in new ways, as well as changing their understanding of the value, content, and methodologies of training.
	EIGE 2023	**Gender Equality Index 2023. Towards a green transition in transport and energy**	Report	A paragraph of the report is focused on Green transition demands skills and education in sectors where gender inequality is significant
	EUROFOUND 2020	**Game-changing technologies: Transforming production and employment in Europe**	Research REport	Digitalisation objectives are combined with the other 2030 Agenda Goals. An array of policies related to the labour market have to consider the impact on the labour force regarding loss and creation of jobs. Thus the paper point out the importance of an Upskilling Pathways initiative and the Digital Skills and Jobs Coalition to foster digital skills among citizens. The paper offer an analysis (mainly qualitative) of the expected effects in Game changing technologies on skills use and skills development. The document provides some policy points reagarding reskilling and upskilling pathways to tackle the long tem effects of the digitalization on the employees.
	EUROFOUND 2023	**Changing labour markets – How to prevent a mismatch between skills and jobs in times of transition**	Background paper	Work is changing. Not least due to digitalisation and automation, the transition towards climate neutrality and net-zero industries as supported by the Green Industrial Plan, but also as a result in a shift in EU economies and labour markets from industrial production towards a more knowledge-intensive service economy. In addition, there is an increasing need for health and care professionals due to demographic ageing and changing societal structures. If the task content of work changes or new jobs arise, the skills required to enter the labour market and to engage in work over an extended working life also need to change. The paper explores how policymakers, employers, and other relevant stakeholders such as sectoral organisations and social partners could promote, stimulate, and facilitate individuals' possibilities for re- and up-skilling to meet employers' skills demands. If companies can access the skills needed, this has a positive effect on their productivity and competitiveness.
	EUROFOUND 2024a	**Company practices to tackle labour shortages**	Research Report	Based on survey, statistical data (Eursotat) and case studies, the report underlyines the importance to adopt a longterm persepctive to reduce the skills shortage. That means to innovate the whole training approach. Conclusions shows that an holistic approach, multistakeholder dialogue and collaboration with VET system are the way to follows. Furthermore, the Report indicates the importance to involve in training target as: women, part time workers and migrants.

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	EUROFOUND 2024b	**Working conditions and sustainable work: Keeping older workers engaged Policies, practices and mechanism**	Research Report	The Reserach consider practices and policies to engage older workers. A paragraph is dedicated to training policies in some EU Countries. These "good practices" could be taken into account considering the demographic change as megatrend to face in the future.
	EUROFOUND and CEDEFOP (Ernesto Villalba-Garcia) 2021	**Innovation in EU companies: Do workplace practices matter?**	Policy Brief	Based on Eurofound's European Company Survey 2019 and integrated with qualitatives methodology, the report presents the main elements that make a company innovative and competitive with respect to change . In particular, it highlights how staff training can be effective if it is accompanied by an environment conducive to proposals, listening and employee involvement. It therefore emphasises the importance of training not only in new technologies, but in a new model of leadership and team management.
	Jorge Tamayo, Leila Doumi, Sagar Goel, Orsolya Kovács-Ondrejkovic, Raffaella Sadun. Harvard Business Review october 2023	**Il reskilling nell'era dell'IA Cinque nuovi paradigmi per i leader (e per i dipendenti)**	Article	The article picks up on other international research and cites case studies that highlight the importance of training managers in an innovative approach to human resources management, valorisation and evaluation of skills acquired through training (re/upskilling).
	OECD 2024	**Getting Skills Right Future-Ready Adult Learning Systems**	Research Report	With digitalisation, deepening globalisation and population ageing, the world of work is changing. The extent to which individuals, fi rms and economies can harness the benefi ts of these changes critically depends on the readiness of adult learning systems to help people develop relevant skills for this changing world of work. This report presents the key results from the Priorities for Adult Learning (PAL) Dashboard which facilitates comparisons between countries along seven dimensions of the readiness of adult learning systems to address future skill challenges. Based on the dashboard, the report highlights in which areas action is needed, and policy examples from OECD and emerging countries throughout the report illustrate how these actions could be implemented.
	OECD ILO 2018	**Approaches to anticipating skills for the future of work**	Report	The report analyzes the different methodologies by which EU countries survey future skills needs among companies. The comparison suggests not relying solely on surveys, but also using participatory methods (stakeholder engagement). Among the examples cited is the ITS system in Italy.

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	Urban Institute 2022	**Skills-Based Hiring and Older Workers**	Research Report	Transformations have generated concern that an increasing number of workers lack the skills that employers value. Evidence suggests that employers are increasingly changing their training and hiring practices to emphasize skills over formal qualifications. Skills-based hiring focuses on job candidates' observable and measurable skills that are relevant to a job rather than on educational credentials. Further, employers increasingly emphasize behavioral characteristics alongside relevant skills and knowledge as key competencies that must be considered when evaluating job candidates. This recruiting approach aims to identify and hire the most suitable candidates for performing each job in an organization, thus optimizing long-term results and subsequent cost savings and improving workforce retention and job satisfaction. Although skills-based hiring is still relatively uncommon, how might older workers fare if such a paradigm were to replace traditional hiring practices? The shortcomings we identify with the skills-based hiring model as currently implemented give rise to a series of recommendations that could improve it. We identify recommendations aimed at employers and policymakers
	WORLD ECONOMIC FORUM 2018	**Towards a Reskilling Revolution A Future of Jobs for All**	Insight Report	The Report introduces a new approach to identifying reskilling and job transition opportunities, including those that might not be immediately apparent. Using big data analysis of online job postings, the methodology in this report demonstrates the power of a data-driven approach to discover reskilling pathways and job transition opportunities. Mainly focused on USA labour market.
	WORLD ECONOMIC FORUM 2023	**Future of Jobs Report 2023**	Insight Report	The Report considers technological change and the connection with megatrends and other transformation (green , demographic, political, etc...) Based on survey data set covering the expectations of a wide cross-section of the world's largest employers, considers trends and directions for the 2023—2027 period. Main findings about skills and training: Analytical thinking and creative thinking remain the most important skills for workers; Employers estimate that 44% of workers' skills will be disrupted in the next five years; Six in 10 workers will require training before 2027, but only half of workers are seen to have access to adequate training opportunities today. The skills that companies report to be increasing in importance the fastest are not always reflected in corporate upskilling strategies. Respondents express confidence in developing their existing workforce, however, they are less optimistic regarding the outlook for talent availability in the next five years. Surveyed companies report that investing in learning and on-the-job training and automating processes are the most common workforce strategies which will be adopted to deliver their organizations' business goals. A majority of companies will prioritize women (79%), youth under 25 (68%) and those with disabilities (51%) as part of their DEI programmes. Majority of businesses see funding for skills training as an effective intervention available to governments seeking to connect talent to employment.

