



**Digital Skills &
Jobs Platform**

DIGITAL SKILLS FOR NON- ICT PROFESSIONS

**A vision paper authored by the
Squad assessment group 2024**

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2024



The Digital Skills and Jobs Platform is funded by the Connecting Europe Facility of the European Union.
Opinions expressed do not necessarily reflect the contracting authority's official position

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Executive Summary

This vision paper examines the pressing need for digital skill development in non-ICT professions, addressing challenges and proposing solutions to close the digital skills gap. Grounded in collaborative research and insights from experts, it emphasizes the role of adaptable conceptual models and comprehensive frameworks that support workforce readiness in an increasingly digital and AI-driven world. The research highlights key challenges, such as the lack of clear frameworks and varying levels of AI acceptance, while also recognizing the importance of both technical and transversal skills for success in the digital economy.

Drawing from a range of reputable sources, including the OECD and CEDEFOP, the paper underscores the need for digital competencies across sectors and outlines strategies for future-proof skill development. We set out the current context of digital skills in non-ICT professions across Europe, including a deep-dive into the existing key resources and existing frameworks that can support digital skill development in Europe. A call to action is made for policymakers, educators, and employers to prioritize flexible and evolving frameworks that incorporate technical skills alongside critical soft skills such as adaptability, problem-solving, and continuous learning. The conclusion highlights the shared responsibility of all stakeholders in ensuring a digitally competent workforce for a sustainable future.



As we move forward into an increasingly digital landscape, it is essential to approach digital transformation with a balanced focus on both technical and non-technical skills. The future of work will require a blend of digital competencies and transversal skills, such as adaptability, problem-solving, and continuous learning. Organizations must prioritize these skills across all sectors, ensuring that employees—whether in blue-collar or white-collar roles—are equipped to navigate the complexities of the digital age.

Collaboration between educational institutions and businesses is key to overcoming the skills gap and ensuring that workforce development remains relevant. Educational frameworks must be adaptable to evolving technologies, and businesses must invest in ongoing skill development. Furthermore, leadership should foster a culture of learning that emphasizes both individual growth and organizational resilience.

By committing to **flexible, forward-thinking strategies** that integrate both digital literacy and transversal skills, organizations can build a workforce that is prepared for today's challenges and adaptable to the future.

With the right investments in education, collaboration, and leadership, the digital transformation can become a sustainable and inclusive journey for all. This vision paper highlights several crucial insights from our research and collaboration on digital skill education, workforce transformation, and the future of work. It has become increasingly clear that closing the digital skills gap is essential for the resilience and adaptability of the global workforce. As digital technologies evolve, the ability to navigate these changes hinges on both technical and transversal competencies. These skills, spanning from programming to critical thinking and adaptability, must be cultivated to ensure the readiness of non-ICT professionals in a digital-first world.

The findings presented underscore the urgent need for action. The growing digital divide threatens to leave large segments of the workforce unprepared for the future, with smaller enterprises and traditionally non-digital sectors particularly at risk. Our research has shown that upskilling is not enough; a holistic approach that also fosters continuous learning, adaptability, and emotional intelligence is vital. Digital transformation should not be seen as a purely technological endeavour but as a profound cultural shift within organizations.

Policymakers, educators, and employers must prioritize the development of digital skills across all sectors. This requires a concerted effort to redesign educational frameworks, support cross-sector collaboration, and create adaptable training programs that address the unique needs of various industries and roles. Investing in these initiatives now will empower workers to thrive in the rapidly changing digital economy, ensuring a future workforce that is technically proficient, resilient and capable of leveraging digital advancements for sustainable growth. Prompt action is the shared responsibility of all stakeholders involved in shaping the future of work.

Introduction

The rapid evolution of digital technologies is reshaping the European workforce across all sectors, with profound implications for non-ICT professions. The European Union has consistently emphasized the importance of digital skills, integrating them into the broader framework of essential competences for all citizens (2019). However, the term "digital skills" is often interpreted differently, which necessitates a clear understanding of its scope and relevance across diverse industries (Sanz, 2023).

The EU's European Skills, Competences, Qualifications and Occupations (ESCO) classification provides a comprehensive framework, cataloguing over 3,000 occupations and nearly 14,000 skills. Recent analyses have identified 733 digital skills within this framework^[1], categorized into two primary groups: those with an explicit digital focus and those that operate in digital environments, even if they are not inherently digital (Cosgrove, 2024). These skills are critical as digital transformation increasingly permeates roles traditionally not associated with technology, creating both challenges and opportunities in non-ICT professions.



The changing job landscape and the urgent need to bridge skill gaps are two key aspects driving the discourse on digital skills. As the European Commission has highlighted (2023), digital technologies are transforming all professions, including those not traditionally seen as requiring digital competencies. This underscores the need for targeted upskilling and reskilling efforts, particularly in sectors like manufacturing, healthcare, and agriculture. The EC also emphasises the need for cross-sectoral relevance of digital skills and the collective effort needed to achieve the goals of the EU's Digital Decade. The role of women in driving these efforts is also highlighted, underlining the importance of inclusivity and gender equality in digital upskilling.

Under the initiative of the Digital Skills and Jobs Platform, 18 experts from various sectors were brought together to investigate the current state of digital skills needs and education for non-ICT professionals, and to formulate a vision for the future. Over six months (February – August 2024), this interdisciplinary team engaged collaboratively in exploration, exchange and dialogue to identify the non-ICT industries most in need of digital skills, outlining specific competencies in demand and proposing strategies to address these needs considering the existing support ecosystem of resources. This vision paper builds on the collaborative efforts of this international working group.

Background

Importance of Digital Skills in Non-ICT Professions

Digital skills are no longer the exclusive domain of ICT professionals. The European workforce, regardless of sector, is increasingly required to adapt to new technologies. Non-ICT professions — from agriculture to healthcare— are undergoing significant transformations, driven by the integration of digital tools and processes. This shift demands a reassessment of the skills required to remain competitive and relevant in a rapidly changing job market.

For instance, digital literacy is now essential for manufacturing workers who need to operate advanced machinery, for healthcare professionals using telemedicine platforms, and for farmers adopting precision agriculture technologies. These developments highlight the need for a workforce that is digitally competent across all sectors, not just within the ICT sector.

Rationale behind this Vision Paper

The Digital Skills and Jobs Platform (DSJP) serves as a vital resource for the promotion of digital skills across Europe. It is a central hub for information, best practices, and policy guidance, facilitating collaboration among

stakeholders at the EU, national, and local levels. By initiating and supporting this vision paper, the DSJP underscores its commitment to foster a digitally skilled workforce that can meet the challenges of the digital age.

A key focus of this platform is to identify and address the digital skills needs of professions outside the ICT sector. This requires a clear transversal definition of digital skills and an understanding of the tools and resources available, including those developed by the European Commission and the European Centre for the Development of Vocational Training (Cedefop). The shift towards remote work, accelerated by the COVID-19 pandemic, has further complicated the digital skills landscape, making it essential to consider how these changes are affecting non-ICT professions.

A word from the authors to the reader on Purpose

Who is this vision paper for?

- ▶ Professionals in a non-ICT profession,
- ▶ Company leadership in any sector,
- ▶ Team leads or managers in non-ICT industries,
- ▶ HR and learning and development specialists,
- ▶ Researchers in digital education,
- ▶ Policy makers on digital transformation,

Interested browser and reader, you might ask yourself: what is in this vision paper for me?

This powerful, simple and introspective question has hardly been a focus of your formal education. Among professionals, however, it is both legitimate and empowering to ask ourselves "why?" - especially in the Large Language Model generative era.

Our answer is simple: the world is continuously changing with more possibilities and opportunities to support or hinder the things we care about. With more knowledge from the people with relevant expertise, we hope to inform you of how these changes potentially affect you, how you can integrate relevant innovations, or how you can intentionally choose not. **In short, we want to support you in making informed choices and decisions.**

Just like the first industrial revolution brought significant changes to civil societies, digital transformation is set to bring significant and ever-lasting changes. The former guided us all into living in cities and sawhorses and donkeys being replaced with mechanical machinery, thanks to the steam engine. The latter - through Information and Communication Technologies - is radically changing the way we live, love, relate and work.

Nowadays, you do not see many horses strolling around towns. Whilst they are sporadically used by state corps for their versatility, motor vehicles are drastically more common. Likewise, whilst non-ICT professions may have been thriving for centuries without ICT, technology continues to enter their workspace with intensified speed.

Let us be clear here.

It is not our intention to change how you work. You choose to carry out your profession in whichever way you desire. Nonetheless, as authors - a community of experts in education, skills and ICT, we prepared this paper for you, to share with you the efficiency and advantages of ICT, the resources available that you can build for upskilling and reskilling, and help you navigate the network of changemakers and thought leaders in this field. In short, by empowering you with this information, we make horse farming or non-ICT workflows a wilful, conscious choice, rather than one dictated by prejudices, traditions or simply ignorance.

In short, through this vision paper, you are encouraged to get acquainted with ICT, explore the opportunities it may bring to your professional life and evaluate them diligently and critically. See our efforts as a kind invitation to

include you into the digital, ICT, modern universe. Awareness, both of ourselves and our organization, is a key step to improve, ameliorate and refine consolidated value generation processes.

What you can find in this paper

Sit back, relax and enjoy the read. This vision paper is a self-contained, state-of-the-art, report of the current EU landscape of the use of ICT in non-ICT professions.



The digitalization journey is personal. Just like historical exploratory expeditions across continents, it is up to you and your crew to evaluate the direction this is going. Objectively informative, the paper aims to guide you through key trends and recommended strategies related to blending ICT in non-ICT professions. The advantages and disadvantages of digitalisation are explained and in case guidance is sought, you can reach out to us.

The digital transformation is reshaping traditional ICT roles and professions across all sectors. This vision paper aims to provide EU policymakers with actionable insights into the evolving landscape of digital skills within non-ICT professions. The goal is to ensure that Europe's workforce remains competitive, adaptable, and future-ready.

Non-ICT jobs are increasingly integrating digital tools and technologies, which necessitates a clear understanding of where digital skills are most needed. The paper identifies key target occupations and provides an in-depth look at the types of digital competencies required in these roles. For a more detailed exploration of this topic, readers are encouraged to refer to the brief on [Digital Jobs: a deep-dive](#), which offers additional insights into the segmentation of jobs based on their digital dependency.

Occupations outside of traditional ICT roles can be broadly categorized as:

- ▶ **ICT-enhanced jobs:** These roles leverage digital technologies but could be performed without them, albeit at a lower level of efficiency or quality.
- ▶ **ICT-dependent jobs:** These roles rely heavily on digital technologies and would be challenging to execute effectively without them.

By analysing the current demands for digital skills in non-ICT sectors, this paper identifies opportunities, addresses challenges, and proposes strategies to close skill gaps across industries. The findings and recommendations will help guide policy decisions that ensure no sector is left behind in the digital transition.

In summary, this paper is about integrating technology and building sustainable, long-term value for professionals across all sectors. We invite you to engage with the insights provided and to join us in strengthening Europe's workforce for the digital future.

Squad Collaboration Methodology

The international working group, or "squad," that contributed to this vision paper brought together 18 experts from diverse sectors across Europe. The key methodology centred around sharing experience, insights and learnings, built on the individual background and expertise of the 18 participating experts. Monthly discussions, combined with asynchronous research and information sharing, enabled the squad to explore the state of digital skills in non-ICT professions. Each meeting was led by a different expert, ensuring a wide range of perspectives and experiences were included in the analysis.

The squad's work reflects a shared commitment to addressing the digital skills needs of non-ICT professions, with the aim of creating a pan-European approach to upskilling and reskilling efforts. This collaborative methodology ensures that the insights and recommendations presented in this paper are grounded in real-world experiences and informed by the latest research.

Structure of the document

In the sections below, we will first set out the current context of digital skills in non-ICT professions across Europe, including a deep-dive into the existing key resources and existing frameworks that can support digital skill

development in Europe. After setting the scene, we look at a curated list of 7 studies that have appeared recently and point towards future trends and needs. Building on these studies, as well as the insights that emerged from the discussions, we identify 3 challenges that emerge in the context of digital skills development. Finally, we set out a vision on digital skills for non-ICT professions in Europe. This statement consists of a description of the desired future, strategies to be employed and Expected impact.

Context



Conversations around digital skills have appeared since the proliferation of digital tools in the workplace in the 1970s. Next to contemplation on how to design digital products that are easier to use for the naive computer user (Eason, 1976), or consideration for attitudes of people towards computers that might hinder uptake (Morrison, 1983), the aspect of skills to interact with these machines has been a central theme in research over many decades (Burford, 1980; Corman, 1980). Over the years, many advancements have been made in digital skill development of new workers, upskilling and reskilling methods for workforce and underlying frameworks that can support digital skill education.

In this section, we look at the shape of the current landscape on digital skills needs, education and available resources, based on the projects, initiatives and examples brought forward by squad members during the monthly discussions.

Current Landscape of Digital Skills

Digital maturity among local enterprises remains insufficient, especially at the regional level, and represents a significant challenge. Initial contributions from squad members reveal a lack of information among SMEs, with local business executives and digital entrepreneurs facing barriers that hinder competitiveness.

One primary challenge in addressing digital skill needs is identifying specific requirements across various occupations, organizational levels, and stages of job maturity. The rapid pace of digital technology acceleration further complicates this effort, making it difficult to create feasible HR tools that effectively combine frameworks such as ESCO and others for the new digital age.

Defining Non-ICT Professions

Because digital skills are becoming fundamental across various fields, it is essential to define what constitutes a non-ICT profession. Although there isn't a universally accepted definition, a general understanding emerges from existing studies. Non-ICT professions are those roles that do not require a specific body of knowledge related to information and communication technologies (ICT). For instance, Doucek et al. (2012) described non-ICT

professionals as individuals who do not study or work in information technology or computer science. This aligns with other literature, such as Thomson et al. (2018) and Carcary et al. (2012), which support the notion that non-ICT professions encompass all those outside the ICT sector, even though these roles increasingly benefit from digital skills.

Sherry et al. (n.d.) further elaborate on ICT professionalism, highlighting the possession of a deep and specialized body of knowledge in ICT-related fields. In contrast, non-ICT professionals do not typically possess this specialized ICT knowledge, although they require digital competencies to adapt to the digital transformation sweeping through industries. This understanding will inform the strategic approach to addressing digital skills across diverse sectors.

Regional Insights and Initiatives

During a brief tour de table, squad members shared insights from their national perspectives, highlighting common challenges. In Hungary, there is a need to assist those over the age of 55, who face significant challenges in the labour market. Meanwhile, in Romania, middle-aged citizens with limited digital skills are increasingly interested in transitioning from non-ICT occupations to more technical roles. However, their options are limited, making self-learning a viable alternative that calls for tailored engagement strategies for adult learners.

Slovakia is making efforts to integrate green and digital skills into its education system. The Slovakian National Coalition for Skills and Jobs is working to define critical skills for emerging occupations in the digital age. Similarly, in Albania, digital transition advocacy is gaining traction through initiatives like the EU Code Week, which raises awareness and influences national policy and curricula.

In Germany, efforts to address digital skills gaps include training programs that have reached over 650,000 people across various digital areas. These initiatives stress the importance of linking changing skill requirements to a broader ecosystem of lifelong learning, where individuals continue to improve throughout their careers.

In line with these efforts, it is essential to focus on training educators and trainers to confidently work with and use digital technologies. As AI adoption increases, further action will be needed to ensure they are equipped to navigate and teach these new technologies effectively.

Digital Skills Frameworks

Key frameworks introduced during the squad's discussions include ESCO, DigComp, and the e-Competence Framework (e-CF), which serve as foundational tools for understanding and categorizing digital skills across professions.

ESCO and DigComp

During the squad's March 2024 meeting, the European Skills Competences and Occupations portal (ESCO) and DigComp were highlighted as essential frameworks for defining digital and e-skills across various professional domains. ESCO categorizes professionals based on their reliance on IT, enhancing productivity and efficiency, while DigComp offers a structured framework for interpreting job requirements in the face of evolving roles.

Efforts to align ESCO and DigComp are ongoing, yet challenges persist due to differences in how transversal skills are mapped between the two. Open-source data and expert opinion contribute significantly to digital skills mapping, but inconsistencies in job descriptions and limited stakeholder engagement hinder comprehensive insight.

Although reports and meta-analyses offer potential solutions, their effectiveness is often undermined by methodological discrepancies and conflicts of interest.

Moreover, the use of online job advertisements and diverse data sources enriches skills analysis, but additional information is required to create a complete picture of digital skills needs and trends. These frameworks, alongside continued research, are critical for navigating the rapidly evolving landscape of digital occupations.



e-Competence Framework (e-CF)

The e-Competence Framework (e-CF), also known as EN16234, is a European standard that provides a common language for describing digital competences for IT professionals. This framework has been an important source for the development of the ESCO classification. e-CF It offers a set of 41 e-competences that can be applied by public and private companies, as well as the education sector. While there is some overlap between the lowest levels of e-CF and the highest levels of DigComp, it is important to note that non-IT professionals performing basic tasks associated with IT work do not necessarily qualify as IT professionals. A useful analogy is the difference between skilled amateurs performing home DIY projects and professional industrial workers.

First released in 2008 with 31 e-competences, the most recent version, e-CF 4.0, was published in late 2019. The framework is currently maintained by the European Committee of Standardization (CEN). Although the framework is not yet widely adopted across Europe, there are notable examples of successful implementation in large companies, such as MAPFRE and Capgemini (CEN, 2014), as well as in SMEs.

The e-CF has significant potential to support digital transformation by facilitating hiring and upskilling of new professionals, as well as improving communication between industry and education.

For non-IT professionals, the e-CF is especially valuable in hybrid or highly specialized occupations (e.g., biotechnologists) where the demand for digital skills is higher than in occupations that are merely enhanced by technology. By combining elements of DigComp with e-CF references, it is possible to better define the digital skill needs in these specialized fields.

The e-CF constellation of documents also includes a user guide, a Body of Knowledge for the ICT profession, and examples of 30 IT professional roles for reference. Practical tools like the e-CF Profile Tool help bring the framework into practice by grouping competences under specific ICT roles¹.