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	WORLD ECONOMIC FORUM and PwC 2023	**Putting Skills First: A Framework for Action**	Paper	The paper presents tha skills-first approach as methodology aiming to promte a transition based on more equity and greater inclusion by recognizing and providing individuals with the necessary skills to succeed in a rapidly changing job market. Investing in a skills-first approach can help businesses and governments develop a highly skilled workforce that has access to better job opportunities and earning potential leading to a more innovative and prosperous economy and society overall. For this to become a reality, collaboration and commitment is needed from both the public and private sectors so that policies and programmes are aligned in creating outcomes that support lifelong learning and skill development. Based on surveys and case studies.
RQ3: How are workplace dynamics changing and what is the importance of workforce wellbeing in this context? Analysis of remote work trends and flexible work arrangments.	**Hesselbarth, Y., Alfes, K., & Festing, M. (2024).**	**Understanding technology-driven work arrangements from a complexity perspective: a systematic literature review and an agenda for future research.**	**Theoretical**	This review systematically organizes 191 studies on technology-driven work arrangements into six thematic clusters, identifying key gaps for further exploration. Technology-driven work arrangements are flexible approaches reshaping work structures and processes, largely enabled by technological advancements. These arrangements lead to more dynamic, boundary-spanning work environments, impacting organizational structure, processes, and actor relationships. The six clusters include: Organizational Architectures (structure): Companies adjust structural elements like teams and networks to manage external complexity and integrate knowledge. Knowledge Integration (process): Technology reshapes how organizations gather and manage external knowledge, balancing digital and face-to-face interactions. Flexible Employment Relations (actor): While flexible work can help organizations adapt, it can also lead to downsides like job insecurity and social isolation. Virtual Teams (structure): Virtual work requires high-trust environments to ensure effective team dynamics. Virtual Communication (process): Technology facilitates communication but requires careful management to prevent human factors from undermining it. Self-Responsibility in Less Hierarchical Structures (actor): Shifting away from traditional hierarchies, employees must take more responsibility for work outcomes, enhancing flexibility.

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	Azar, S., Khan, A., & Van Eerde, W. (2018).	**Modelling linkages between flexible work arrangements' use and organizational outcomes**	Empirical	The authors discuss the evolving nature of work in organizations, driven by information communication technologies (ICT), from both employee and organizational perspectives. A key change is the offering of **Flexible Work Arrangements (FWAs)**, which allow employees to choose where, when, and how much to work. Common FWAs include **flexplace** (telecommuting or working remotely) and **flexitime** (flexible work hours). These arrangements aim to balance work and personal life, improve job satisfaction, and reduce work-life conflict. The study finds that the use of FWAs can reduce turnover intentions by enhancing job satisfaction, while planning behavior—the ability to manage time and prioritize tasks—helps reduce work-life conflict. Planning allows employees to structure their activities, leading to a sense of control and higher job satisfaction. This aligns with Macan et al. (1990), who highlight that effective planning increases the likelihood of completing work on time and reduces strain.
	Charalampous, M., Grant, C. A., Tramontano, C., & Michailidis, E. (2019)	**Systematically reviewing remote e-workers' wellbeing at work: A multidimensional approach**	Systematic Review that provides a narrative synthesis of quantitative, qualitative and mixed methods research (63 studies)	The presence of organizational support helps reduce feelings of social isolation, leading to increased job satisfaction. Building and maintaining strong relationships is key to remote workers' job satisfaction and commitment, with job autonomy also playing a crucial role. Remote workers experience more positive emotions and fewer negative ones, particularly when remote work is part-time and allows for face-to-face interactions. Despite increased work intensity, remote workers often show greater organizational commitment than office-based employees, valuing the trust their organization places in them. Job satisfaction is higher when there is low task interdependence, high job discretion, and performance-based evaluations. Additionally, organizations offering proper training for virtual work see improved supervisor-employee relationships. However, remote workers are vulnerable to the "always-on culture," struggling to separate personal and work boundaries, leading to burnout. Using technology outside of work hours can prevent employees from mentally detaching from work. Good practices for managing remote work include granting autonomy, building trust, fostering social support networks, scheduling face-to-face interactions, and providing career development resources to alleviate concerns about advancement.

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	ETUI – European Trade Union Institute (2022)	**Remote working and European private international law**	PRACTICES / Policy Brief	The rise of remote and hybrid working has led to significant changes in the workplace. In April 2020, 33.7% of EU employees worked entirely from home, with 14.2% adopting hybrid models (Eurofound, 2020). These trends are likely to persist, detaching many workers from traditional workplaces, and in some cases, from the country where their employer is located. Remote work, broadly defined, includes working from home, teleworking (using technology to work from anywhere), and hybrid models combining remote and on-site work. Initially, low-wage workers performed most remote work, but it has now expanded to highly skilled roles in management and professional services (Felstead, 2022). Key trends include: Detachment from fixed workplaces, enabling employees to work outside their country of employment. Broader labour pools as employers can hire international workers more easily. A decline in employer control, with some turning to employee monitoring software. Remote work also presents challenges in private international law, especially regarding habitual workplace definitions and jurisdiction issues, which complicate employment standards enforcement, collective bargaining, and competition laws across borders. These issues could be addressed by EU legislative reforms to safeguard employment standards for workers both within and outside the EU.