AI Competencies

The **ARISA project**, funded by the European Union, plays a crucial role in addressing AI skills gaps across diverse sectors. The project focuses on developing AI competencies tailored to specific professional roles, such as business leadership, technology management, technical professions, and policymaking. Its primary goals include creating a comprehensive **AI Skills Strategy for Europe** and designing curricula that integrate essential elements like privacy, bias, trust, and inclusivity.

ARISA involves a wide network of ICT organizations, educational institutions, and industry representatives to ensure that upskilling and reskilling efforts are effective. These collaborations contribute to building an AI-capable workforce, fostering sustainable AI adoption across various sectors. The project is actively involved in formulating strategies that meet the needs of Europe's evolving AI landscape².

¹ Further details and resources can be accessed at <https://itprofessionalism.org/e-cfexplorer/> and <https://bit.ly/CENT-TC-428>

² Further details on ARISA's mission and resources can be accessed at aiskills.eu. EPRS | European Parliamentary Research Service: BRIEFING Pre-legislative synthesis

Key Findings from the Literature Review

In this section, we bring together six influential studies that give insight into the trends in needs for digital skills for non-ICT professions in the labour market, the available resources that could offer a starting point for changes in digital skill education, and future avenues for policy development. This list has been curated by the expert group, as studies that offer landmark insights in this field.



1. OECD 2016: Skills for a Digital World

In its December 2016 policy brief on the future of work, the OECD highlights the transformative impact of Information and Communication Technologies (ICT) on job skills profiles, advocating for comprehensive skill development policies to mitigate the risk of increased unemployment and growing inequality. Despite the digital shift, 56% of adults still lack adequate ICT skills, emphasizing the urgency for policy action to strengthen initial learning, anticipate skill needs, promote skill utilization, and incentivize further learning. The report outlines four key priorities for skills policies to address the challenges of the digital world: **ensuring basic ICT literacy, anticipating changing skill needs, enhancing skill utilization, and promoting lifelong learning**. Additionally, it emphasizes the importance of active labour market programs and innovative learning infrastructure to facilitate skill development and workforce adaptation in the digital era.

2. Cedefop 2022: Setting Europe on Course for a Human Digital Transition

Cedefop's second European Skills and Jobs Survey (ESJS2), covering over 46,000 adult workers across 29 European countries, challenges the notion of digitalization as a job-destroying force. The report frames the digital transition primarily as a skills transition, noting that while some jobs will be lost and tasks automated, new opportunities will emerge, requiring different skill sets. The unequal distribution of digital skills remains a key concern, particularly for workers in low-skilled, routine jobs, which are more susceptible to automation. The report stresses the need to prioritize worker well-being and promote quality jobs during the digital transition. **Upskilling and reskilling** initiatives are crucial to ensuring that all workers can benefit from the digital transformation. Though specific digital skills are not explicitly listed, foundational skills like **information literacy, communication and collaboration, and problem-solving with technology** are highlighted as increasingly important (Cedefop 2023: Skills in Transition - The Way to 2035).

Cedefop's 2023 report predicts continued demand for highly skilled workers across sectors, with a shift from job polarization (high-skill vs. low-skill) to job upgrading. Existing jobs will increasingly require higher levels of skill, including digital skills. The report underscores strong growth for ICT professionals while also emphasizing the increasing importance of digital skills in non-ICT professions. This trend is driven by the twin transition towards a greener and more digital economy. Though the report doesn't explicitly list the specific digital skills needed, the broader trends suggest a focus on:

- ▶ **Information Literacy:** Finding, evaluating, and using digital information effectively.
- ▶ **Communication and Collaboration:** Using digital tools for communication and teamwork.
- ▶ **Problem-Solving with Technology:** Applying technology to solve problems and automate tasks.
- ▶ **Data Analysis:** Interpreting and drawing insights from data, such as using spreadsheets and basic data visualization tools.

3. Cedefop 2023: Going Digital Means Skilling for Digital

This policy brief, based on a big data analysis of millions of online job advertisements, identifies the evolving landscape of digital skill needs across the European Union (EU-27). It emphasizes the urgent need to accelerate the implementation of digital skills strategies and policies, including significant investments in upskilling and reskilling the existing workforce to bridge the digital skills gap. The report highlights that the demand for digital skills extends beyond ICT professions and touches various sectors, where a blend of technical and soft skills is increasingly required. It calls for a multi-pronged approach to equip the entire workforce with the necessary digital skills, including:

- ▶ **Strategic Investments:** Increased funding for upskilling and reskilling initiatives, focusing on educators and trainers to ensure they possess the skills needed to deliver effective digital skills training.
- ▶ **Modernized Education Systems:** Transformation of education and training systems to integrate digital skills development across all educational pathways.
- ▶ **Inclusive Approach:** Strategies to ensure access to digital skills development opportunities for all citizens, promoting an inclusive digital transformation.

4. European Commission 2023: Digital Decade Cardinal Points

The European Commission's staff working document titled "Digital Decade Cardinal Points" covers key aspects of digital skills and infrastructures as part of the 2023 State of the Digital Decade report. It recognizes the importance of **digital literacy** for all citizens, beyond just ICT professionals. Basic digital skills, such as using digital tools, understanding online security, and navigating digital environments, are essential for everyone. The document also highlights the need for **transversal digital skills** that cut across various professions, including critical thinking, problem-solving, and adaptability in a digital context.

The report acknowledges that **different sectors require tailored digital competencies**. For example, healthcare professionals may need skills related to telemedicine and health informatics, while educators benefit from digital pedagogy skills. The document emphasizes continuous learning, upskilling, and reskilling to ensure that non-ICT professionals stay relevant in a rapidly evolving digital landscape.

5. Joint Research Centre 2024: Mapping DigComp, digital competences and ESCO skills framework

The Joint Research Centre's recent study titled "Mapping DigComp digital competences to the ESCO skills framework for analysis of digital skills in EU online job advertisements" (Cosgrove et al, 2024) looks at the extent to which there is alignment between the supply of digital skills and the demand for digital skills in non-ICT professions. Taking a generalist perspective, it maps the DigComp 2.2. framework for digital skills, the skills taken up in the fourth iteration of the European Digital Competence framework for citizens and the online job advertisement (OJA) database, Skills-Online Vacancy Analysis Tool for Europe (Skills-OVATE). The study shows interesting findings: Digital skills, as classified under DigComp competences, are highly represented in ESCO and the OJA database. Figure 1 shows the distribution of ESCO skills across the DigComp competences. Figure 2 shows a similar mapping for the OJA database.

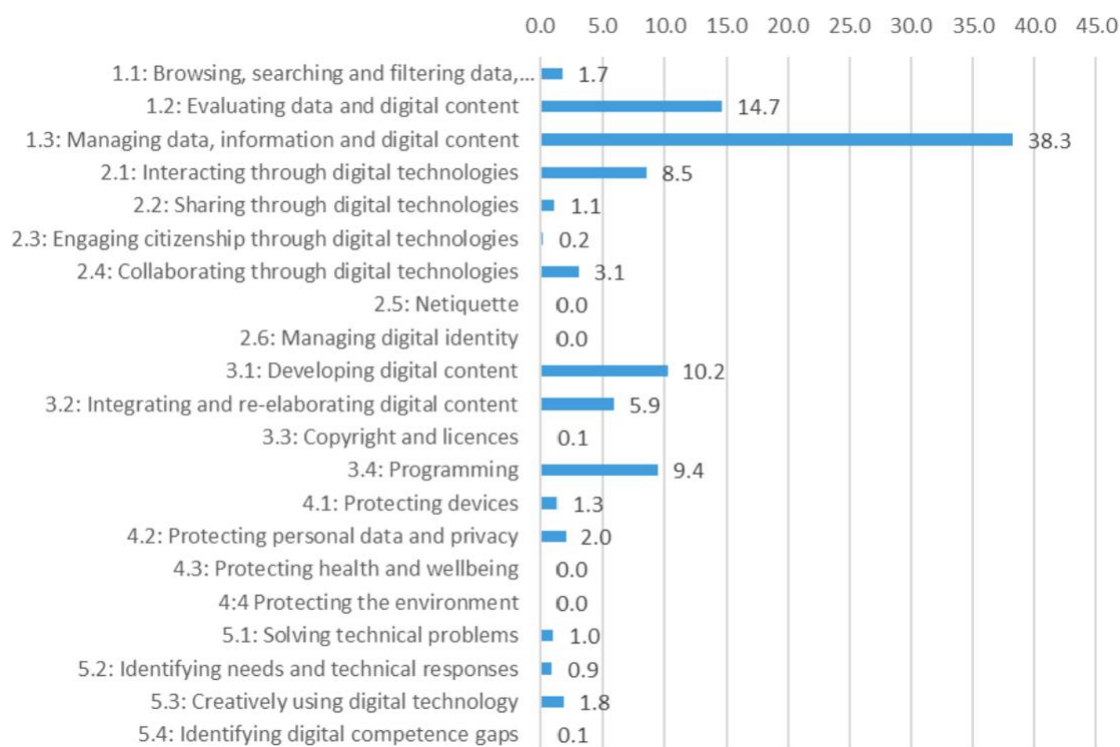


Figure 1 Distribution of the ESCO skills across DigComp competences

Note: the figure shows 27% of 2,760 ESCO skills which have been mapped to one or more OJA and DigComp

Note. Adapted from *Mapping DigComp digital competences to ESCO skills to analyse digital skills demand* (p.12), by J. Cosgrove et al., Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/197497, JRC137060.

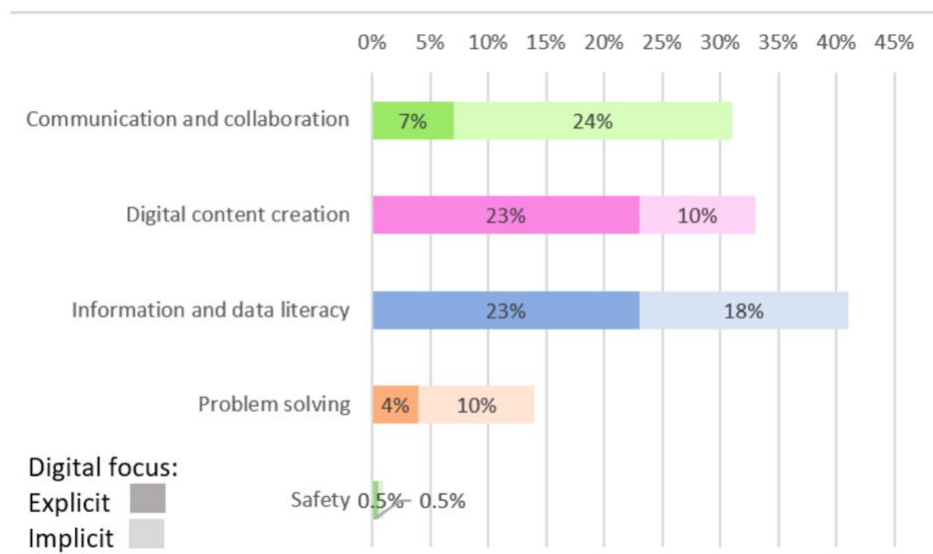


Figure 2 : Share of EU online job ads requiring DigComp-related skills, by DigComp competence area and explicit/ implicit digital focus

Note. Adapted from *Mapping DigComp digital competences to ESCO skills to analyse digital skills demand* (p.13), by J. Cosgrove et al., Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/197497, JRC137060.

Interestingly, both mappings show an uneven distribution across the DigComp competences, with an emphasis on information and data literacy. Problem solving and Safety are underrepresented in the OJA, suggesting less emphasis on these competences in the demand side for skills, which needs significant effort in awareness-raising with employers on these issues. The study also suggests including explicit references in vacancy descriptions and competency profiles for role on the needs to work in digital or non-digital environments.

6. CEPIS Expert Group on Digital Skills Policy (Preliminary Findings)

The Council of European Professional Informatics Societies (CEPIS) represents national informatics associations across Europe. Established in 1989 by nine European informatics societies, CEPIS now represents IT professionals in 29 countries. The organization has published various reports and position papers on digital skills³, providing a distinct and complementary perspective to other studies, such as those based on online job ads⁴ surveys, or stakeholder interviews.⁵

The ESCO classification, which has served as the official labour classification for all EU member states since 2021, forms a central component of this analysis. Developed by over 200 experts from various sectors over four years, ESCO is regularly updated by the European Commission with input from public employment services across the EU.

³ ^[1] See for example [Features For an Ideal, Feasible System For Certification Of Digital Skills In Europe](#) and [Statement on the European Digital Skills Certificate \(EDSC\)](#)

⁴ [Mapping DigComp digital competences to the ESCO skills framework for analysis of digital skills in EU online job advertisements](#)

⁵ e.g. [Skills for a Digital World OECD 2017](#)

Preliminary findings from the CEPIS Expert Group on Digital Skills Policy include an analysis of digital skills demand, expressed through the DigComp 2.2 framework (2022) across different occupation groups in the ESCO classification. These findings illustrate that not all DigComp competencies are equally demanded, and the distribution of digital skills requirements varies significantly among the main occupation groups, excluding ICT occupations. More detailed segmentation of the data reveals further nuances, such as the relevance of advanced skills at the intersection of general digital competencies and those required for ICT professionals.

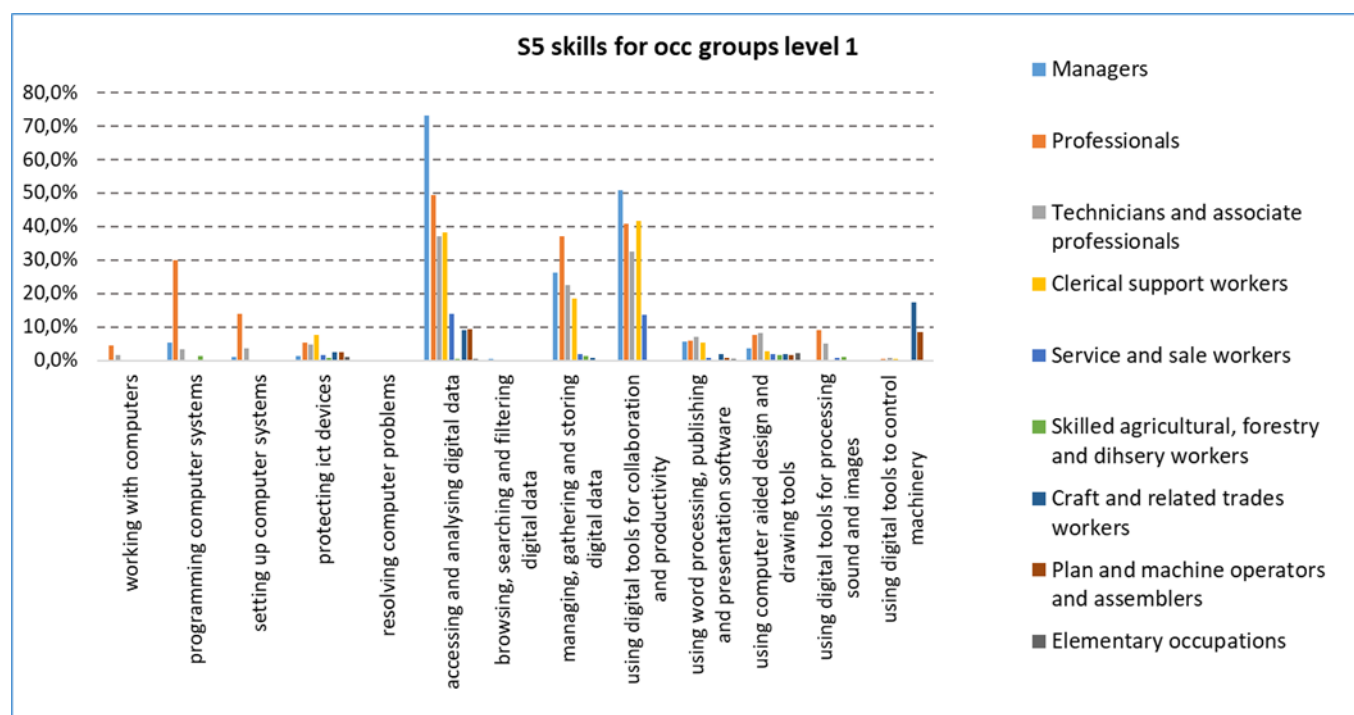


Figure 3 The distribution of demand for DigComp digital skills across different ESCO occupation groups, excluding ICT occupations (Preliminary results from the CEPIS Expert Group on Digital Skills Policy, 2024).

Despite the usefulness of various reports and data analyses, it is important to recognize their limitations. For instance, not all job openings are made public, and job ads may not always accurately reflect the full range of requirements for candidates. Furthermore, samples from surveys or expert groups can be limited, and responses in interviews or surveys may lack precision. Therefore, while these reports provide valuable insights, they cannot offer a complete picture of the demand for digital skills in non-ICT occupations⁶.

⁶ EPRS | European Parliamentary Research Service Authors: Vasilis Margaras and Vasco Guedes Ferreira with Nicole Inama Linking the Levels Unit – Scientific Foresight Unit (STOA) PE 739.270 – December 2022 Digital in education and skills
[https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/739270/EPRS_BRI\(2022\)739270_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/739270/EPRS_BRI(2022)739270_EN.pdf)
<https://itprofessionalism.org/ep-releases-briefing-on-digital-in-education-and-skills/>

Challenges

Building on this list of studies, as well as the insights that emerged from the discussions within the squad, we identify 4 major and transversal challenges that emerge in the context of digital skills development.



Lack of Clear Frameworks

One significant challenge is the difficulty in accurately identifying the digital skills needed for non-ICT professionals due to the lack of clear, universally adopted frameworks. Squad members have noted that existing frameworks, while valuable for providing structure and gaining control, are often difficult for individuals and organizations to use effectively when determining the specific competencies required across different roles and sectors. Frameworks like ESCO, although widely used and accepted throughout the EU, are often too general and insufficient for establishing a common terminology across different industries. As a result, organizations tend to develop their own methodologies to define digital competencies, leading to inconsistencies.