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	EU-OSHA - European Agency for Safety and Health at Work (2023)	**Regulating telework in a post-COVID-19 Europe: recent developments**	PRACTICES /Report	Regulation of telework in the EU; Changes in national regulation and debates post-COVID-19: permanent legislative initiatives on telework have been passed in Austria, Belgium, Croatia, Estonia, Greece, Ireland, Latvia, the Netherlands, Poland, Portugal, Romania, Slovakia and Spain; and changes in the statutory definitions of telework were made in seven countries: Austria, Croatia, the Netherlands, Portugal, Romania, Slovakia and Spain. Right to disconnect: before the outbreak of the pandemic crisis there were only four countries that regulated the right to disconnect (Belgium, France, Italy and Spain). Since 2020, new legislation on the right to disconnect has been passed in Belgium, Croatia, Greece, Ireland (Code of Practice, Portugal, Slovakia and Spain (new regulation modified minor aspects compared to previous regulation approved). In all these countries except for Greece and Slovakia, the right to disconnect formally applies to all employees. In Greece and Slovakia, the right is circumscribed mainly to teleworkers. Compensation for the costs of telework: New provisions on cost compensation for teleworkers have been introduced in Austria, Poland, Portugal, Romania, Slovakia and Spain. Occupational safety and health: seven countries have developed new legislation on telework and OSH since the outbreak of the pandemic crisis: Austria, Croatia, Greece, Estonia, Poland, Portugal and Spain
	Eurofound (2022)	**The rise in telework: Impact on working conditions and regulations**	PRACTICES / Report	The prevalence of telework in the EU has evolved significantly between 2008 and 2021, with variations in telework adoption based on gender, age, and occupation. The impact of teleworking on working conditions includes long hours, flexible working times, and hybrid work models, which influence productivity, work-life balance, and relationships at work. Country-specific differences in teleworking practices are notable. Teleworking has both physical and psychological health effects. During the pandemic, many EU countries updated their telework regulations, resulting in different approaches across Member States. While the term "telework" is commonly used to describe work outside of employer premises, terms like "hybrid work" emphasize part-time or partial teleworking arrangements. The literature uses data from sources like the EWCTS 2021, focusing on ICT use, job teleworkability, and remote work frequency. Teleworking's effects include impacts on working time, monitoring, disconnection, health, and productivity. Regulations and future trends in telework continue to develop at European, national, and company levels.

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	European Commission (2021)	**Proposal for a directive of the European Parliament and of the Council**	PRACTICES /Regulation	Proposal for a directive on improving working conditions in platform work. The general objective of the proposed Directive is to improve the working conditions and social rights of people working through platforms, including with the view to support the conditions for the sustainable growth of digital labour platforms in the European Union. The specific objectives through which the general objective will be addressed are: (1) to ensure that people working through platforms have – or can obtain – the correct employment status in light of their actual relationship with the digital labour platform and gain access to the applicable labour and social protection rights; (2) to ensure fairness, transparency and accountability in algorithmic management in the platform work context; and (3) to enhance transparency, traceability and awareness of developments in platform work and improve enforcement of the applicable rules for all people working through platforms, including those operating across borders.
	European Commission (2024)	**First-phase consultation of social partners under Article 154 TFEU on possible EU action in the area of telework and workers' right to disconnect**	PRACTICES / Regulation	This consultation is part of the follow-up to the European Parliament's resolution under Article 225 of the Treaty on the Functioning of the European Union (TFEU) on the right to disconnect adopted on 21 January 20211. The resolution called upon the Commission to present 'a proposal for a Union directive on minimum standards and conditions' for the right to disconnect. The resolution also called for 'a legislative framework with a view to establishing minimum requirements for remote work across the Union, ensuring that teleworking does not affect the employment conditions of teleworkers'. The purpose of this document is to consult the social partners in line with Article 154(2) TFEU and obtain their views on the possible direction of EU action to introduce a right to disconnect and ensure adequate working conditions in telework.

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	Franken, E., Bentley, T., Shafaei, A., Farr-Wharton, B., Onnis, L. A., & Omari, M. (2021).	**Forced flexibility and remote working: Opportunities and challenges in the new normal.**	Qualitative study with two distinct phases: a Diary Study and a Critical Event Study. Eleven respondents (three team managers and eight team members within the work unit) responded to the first phase of the study. The second phase commenced immediately after the mandatory remote working response to COVID-19 was eased, and comprised of an online survey and in-depth interviews.	IT support played a crucial role in enabling remote work, but technical issues under tight deadlines caused stress. Over time, team members became more skilled, finding effective workarounds. Flexible working arrangements were appreciated for enhancing work-life balance, allowing employees to spend more time with family and improve productivity by splitting work hours. However, feelings of personal and professional isolation were noted, with some employees losing trust in co-workers due to perceived decreased job responsibility. Despite increased workloads, remote workers managed to balance personal and work demands efficiently. Perseverance and strong team dynamics were vital to overcoming challenges, with employees supporting each other and finding innovative solutions. Remote work also posed risks, such as blurred boundaries between personal and professional life, leading to stress and decreased recuperation. Good practices included granting autonomy, building trust, creating social support networks, and providing career development opportunities. Organizations were encouraged to adapt policies to respect employees' individual needs and family circumstances. Managers' leadership and HR support were crucial for ensuring that flexible work arrangements were effective and aligned with employee wellbeing, requiring regular review and adaptation to ensure success
	ILO (2020)	**Defining and measuring remote work, telework, work at home and home-based work**	**PRACTICES Technical Note**	The concept of distance working, introduced widely during the pandemic, covers multiple forms like remote work, teleworking, work from home, and home-based work. However, these terms often overlap, and many countries lack consistent statistical standards to define them. The idea of the "default place of work" helps in understanding these concepts, as it refers to where work is typically expected to occur for a specific profession, but it's more theoretical. Telework is a subset of remote work, specifically involving the use of ICT to perform tasks outside the default workplace. Work at home, on the other hand, can be performed by both independent and dependent workers, without relying on ICT, and home-based work refers to those who use their residence as their primary work location. Key aspects to measure include frequency (regular or occasional) and mobility (high or low). For instance, high-mobility workers operate in various locations, while low-mobility workers mostly work in one or two locations beyond the default workplace. An example comes from the UK Labour Force Survey, which examines the frequency and mobility of remote work.