Moreover, the rapid pace of AI-driven technological disruption has outpaced many of these models, rendering them increasingly obsolete. The challenge lies in the fact that focusing too heavily on static frameworks may result in biased or outdated conclusions. As the digital landscape evolves at an unprecedented rate, **frameworks need to be agile and adaptable to remain relevant**. From an educational perspective, the real challenge is translating these frameworks into practical tools that can be easily adopted and used by both individuals and organizations. However, it is also increasingly clear that many educators are insufficiently trained to use competence frameworks effectively in the development of their learning activities, nor in their use as a diagnostic tool for formative assessment and learning.

Furthermore, traditional frameworks tend to focus too narrowly on computer-related skills, whereas digital technologies, particularly AI, now permeate all aspects of professional and personal life. The challenge, then, is to reframe digital education to reflect the pervasive role of these technologies beyond the ICT sector and integrate digital elements into every professional environment.

Mixed Acceptance of AI and Digital Tools

The new wave of technology that has become widely available to the public over the run of the Squad has introduced countless new tools and applications, provoking a variety of reactions from non-ICT professionals. Responses range from eagerness to learn and adapt, to hesitation and abstention. This mixed acceptance presents a significant challenge to digital skills initiatives, as individuals react differently to integrating new technologies into their daily tasks.

Underlying this mixed attitude is the uncertainty of how these technologies will exactly affect non-ICT professions. While it is understandable that non-ICT professionals may be resistant to adopting these new technologies, particularly due to fears of obsolescence or the perceived complexity of new tools, it remains crucial to clarify the specific digital skills that are relevant to their roles. By clearly defining the competencies needed in different sectors and providing targeted digital skills training, resistance can be alleviated by **shifting mindsets from a perspective of inevitable futures towards humane futures that are made and designed**. Showing how these tools can enhance, rather than replace, their professional roles can help foster greater acceptance and engagement.

Ambiguity Regarding Responsibility and Investment

Another challenge is the ambiguity surrounding financial responsibility for digital skills development. There is often a lack of clarity around who should bear the cost of upskilling and reskilling—should it be the responsibility of **individuals, employers, or governments?**

This ambiguity can result in a lack of investment in digital skills training, particularly by organizations. Despite the initiatives of many governments, including initiatives by the European Commission on flexible and fit-for-purpose learning formats (European Commission, 2022a) and individual learning accounts (European Commission, 2023b), many companies fail to see learning and development as a strategic priority, leaving employees to navigate the challenges of digital transformation on their own. Differentiating between lifelong learning initiatives for individuals and organizational strategies for upskilling employees is crucial. Organizations must recognize that investing in continuous learning and creating opportunities for skill development is not just a benefit for employees, but a strategic necessity in staying competitive in a digital world.

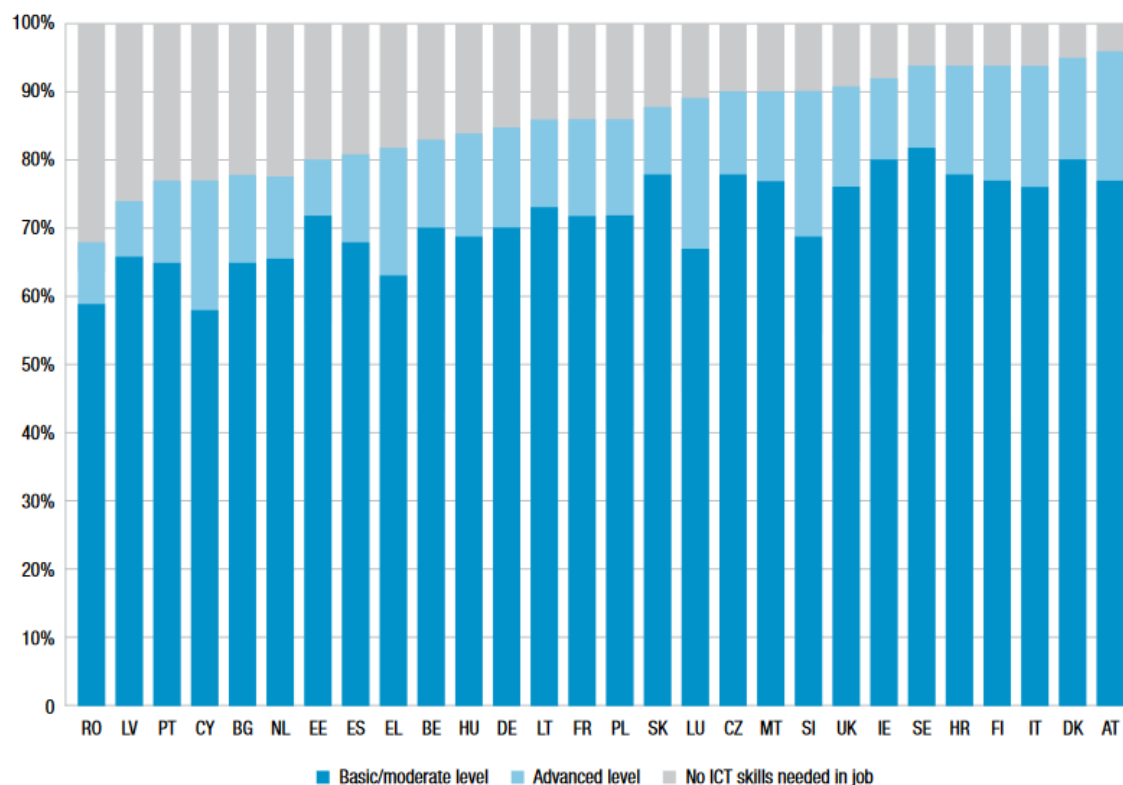
Creating a learning culture within organizations, where digital skills are continuously updated and encouraged, will be vital in overcoming this challenge. Organizations should invest in training and provide motivation and support for employees to embrace these learning opportunities.

Needs of employees

Understanding the specific digital skills needs of employees across various sectors is crucial in addressing these challenges. Cedefop's ESJ surveys provide valuable insights into the ICT skills required by employees in different EU member states. The first survey conducted in 2018 distinguishes basic ICT skills such as using a PC, tablet or mobile device, moderate ICT skills such as creating documents and spreadsheet and advanced ICT skills such as developing software or programming (Cedefop, 2018).

According to the survey, 71% of employees require basic or moderate digital skills, while 14% need advanced ICT skills, and 14% reported no need for digital skills at all in their jobs. 52% of adult EU employees stated they require moderate ICT level skills and 19% reported requiring basic ICT skills. These variations highlight the importance of tailoring digital skills training to meet the diverse needs of employees across sectors.

Additionally, the survey identifies significant disparities between countries, with over 80% of adult employees in Sweden, Denmark, and Ireland needing at least basic ICT skills, compared to around 60% in countries like Cyprus, Romania, and Greece. Certain sectors, such as education, health, and financial services, report higher demands for digital competencies, while others, like agriculture and elementary occupations, see less need. (Cedefop, 2018).

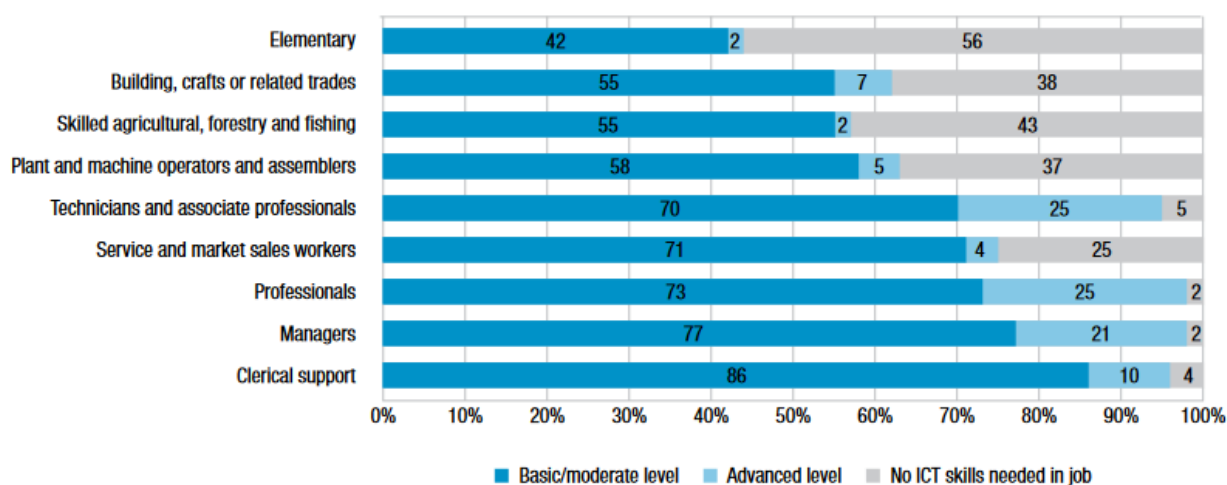


NB: Share of valid responses to the question: 'Which of the following best describes the highest level of information communication technology skills required for doing your job?'