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	Johnson, A., Dey, S., Nguyen, H., Groth, M., Joyce, S., Tan, L., ... & Harvey, S. B. (2020).	**A review and agenda for examining how technology-driven changes at work will impact workplace mental health and employee wellbeing**	Literature review on mental health in the workplace and how it has changed over the last few decades. Next, the authors outlined two major trends in the workplace and the evidence for their impact on mental health, both positive and negative. The first trend is automation and advanced technology such as artificial intelligence in the workplace and how it is changing *how we work*. The second trend is the increase in flexible work arrangements afforded by changes in telecommunicatio n technology and how it is affecting where and when we work.	Technology impacts workplace mental health by increasing demands and reducing resources, which can lead to stress and mental health conditions. However, when designed well, it reduces job strain by automating repetitive tasks and improving safety. Flexible work can boost work-life balance but can also lead to social isolation and blurred work-life boundaries if poorly managed. Organizations should invest in mental health support programs like Employee Assistance Programs (EAPs), and provide training on good mental health practices, such as setting technology boundaries. Clear expectations for flexible workers, peer mentorship, and team-building activities can reduce isolation. Collaborative tools like instant messaging help maintain relationships and communication, which are crucial for the wellbeing of remote workers.
	Kraus, S., Ferraris, A., & Bertello, A. (2023).	**The future of work: How innovation and digitalization re-shape the workplace**	Theoretical	The questions about remote and hybrid work focus on several key areas: organizational performance, management, and individual worker features, as well as the potential negative impacts and policy concerns. Specifically: How remote work affects coordination and control mechanisms in organizations; The best organizational culture for managing work-life conflicts in remote settings; Conditions that make remote workers more or less productive and how to manage them virtually; The personal traits that explain a worker's willingness to work remotely and the skills needed to build trust in a virtual environment; The influence of remote work on knowledge sharing and employees' tendencies to hide information; The potential downsides, such as loneliness, decreased creativity, and motivational issues; Policy and regulatory questions about creating effective hybrid work arrangements and handling remote work challenges like isolation or a lack of motivation.

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	McKinsey Global Institute (2020)	**What's next for remote work: An analysis of 2,000 tasks, 800 jobs, and nine countries**	PRACTICES / Report	The pandemic has clarified both the limitations and advantages of remote work. While many people have returned to physical workplaces, hybrid models of working are now permanent, heavily relying on technology. However, remote work is mostly available to highly skilled, educated workers in specific industries and regions. It has significant effects on urban economies, transportation, and consumer spending. For more than half the workforce, remote work is not an option, as their jobs require in-person collaboration or the use of specialized equipment. Many of these roles, such as delivery services, are low-wage and are more vulnerable to automation and digitization. Remote work thus risks increasing social inequalities. The potential for remote work is shaped by tasks rather than occupations, as some tasks inherently require physical presence or interaction. Key findings from an analysis using MGI's workforce model, which examined over 2,000 activities in 800 occupations, indicate that activities like computer-based tasks and updating knowledge have the highest remote work potential. Sectors such as finance, management, and professional services are the most likely to adopt remote work, particularly in advanced economies. In these economies, up to 25% of the workforce could work remotely for three to five days a week, unlike in emerging economies where this proportion is significantly lower due to the mix of job activities.

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	OCDE (2022)	**OECD Employment Outlook 2022**	PRACTICES / Report	Working time is a crucial factor for both worker wellbeing and productivity. Policies on working hours influence not only wages and employment but also workers' physical and mental health, work-life balance, and life satisfaction. The chapter focuses on how various working time policies, such as reducing weekly hours, can enhance worker wellbeing without compromising productivity. Research suggests that long working hours are linked to poor health outcomes, especially when workers lack control over their schedules, while reducing normal hours can improve wellbeing if not accompanied by increased work intensity. At the macro level, reforms in countries like Germany, Korea, and Portugal have led to a reduction in yearly working hours but with no significant impact on employment, wages, or productivity. Firm-level effects show mixed results, with positive outcomes when there is strong social dialogue and collective bargaining. Flexible working hours tend to improve non-material wellbeing and can boost employment without lowering productivity, while teleworking shows varied effects, enhancing life satisfaction but sometimes negatively affecting health. However, it tends to attract and retain workers, particularly women, due to improved work-life balance. Further research is needed to explore why some policies succeed in creating virtuous cycles between working time reductions and productivity while others do not.

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	Schwarzmüller, T., Brosi, P., Duman, D., & Welpe, I. M. (2018).	**How does the digital transformation affect organizations? Key themes of change in work design and leadership**	Empirical	The authors highlight that technological advancements are triggering significant changes in work design and leadership within organizations. However, much of the existing research is outdated or fragmented. To fill this gap, the authors conducted a survey with 49 digitalization experts, identifying four key themes of change: 1. Work-life and Health: The increasing flexibility in when and where employees work has both benefits (e.g., improved work-life balance) and risks (e.g., constant connectivity, increased stress). Leaders must manage these changes by setting boundaries and focusing on employees' wellbeing. 2. Information and Communication Technology: Digital tools are reshaping work modes, communication, and collaboration, demanding new skills for both employees and leaders. 3. Performance and Talent Management: Digitalization shifts competency requirements and how performance is managed, creating new challenges for talent development. 4. Organizational Hierarchies: As work becomes more flexible, employees take on more responsibility, and leaders must adapt their influence and leadership styles. These findings suggest that both work design and leadership are becoming more complex, with leaders needing to support employees through increased flexibility and health management.
	Shifrin, N. V., & Michel, J. S. (2022)	**Flexible work arrangements and employee health: A metanalytic review**	Meta-analytic review (k = 33, n = 90,602)	Flexible work arrangements (FWAs) show small but significant positive effects on employee physical health and reduced absenteeism, along with fewer somatic symptoms. FWAs allow employees to better manage their personal resources like time and energy, leading to health-promoting activities and less stress. Importantly, just having access to FWAs is more beneficial to physical health than actually using them, indicating the work environment must support their use. Flextime, in particular, is associated with fewer somatic symptoms than other forms of flexibility. Organizations should offer tailored flexibility options, like telecommuting or compressed workweeks, to suit both employee and organizational needs.

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	Spreitzer, G. M., Cameron, L., & Garrett, L. (2017).	**Alternative work arrangements: Two images of the new world of work**	Theoretical	The authors explore "alternative work arrangements," which encompass various forms of work, from high-skill freelancers seeking work-life balance to low-wage workers with unpredictable hours. A fast-growing segment, though still small at 0.5%, involves gig work facilitated by platforms like Uber. Remote work, enabled by technological advances such as cloud computing and collaborative software, is increasing across various employment types. They outline three key dimensions of flexibility in alternative work: Employment Relationship Flexibility: Shifting from long-term employment to short-term, often insecure work arrangements. Scheduling Flexibility: Workers manage family and work demands, but flexible work can also lead to negative consequences like job insecurity or reduced engagement. Workplace Flexibility: More workers perform tasks outside the office, benefiting from reduced stress and increased autonomy but facing challenges such as loneliness and fewer development opportunities. These flexible work arrangements reflect how technology-driven work reshapes employment, scheduling, and location, with both benefits and challenges, especially in virtual teamwork and knowledge sharing. The authors also raise questions about the future of flexibility in work contracts, scheduling, and work locations.
RQ3: How are workplace dynamics changing and what is the importance of workforce well-being in this context? Working conditions and employee well-being. Research on stress management and mental health in the workplace.	**European Agency for Safety and Health at Work (EU-OSHA) (2021)**	**Eurobarometer Report on Occupational Safety and Health in Post-Pandemic Workplaces**	Empirical	This report by EU-OSHA examines how occupational safety and health (OSH) practices in European workplaces have evolved in the wake of the COVID-19 pandemic. The study, conducted across various sectors, emphasizes how the pandemic has reshaped workplace practices, particularly around health and safety measures, remote work, and mental health awareness. It highlights the increased importance of flexible work arrangements, employee wellbeing initiatives, and enhanced OSH measures, as well as the necessity of adapting these to address the ongoing and future challenges of post-pandemic workplaces. The report provides quantitative data on employee perceptions and organizational responses, offering insights into good practices and areas for improvement across European workplaces.

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	European Agency for Safety and Health at Work (EU-OSHA) (2019)	**Third European Survey of Enterprises on New and Emerging Risks (ESENER-2019): Overview Report**	Empirical	The ESENER-2019 Overview Report provides insights into how European workplaces manage safety and health risks, with a focus on both traditional and emerging risks. The study covers areas such as psychosocial risks, ergonomics, and the role of leadership in promoting safety culture. The report emphasizes the importance of addressing psychosocial risks (e.g., stress and harassment), which remain under-recognized compared to physical hazards. It also highlights good practices in risk management, such as the integration of worker participation and leadership involvement in safety protocols. Furthermore, it identifies challenges, such as limited resources for small and medium-sized enterprises (SMEs) to implement comprehensive risk management strategies.
	European Agency for Safety and Health at Work (EU-OSHA) (2021)	**A Review of Good Workplace Practices to Support Individuals Experiencing Mental Health Problems**	Practices / Empirical	This report provides a review of effective workplace practices aimed at supporting employees with mental health problems. It highlights key strategies such as the implementation of Employee Assistance Programs (EAPs), offering flexible working arrangements, and creating a supportive, stigma-free environment. The report emphasizes that good practices must include active involvement from both employers and employees to reduce mental health stigma and improve workplace culture. It also underscores the importance of tailored interventions that address the unique needs of individuals experiencing mental health issues, offering examples of successful practices from various organizations across Europe. Key challenges include insufficient resources and awareness in small organizations.
	Björck, Kolouh, Forte (n.d) (2023)	**Strategic Research Agenda for Mental Health**	Theoretical / Strategic Agenda	This document outlines Forte's strategic research agenda for mental health, aiming to influence research policy and promote mental health research initiatives in Sweden from 2025 onwards. The agenda focuses on identifying key areas for mental health research that will contribute to the development of socially sustainable societies. It emphasizes the importance of interdisciplinary research to understand and address mental health challenges across the lifespan. The agenda identifies several priority areas, including the need for more knowledge about mental health disparities, preventive interventions, and the social determinants of mental health. It also highlights the necessity of improving access to mental health services, especially for vulnerable populations, and stresses the role of collaboration between researchers, policymakers, and practitioners. The document is framed as a forward-looking roadmap to foster better mental health outcomes through evidence-based policies and research.

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	Gallup (2024)	**State of the Global Workplace: 2024 Report**	Empirical	The 2024 edition of Gallup's State of the Global Workplace report provides a comprehensive analysis of global employee engagement, wellbeing, and workplace stress. The report identifies key trends in employee productivity, engagement, and mental health across various regions. One of the report's central findings is that only 23% of employees worldwide are engaged at work, and global disengagement is costing the economy nearly $8.8 trillion in lost productivity. Additionally, workplace stress remains at an all-time high, with 44% of employees reporting daily stress. Gallup highlights the importance of creating workplaces that foster engagement and wellbeing, stressing the role of leadership in addressing disengagement and stress. The report includes regional breakdowns, providing valuable insights into how cultural and economic factors influence employee experience globally.
	Government Offices of Sweden (1977, amended in 2020)	**The Swedish Work Environment Act (SFS 1977:1160)**	Regulation	The Swedish Work Environment Act (SFS 1977:1160) is a comprehensive regulation designed to ensure safe and healthy working conditions for all employees in Sweden. The Act covers physical, psychological, and social aspects of the work environment. It mandates that employers take responsibility for preventing accidents and health hazards in the workplace, which includes addressing both physical safety and psychosocial risks, such as stress and harassment. Employers are required to continuously assess and improve the work environment and involve employees in these processes. The Act has been updated over time to adapt to changes in working life, such as the rise of digitalization and remote work. It emphasizes cooperation between employers and employees in achieving a safe workplace and assigns the Swedish Work Environment Authority the role of overseeing compliance.
	Government Offices of Sweden (2021)	**A Good Work Environment for the Future: The Government's Work Environment Strategy 2021–2025**	Regulation / Strategic Policy	This strategic policy document outlines Sweden's national approach to improving workplace environments from 2021 to 2025. The focus is on creating safe, inclusive, and sustainable workplaces that prioritize employee wellbeing, mental health, and physical safety. The strategy is built around four key areas: preventing work-related accidents and ill-health, adapting workplaces to meet new challenges (such as digitalization and remote work), promoting gender equality and non-discrimination, and supporting leadership development in health and safety practices. It also emphasizes the need for effective enforcement of work environment laws and regulations. The document highlights Sweden's long-term commitment to ensuring that work environments evolve alongside societal and technological changes, with a strong focus on reducing psychosocial risks and promoting a balance between work and private life.