Source: Cedefop European skills and jobs survey (ESJS): <http://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey>

Figure 4 Level of ICT skills needed to do the job, adult employees, 2014, EU-28 (Cedefop, 2018)

Specific sub-groups not requiring any ICT skills were identified in the survey – among them 56% of employees in elementary occupations, 43% employees in skilled agricultural, forestry and fishing sector and 25% employees in service and market sales sector reported no need of ICT skills in performing their job tasks (Cedefop, 2018).

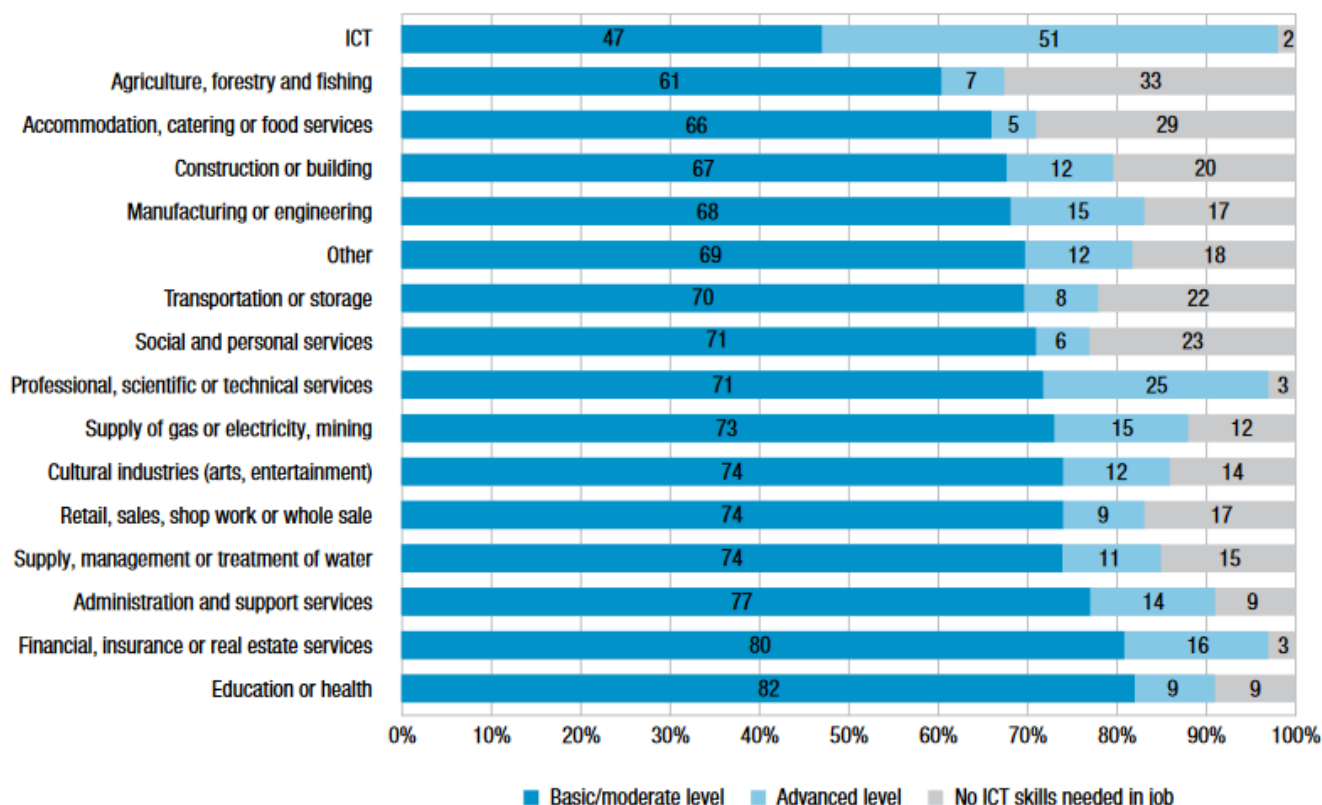


NB: Share of valid responses to the question: 'Which of the following best describes the highest level of information communication technology skills required for doing your job?'

Source: Cedefop European skills and jobs survey (ESJS): <http://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey>

Figure 5 Level of ICT skills needed to do the job by occupation, adult employees, 2014, EU-28 (Cedefop, 2018)

Among job sectors in which highest percentage of employees reported needing at least fundamental level of ICT skills were education or health, financial, insurance or real estate services and administration and support services (Cedefop, 2018).



NB: Share of valid responses to the question: 'Which of the following best describes the highest level of information communication technology skills required for doing your job?'

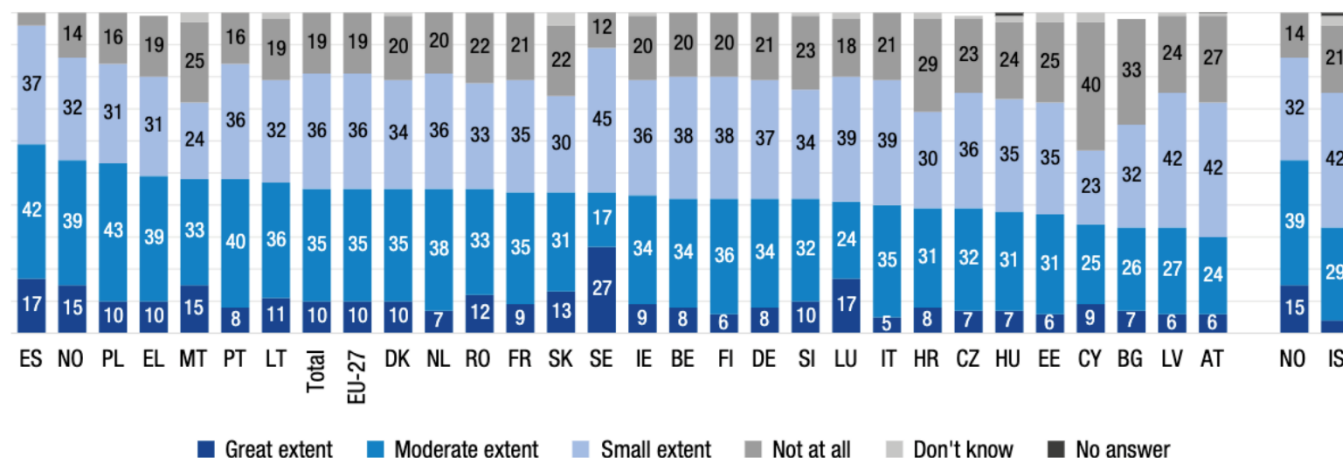
Source: Cedefop European skills and jobs survey (ESJS): <http://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey>

Figure 6 Level of ICT skills needed to do the job by sector, adult employees, 2014, EU-28 (Cedefop, 2018)

These findings underscore the importance of customizing digital skills training to meet the specific needs of different professions and regions, ensuring that non-ICT professionals are equipped with the skills necessary to thrive in a digital economy.

The second ESJ survey (Cedefop, 2022) provides additional findings to be considered. It is worth highlighting the extent to which participants considered the need for new skills that are currently non-existent in their companies (see figure 5 below)

F_DISPLSKIL: TO WHAT EXTENT DO YOU THINK NEW DIGITAL OR COMPUTER TECHNOLOGIES IN YOUR COMPANY OR ORGANISATION NEED OR WILL NEED NEW KNOWLEDGE AND SKILLS YOU CURRENTLY DO NOT HAVE?



Source: Cedefop second European skills and jobs survey, 2021.

Figure 7 Impact of new digital technology in skill needs.

This second ESJ survey noted the impact of the COVID pandemic, which significantly accelerated digitisation at work. For example, 39% of the workers noticed such increase in the use of digital skills, 39% increased their remote work time, and 36% increased their time learning online for job purposes (Cedefop, 2022). That has in turn significantly increased the perceived need for digital skills. These skills were broken down into nine different digital activities from those requiring most basic skills -Internet browsing, sending emails etc- to most advanced skills, such as writing programs (see Figure 6, Cedefop 2022)

D_PC*: DID YOU USE ANY OF THE COMPUTING DEVICES MENTIONED EARLIER TO DO THE FOLLOWING ACTIVITY AS PART OF YOUR MAIN JOB IN THE LAST MONTH?