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	Gagnon, C., John, E., & Theunissen, R. (2017, September 7)	**Organizational Health: A Fast Track to Performance Improvement**	Empirical / Practices	This McKinsey & Company report explores how improving organizational health can lead to better performance outcomes. The authors define "organizational health" as the ability of an organization to align, execute, and renew itself in response to the market or business environment. Using empirical data, the report highlights key elements such as leadership, capability building, and workplace culture that influence organizational health. By focusing on these areas, organizations can foster better employee engagement, reduce absenteeism, and ultimately improve their performance. The report emphasizes the importance of embedding organizational health in long-term strategies, providing practical examples and case studies that illustrate successful implementation in different sectors. The report concludes that organizations with strong health metrics consistently outperform their peers in terms of both productivity and profitability.
	Berglund, D., Toropova, A., & Björklund, C. (2024).	**Workplace Bullying, Stress, Burnout, and the Role of Perceived Social Support: Findings from a Swedish National Prevalence Study in Higher Education**	Empirical	This empirical study explores the prevalence and consequences of workplace bullying, stress, and burnout in higher education institutions in Sweden. The authors examine how perceived social support can buffer the negative effects of workplace bullying on mental health outcomes like stress and burnout. Their findings indicate that workplace bullying is a significant predictor of stress and burnout, but perceived social support from colleagues and supervisors plays a critical role in mitigating these effects. The study underscores the need for strong social support systems within organizations to foster employee wellbeing and reduce the harmful impact of bullying and stress. It also highlights the specific challenges faced in academic settings, where hierarchical structures may exacerbate such issues. The study calls for policy interventions that enhance social support structures in educational institutions to improve overall mental health outcomes.
	Lytsy, P., & Friberg, E. Swedish Agency for Work Environment Expertise (2020)	**Psychosocial Work Environment: Health and Wellbeing – Two Systematic Reviews**	Empirical	This report from the Swedish Agency for Work Environment Expertise provides a comprehensive review of the psychosocial work environment and its impact on health and wellbeing. The report focuses on two systematic reviews that examine how psychosocial factors at work, such as job demands, job control, and social support, influence physical and mental health. The findings highlight that high job demands combined with low control increase the risk of stress-related illnesses, including burnout and depression. The report also emphasizes the importance of leadership and organizational culture in promoting a healthy work environment. It recommends practices such as increasing job autonomy, providing support systems, and fostering open communication to mitigate the negative effects of psychosocial risks in the workplace.

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	Swedish Agency for Work Environment Expertise (2020)	**The Organization of Work and Its Significance for Health and Well-being**	Empirical / Theoretical	This report explores how the organization of work impacts employee health and wellbeing. It highlights how various organizational factors—such as work structure, leadership, and job design—affect both physical and mental health outcomes. The study focuses on key areas like work autonomy, social support at work, and the balance between job demands and personal resources. Findings suggest that poorly organized work environments, where employees experience high demands with little control, significantly contribute to stress, burnout, and other health problems. The report stresses the importance of promoting supportive leadership, fostering a balanced workload, and providing employees with greater autonomy to enhance their wellbeing. It offers practical recommendations for improving work environments, such as implementing policies that encourage regular breaks and mental health resources.
	Aronsson, G., Nilsson, K., Johansson, B., Albin, M., Torgén, M., Nylén, P., Persson Waye, K., Vingård, E., Swedish Work Environment Authority, Elanders Sverige AB, & Mikael Gustavsen and Mia Åkermark. (2017).	**Healthy Workplaces for Women and Men of All Ages: Knowledge Compilation**	Theoretical / Empirical	This report examines how different groups—specifically men and women of varying ages—experience workplace health risks differently. The report compiles research on how age and gender impact exposure to physical and psychosocial risks, such as ergonomic stress and work-life balance challenges. It highlights the importance of adapting workplaces to meet the needs of diverse employee demographics by offering tailored solutions such as flexible work schedules, better job control, and targeted mental health support. The findings indicate that older workers and women are more vulnerable to certain risks and may require specific workplace interventions. The report advocates for policies that promote inclusivity and considers the life stages and specific challenges of different worker groups to foster healthy, sustainable workplaces.
RQ3: How are workplace dynamics changing and what is the importance of workforce wellbeing in this context? Employment and VET training policies in the context of digitalization and globalization.	**European Publisher, vol 105 (2021)**	**Technological Development And Employment Structure In Context Of Economy Digital Transformation**	Theoretical/Empirical	The article explores the impact of technological changes on labour market formation and employment in new forms. It reveals that the demand for highly skilled workers in the digital age is growing due to new jobs in big data analytics, artificial intelligence, and software development. Additionally, digital technologies create new opportunities for finding and organizing work, leading to a significant market for alternative employment forms. The authors propose mathematical models for labour force distribution across full employment, contingent employment, and electronic platforms in the context of digital transformation.
	European Commision 2024	**Digital Decade 2024 report: Country fact pages**	Empirical/Surveys	The Digital Decade outlines 2030 goals for successful digital transformation, promoting competitiveness, resilience, sovereignty, and sustainability. The EU tracks progress annually, and Member States submit national roadmaps for the first time.

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	European Labour authority, May 2024	**Regulating digital platforms – Articles 68-72 of Law 4808/2021 (Greece)**	Regulation	On 19 June 2021, Greece's new Labour Law 4808/2021 came into force.i Articles 68–72 of the new law set new regulations for digital platform workers, establishing a protective framework for those engaging in such work.
	Marsh, E., Vallejos, E. P., & Spence, A. (2022).	**The digital workplace and its dark side: An integrative review. Computers in Human Behavior**	Theoretical/Empirical	The Covid-19 pandemic has highlighted the benefits of digital workplace technologies, but also highlighted their potential dark side effects. A study of 194 studies analyzed the negative effects of various workplace technologies, including email and smartphones. While some insights have been found, a broader understanding of how these effects manifest beyond ICTs is needed. The study emphasizes the importance of theoretical rigor and diversity in understanding these effects.
	National Institute of Occupational Health, Norway (STAMI) National Research Centre for the Working Environment, Denmark (NRCWE) November 2019	**The influence of digitalization and new technologies on psychosocial work environment and employee health: a literature review**	Empirical	Digitalization and new technology have significantly impacted the workplace, affecting the psychosocial work environment and occupational health and wellbeing. A systematic literature review of 53 studies from 2000 to 2018 revealed that new technologies and ways of working were associated with both health and work factors. Some studies suggested that higher technological advancements were associated with deteriorating working conditions and wellbeing, while others found factors that could moderate the negative impact of new technologies. Some studies also highlighted the potential of technological advancements to affect worker autonomy, with some studies suggesting that increased access to communication or simple technological advancements could have beneficial effects on employee wellbeing. The potential for negative or positive effects depended on the context, function, and implementation of the technology.
	Potgieter, I. L. (2021).	**Surviving the Digital Era: The Link Between Positive Coping, Workplace Friendships and Career Adaptability.**	Theoretical	Industry 4.0 has prompted HR to rethink human capital management, with over half of jobs predicted to be replaced by smart technology and artificial intelligence. The Covid-19 pandemic has accelerated technology adoption in the workplace. Limited research exists on how employees cope with technological advancements and changes. This chapter explores agile coping dynamics in the future workplace, focusing on positive coping behavior, workplace friendships, and career adaptability. HR practitioners can use this information to help employees survive and excel in the digital era.
	Technological Forecasting and Social Change, 150 (2020)	**Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process**	Theoretical	Digital technologies are transforming business ventures, enabling collaboration and collective intelligence for sustainable entrepreneurial initiatives. However, there is limited literature on the impact of digital technologies on the entrepreneurial process. This article proposes a digital entrepreneurship ecosystem, focusing on integrated digital-output and digital-environment perspectives. A collective intelligence approach is used to define a descriptive framework, identifying four dimensions: digital actors, activities, motivations, and organization.

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Table 5
List of policies

Author/Authority	Title	Country
Cedefop. (2020).	*Slovenia: Skills forecast up to 2030. European Centre for the Development of Vocational Training.*	Slovenia
Cedefop. (2021).	Poland: integrated skills strategy 2030. European Centre for the Development of Vocational Training.	Poland
Cedefop. (2024)	2023 skills forecast	Germany
Cedefop. (n.d.).	Automation risk for occupations. European Centre for the Development of Vocational Training.	EU
Consolidated Version of the Treaty on European Union		EU
Consolidated Version of the Treaty on the Functioning of the European Union		EU
Council of Europe. (2024).	Council of Europe Gender Equality Strategy 2024-2029	EU
Council of Ministers (2020)	Policy for the development of artificial intelligence in Poland from 2020	Poland
Dębkowska, K., Kłosiewicz-Górecka, U., Szymańska, A., Wejt-Knyżewska, A., & Zybertowicz, K. (2024).	Work-life balance a elastyczne formy organizacji pracy	Poland
EU-OSHA (n.d.a)	Directive 89/391/EEC - The OSH framework directive. EU-OSHA	EU
EU-OSHA (n.d.b)	Directive 2004/37/EC - carcinogens, mutagens or reprotoxic substances at work	EU
EUR-Lex (n.d.).	Employment and social policy	EU

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Eurofound (2024).	Human–robot interaction: What changes in the workplace?	EU
European Commission (2010).	Europe 2020: A strategy for smart, sustainable and inclusive growth	EU
European Commission (2020a)	Digital Agenda for Europe	EU
European Commission (2020b).	Digital Education Action Plan 2021–2027	EU
European Commission (2020c).	European Green Deal	EU
European Commission (2021).	European Pillar of Social Rights: Action Plan	EU
European Commission (2023a).	Annex to the Report From the Commission to the European Parliament and the Council on the Implementation of the Recovery and Resiliency Facility: Moving forward.	EU
European Commission (2023b).	Recovery and Resilience Facility: 30th RRF Working Group meeting	EU
European Commission (2024a).	Digital Decade Country Report 2024	Poland
European Commission (2024c).	Mid-term evaluation of the Recovery and Resilience Facility	EU
European Commission (2024d).	Slovenia's Recovery and Resilience Plan	Slovenia
European Commission (2024e)	Tackling labour and skills shortages in the EU	EU
European Commission (n.d.a)	European Semester	EU
European Commission (n.d.b).	What are the 20 principles of the European Pillar of Social Rights?	EU
European Commission (n.d.c)	What is ESF+? European Social Fund Plus	EU

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European Commission. (2020d).	European Skills Agenda for sustainable competitiveness, social fairness and resilience	EU
European Commission.(2024b)	Malta's Recovery and Resilience Plan	Malta
European Commission: Joint Research Centre (2022)	Towards a green & digital future : key requirements for successful twin transitions in the European Union	EU
European Parliament & Council. (2024).	Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act)	EU
European Parliament (2022).	Gender equality in the Recovery and Resilience Facility	EU
European Parliament (n.d.a).	Employment policy	EU
European Parliament (n.d.b)	Free movement of workers	EU
European Parliament (n.d.c).	Health and safety at work	EU
European Parliament (n.d.d).	Posting of workers	EU
European Parliament (n.d.e)	The fight against poverty, social exclusion, and discrimination	EU
European Parliament (n.d.f)	Workers' right to information, consultation, and participation. European Parliament	EU