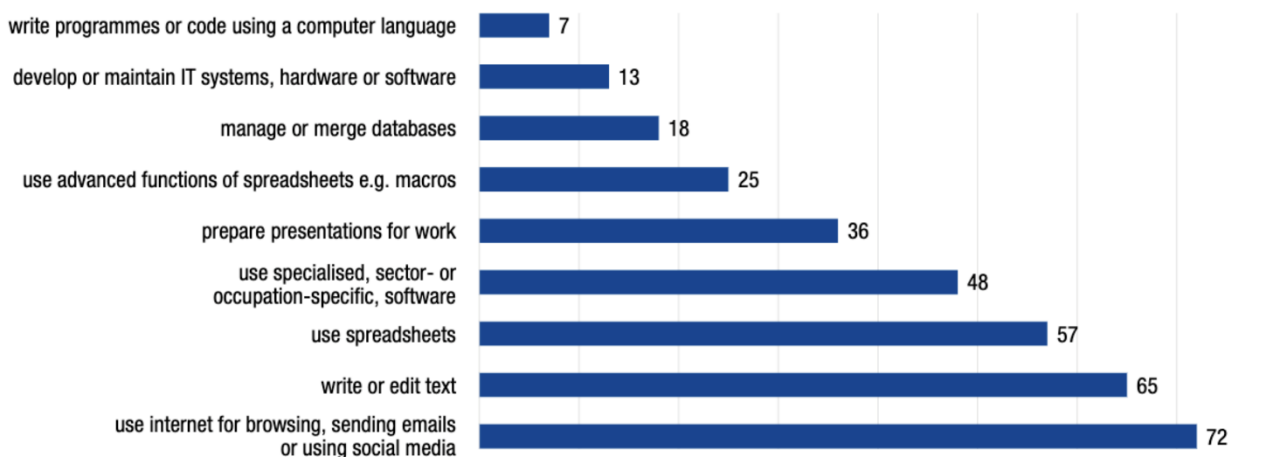


Figure 8 Activities performed by respondents as part of their main job using computing devices

There are employment sectors where this need has recently become more evident, such as health care and communication (Cedefop 2023). Additionally, a significant growth in online job advertisements for highly digitally intensive occupations has been registered in several studies, as noted in Cedefop (2023). Figure 7 illustrates such trends drawn from the WIH-OJA Database.

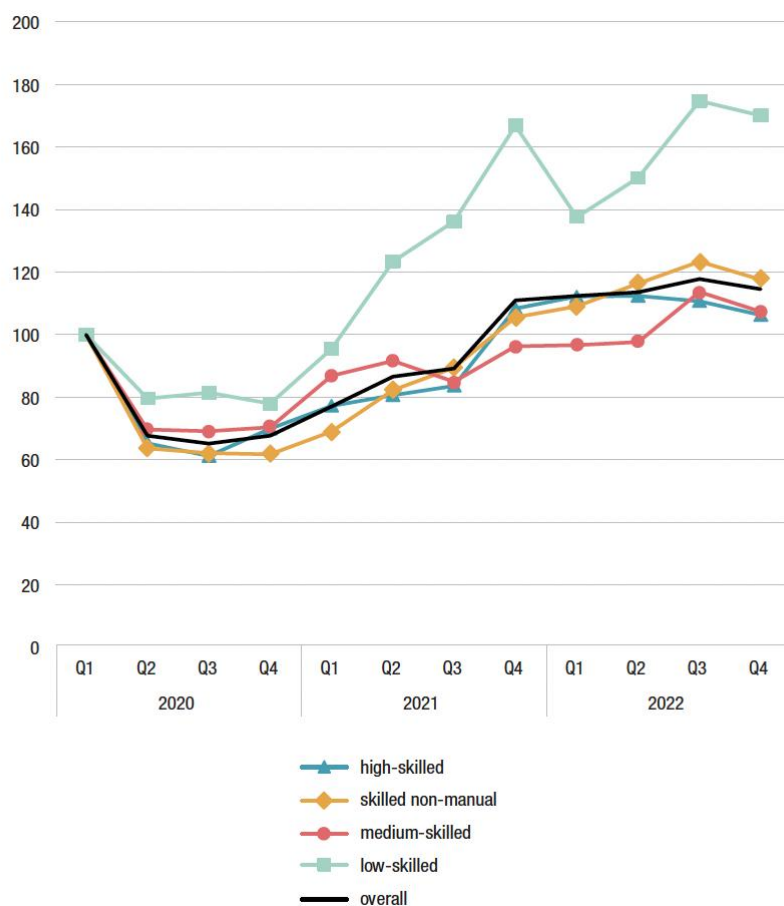


Figure 9. Cedefop (2023), drawn from WIH-OJA Database

Based on the findings of the Second ESJ survey (Cedefop 2022), Cedefop forecasts higher shortages of qualified professionals with the necessary ICT skills to fulfil the needs of their occupations. Figure 8 maps the areas of employment where these shortages will be most critical (Cedefop 2023).

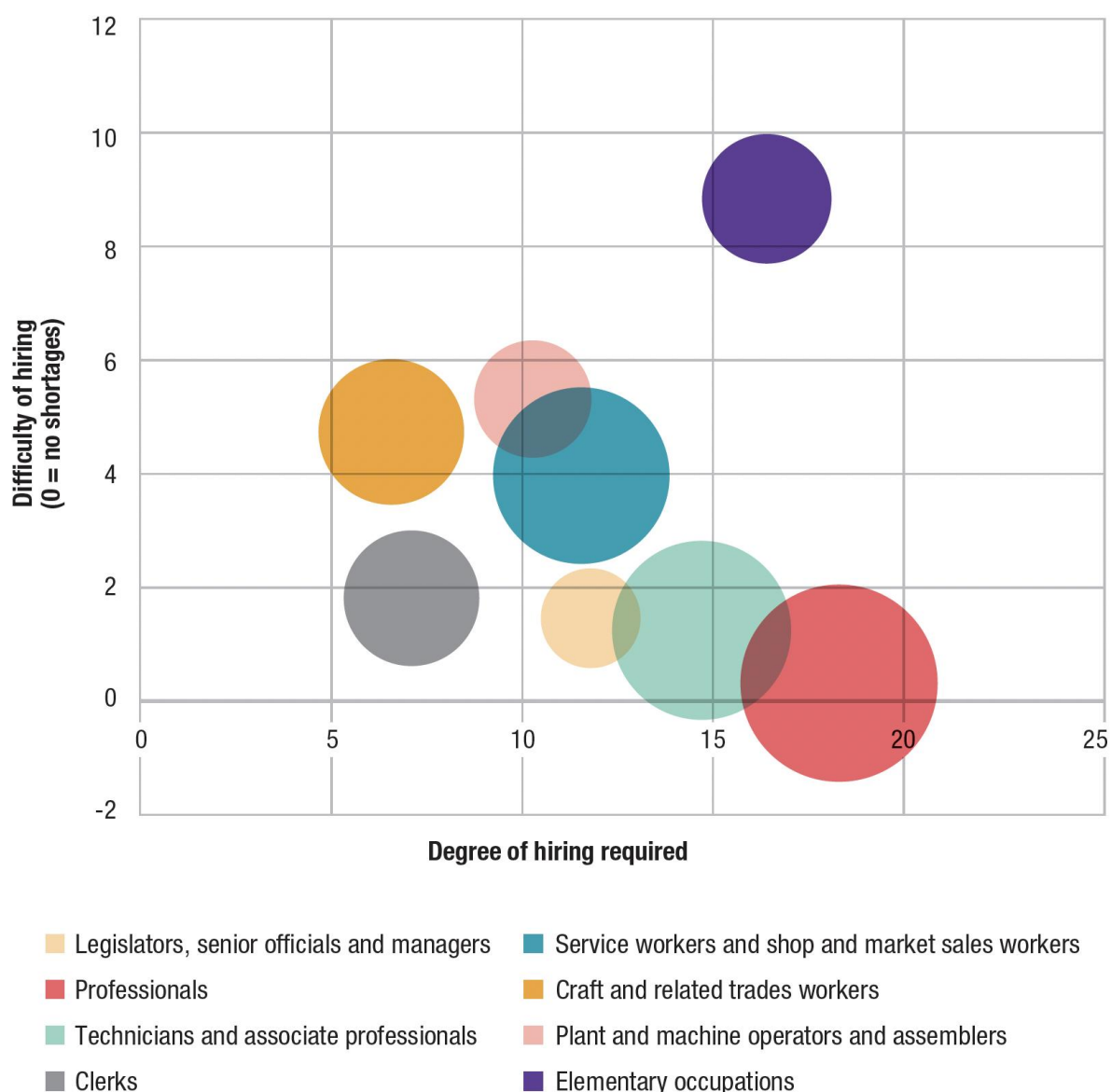


Figure 10 Areas of employment with critical shortages in ICT professionals

These CEDEFOP studies show that nearly every sector requires a workforce with fundamental skills in ICT, but also foresee that many ICT skills will become obsolete in the near future, requiring a workforce that is agile and adaptive to the emergence of new technologies.

Vision Statement

This exploration of the current state of digital literacy and education allows us to define our vision for the future, which we will present in four key areas: our desired future, future directions, strategies for achieving this vision, and the expected impact of these strategies on the current situation.

A desired future

Our desired future is straightforward: this is a future where non-ICT professionals are knowledgeable of new technologies, skilled in using them (if they desire) and adaptive to the emergence of new technologies. It is a future where uncertainty for individuals, organisations and for governments is mitigated by lifelong learning and other initiatives tackling skills asymmetries and fostering confidence, foresight and trust in the ability to make your future. To reach this future, we need increased clarity on three crucial aspects.

A first is more clarity on non-ICT professions: As digital skills become increasingly essential across various sectors, it is critical to establish a clear understanding of what constitutes non-ICT professions. Despite extensive research on digital skills for ICT professionals, a precise definition of non-ICT professions remains elusive. However, it is generally accepted that non-ICT professionals are those who do not work in information technology (IT) or computer science (Doucek et al., 2012); have nothing to do with information and communication technologies (Thomson et al., 2018), (Carcary et al., 2012).