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European Training Foundation (n.d.)	Green skills	EU
Eurostat (2022)	Gender pay gap statistics	EU
Eurostat (2024a)	EU's employment rate exceeds 75% in 2023	EU
Eurostat (2024b	Social Scoreboard: track social progress across Europe	EU
Eurydice (2024).	Developments and current policy priorities	EU
Future of Life Institute (2024)	High-level summary of the AI Act	EU
Garnitz J., Schaller D., Selleng N. (2024)	Arbeitswelt im Wandel: Herausforderungen des Arbeitskräftemangels und die Dynamik des hybriden Arbeitens	Germany
Gov.si (2022)	Slovenian Industrial Strategy 2021 – 2030	Slovenia
Gov.si (2024a)	Aktivna politika zaposlovanja	Slovenia
Gov.si (2024b)	Slovenska strategija pametne specializacije	Slovenia
Gov.si (2024c)	Pravica do odklopa	Slovenia
Gov.si (2024d)	Slovenija aktivna pri implementaciji Akta o umetni inteligenci.	Slovenia
Gov.si. (2023)	76th Regular Meeting of the Government of the Republic of Slovenia	Slovenia
Gov.si. (2024e)	The Recovery and Resilience Plan	Slovenia
Government of Greece (2021a).	Green Growth Strategy	Greece
Government of Greece (2021b).	Labour Law N. 4808/2021 on employment rights and working conditions	Greece
Government of Greece (2021c).	National Digital Strategy 2021-2025	Greece

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Government of Greece. (2023).	Active Labour Market Policies	Greece
Government of Greece. (2023).	Reform of Vocational Education and Training	Greece
Government of Malta (n.d.).	Employment & Industrial Relations Act	Malta
Government Offices of Sweden (1977).	Work Environment Act (SFS 1977:1160	Sweden
Government Offices of Sweden. (2021).	A Good Work Environment for the Future: The Government's Work Environment Strategy 2021–2025	Sweden
Kancelaria Prezesa Rady Ministrów (2023).	Program Rozwoju Kompetencji Cyfrowych	Poland
Lilyanova, V. (2023).	Governance and oversight of the Recovery and Resilience Facility	EU
Ministerstwo Cyfryzacji. (2020)	Kompetencje cyfrowe	Poland
Ministerstwo Edukacji Narodowej (2019).	Zintegrowana Strategia Umiejętności 2030	Poland
Ministerstwo Funduszy i Polityki Regionalnej (2023).	Otwórz się na nowe możliwości!	Poland
Ministerstwo Rozwoju, Pracy i Technologii (2020)	Strategia Rozwoju Kapitału Ludzkiego 2030	Poland
Ministrstvo za delo, družino, socialne zadeve in enake možnosti (2016)	Starejši in trg dela v Sloveniji	Slovenia
Ministry for Education and Employment (2021).	National Lifelong Learning Strategy 2023 – 2030	Malta
Ministry for Education and Employment (2023)	National Lifelong Learning Strategy 2023 – 2030	Malta
Ministry for Education and Employment. (2021).	National Employment Strategy 2021 – 2030.	Malta
Ministry for the Economy and Industry (2022).	Malta Diġitali Strategy 2022 – 2027	Malta

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Ministry of Family, Labour and Social Policy (2023)	Parental and Work-Life Balance Directives. President signed the Labour Code amendment	Poland
Narodowe Centrum Badań i Rozwoju (n.d.)	Program Operacyjny Wiedza Edukacja Rozwój	Poland
Public Employment Service of Greece. (Δημόσια Υπηρεσία Απασχόλησης). (2023).	Programs for skills development and employability enhancement.	
Sapala M., Szczepański, M. (2024).	Poland's National Recovery and Resilience Plan: Latest state of play. European Parliamentary Research Service	Poland
Schnaller D. (2004).	Chancengerechtigkeit am Arbeitsmarkt als Teil der HR - Strategie gegen Arbeits- und Fachkräftemangel	Germany
Serwin, K. (2023)	Praca zdalna w Kodeksie pracy – czy zmiany zapewnią pracownikom elastyczność?	Poland
Sochańska-Kawiecka, M., Kusideł, E., Gajewski, M., Szuicki, J., Kubajek, R., Kołakowska-Seroczyńska, Z., Witkowska, J., Milczarek, D., Studzińska, M., Schimanek, T., & Pietrzak, B. (2024).	Ewaluacja ex-post PO WER: Executive summary	Poland
Symela, K., & Stępnikowski, A. (2021)	Wyzwania kompetencyjne w rozwoju sztucznej inteligencji w polsce	Poland
The Act of 10 May 2018 on the Protection of Personal Data	amended on October 10, 2019	Poland
The Act of 13 April 2007 on National Labour Inspectorate	amended on June 26	Poland
The Labour Code Act of 26 June 1974	Amended on September 11, 2024	Poland
Uradni list RS (2014)	ZVOP-2	Slovenia

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Uradni list RS, št. 114/23. (2023)	Zakon o spremembah in dopolnitvah Zakona o delovnih razmerjih	Slovenia
Uradni list RS, št. 19/14 in 55/17. (2014)	Zakon o inšpekciji dela	SLovenia
Uradni list RS, št. 21/13, 78/13. (2013)	Zakon o delovnih razmerjih	Slovenia
Vlada Republike Slovenije (2023)	Krovna strategija digitalne preobrazbe Slovenije do leta 2030	Slovenia
Zeitlin, J., and Bokhorst, D. & Eihmanis, E. (2023)	Governing the RRF: Drafting, Implementing, and Monitoring National Recovery and Resilience Plans as an Interactive Multilevel Process	EU
Zavod RS za zaposlovanje	Zavod RS za zaposlovanje	Slovenia

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