A second is more clarity on which are the desired levels of knowledge and skills in ICT for these professionals. A helpful reference is the "Considerations in developing a European framework for ICT professionalism" study by Sherry et al., (n.d.) which outlines the characteristics of ICT professionals: (i) possessing a comprehensive and up-to-date body of ICT-related knowledge, (ii) a commitment to ongoing professional development, (iii) adherence to ethical codes, and (iv) the delivery of value to stakeholders through competent practice. From this, we can infer that non-ICT professions lack this specific ICT body of knowledge, related skills, and the perspective of technology use as an ongoing necessary professional development (rather than driven by individual interest). But this does not elucidate to which level of proficiency this is required (e.g. general skills for use of data tools in Rajagopal (2024))

Non-ICT professions stand to gain significantly from enhanced digital competencies as digital transformation continues to reshape industries. Digital literacy, adaptability, and the ability to engage with emerging technologies will become critical for non-ICT professionals as they navigate this evolving landscape.



Thus, our vision is to support non-ICT professionals in acquiring the digital skills they need to thrive in a digitally transformed world. This includes recognizing the unique challenges they face in defining which digital skills are most relevant to their roles and providing tailored education and training solutions that bridge the gap between traditional professions and modern technological demands. We hope to raise awareness and educate non-ICT professionals about the benefits and values unlockable by digital technologies, irrespective of whether they will choose to digitalize their work.

The third and final aspect relates to desired attitudes and behaviours in the workforce. The adoption and use of digital technologies depend both the availability of training and upskilling opportunities as well as on people's own ability and willingness to adapt. Motivation plays a critical role in driving sustained engagement with digital tools. Yet, there is often a mismatch between employee expectations and the support provided by organizations, significantly hindering motivation and the broader adoption of digital technologies (Ramin, 2024).

This aligns with insights from the World Economic Forum, which underscores the urgency of addressing these challenges. According to their findings, 60% of respondents identified the skills gap as a major barrier to digital transformation (cited in Ramin, 2024). This gap is particularly pronounced in smaller enterprises, where access to comprehensive training programs is limited. Moreover, the skills gap extends beyond technical expertise. **Non-technical skills such as adaptability, critical thinking, and problem-solving are just as essential for navigating the complexities of digital transformation.** These complex competencies refer to proficiency in

certain tangible skills which require persistent positive attitudes to learning. The Digital Skills and Jobs Coalition further highlights that creating a learning ecosystem within organizations is critical for fostering a culture of continuous learning and ensuring that employees can adapt to rapidly evolving technological landscapes [ibid.].

Additionally, the importance of AI competencies in the workplace cannot be overlooked. As Prof. Karim Lakhani of Harvard Business School noted, "AI won't replace humans, but humans with AI will replace humans without AI" (cited in Ramin, 2024). The integration of AI in the workplace levels the playing field between blue-collar and white-collar workers, emphasizing the **growing importance of soft skills such as analytical thinking, attention to detail, quality control, flexibility, motivation, self-awareness, and curiosity**. These skills will be increasingly in demand as AI takes over routine tasks, leaving more complex decision-making and human-centric roles to the workforce [ibid.].



Leaders must recognize that digital competencies are a combination of technical literacy and a blend of understanding and adapting to new tasks that arise in the context of digital and sustainable transformation. As roles and responsibilities shift with automation and technology incorporation, leaders need to grasp these changes both for themselves and their teams. Digital competencies must combine well-defined and evolving tasks with familiarity with organizational factors and personality traits that foster continuous development. As Ramin (2024) highlighted, the varied types of AI use across an organization's technology and business departments, which often share resources such as cybersecurity and data analytics, illustrate the need for leaders to assess both immediate and long-term competency needs of the work environment. This assessment ensures that workforce education evolves in tandem with technological advancements.

Strategies for Future-Proof Digital Skill Education in Non-ICT Professions

How can we reach this desired future state? The Squad defined the following approaches that can help you take a step forward. We distinguish here between

Macro-level: Strategies for policymakers

- 1. Skills Differentiation:** The skill requirements for blue-collar and knowledge-based roles differ significantly, with the former often prioritizing human-robot interaction and the latter needing a broader skill set, including analytical thinking and digital literacy. Competence development paths should follow a progression from basic knowledge to understanding, application, and creativity. Similarly, digital literacy should grow from interacting with AI and data awareness to creativity and systems thinking. As digital transformation affects all sectors, both blue-collar and white-collar workers will need a blend of technical and non-technical skills. Cedefop (2023) emphasizes the importance of skill development that integrates both technical and transversal skills across all job types.
- 2. Transversal vs. Digital Skills:** Transversal skills, such as communication, critical thinking, and teamwork, are critical across all sectors, while digital skills specifically relate to technology-related competencies. Addressing both types of skills is crucial for a holistic approach to workforce readiness in the digital age. OECD (2016) notes that balancing transversal and digital skills ensures adaptability and employability in a rapidly evolving digital world.
- 3. Relevance of Programming Skills:** Programming skills are increasingly relevant in fostering computational thinking and innovative development, beyond the mere ability of coding. Understanding programming concepts allows workers to engage in creative problem-solving and to drive digital innovation. As the World Economic Forum (2024) highlights, computational thinking is becoming a core competency in modern job markets, contributing to digital innovation across industries.
- 4. Incorporating Soft Skills into Digital Education:** While digital education often focuses on technical skills, soft skills such as problem-solving, mindfulness, and adaptability should also be emphasized. These skills enhance analytical thinking and overall resilience in the rapidly changing digital landscape. Cedefop (2022) supports this

by emphasizing that integrating soft skills into digital education is key to preparing workers for complex decision-making in tech-driven environments.

5. **Use of Personas:** Advocating for the use of personas helps tailor skills development strategies to specific roles within an organization. By considering diverse knowledge levels and seniority, organizations can ensure that training programs meet the needs of all employees. Personas offer a practical method for mapping out different learning paths and addressing various competency levels.
6. **Overcoming the Slowness of Educational Institutions:** Educational institutions often struggle to keep pace with evolving skills needs, focusing primarily on domain-specific knowledge rather than broader skills development. Encouraging institutions to prioritize both transversal and digital skills alongside domain knowledge will be crucial to preparing students for the workforce. The European Commission (2023) highlights that educational institutions must adapt their curricula to meet the demands of the digital era, ensuring that graduates are equipped with both technical and soft skills.
7. **Conceptual Models for Skills Development:** There is a need for comprehensive and adaptable frameworks to guide skill acquisition and development initiatives, and training for educators to use them in fit-for-purpose ways. Rather than outlining rigid learning paths, these conceptual models should provide flexible structures that can evolve with technological advancements, facilitating efficient and effective skill acquisition in the increasingly digital workplace. Cedefop (2023) recommends the development of such adaptable frameworks to ensure that skills development remains relevant in dynamic environments.
8. **Business Involvement in Skills Development:** Greater collaboration between businesses and educational institutions is necessary to address skills gaps. Shared responsibility for workforce development ensures that educational programs remain relevant to industry needs and that businesses invest in their employees' growth. The World Economic Forum (2024) advocates for stronger partnerships between the private sector and educational institutions to create dynamic learning environments.
9. **Inclusion of Experts:** Bringing in external specialists, especially those with expertise in motivation, readiness, and sector-specific challenges, can enrich discussions and provide deeper insights into the dynamics of skills development. Leveraging this expertise will help address nuanced issues and tailor solutions more effectively. Cedefop (2023) supports the inclusion of diverse experts to navigate sector-specific challenges and improve overall skills development strategies.

Meso-level: Strategies for Organisations

The core and critical change that any organisation can undertake is to establish a learning culture. This means:

- ▶ **Barrier-free access** to learning opportunities for all members of the organization: this requires recognising that all employees need certain proficiency levels in their digital skills, to ensure that the organisation and the individual thrive.
- ▶ Embracing **continuous learning** as the new normal: learning should be celebrated, encouraged and shared. The platforms within organisations to make learning visible, to recognise learning successes, and to share lessons learnt on a regular basis should become the strong backbone of any organisation.
- ▶ Ensuring employees have **dedicated time for learning** and development: if learning is crucial for every member of the organisation, it is part and parcel of their tasks.
- ▶ Promoting a culture of **experimentation and learning** from failure: experimentation supports team-building and considered risk-taking, but it can result in success or failure. In either case, learning is always a result.
- ▶ **Critically questioning the status quo** to foster innovation and improvement: encourage all members of the organisation to review their working processes and organisation regularly, to remain future-proof and resilient to change.
- ▶ Implementing **new metrics and KPIs** to redefine success in a digital-first world: understand the new values of the digital-first world, communicate these values, and measure what you value,

- ▶ Viewing **uncertainty as an opportunity** for growth and innovation: create a culture of trust and confidence, to tackle uncertainty with reasoned steps, entrepreneurial skills, and team efforts.

Micro-level: Strategies for the individual learner

Some strategies that individual learners can use in the digitization journey include:

- ▶ To remain curious: the single most important attitude for a future-proof career seems to be curiosity. Find what grabs your interest and invest time and effort in following this interest.
- ▶ Prioritise your Continuous Professional Development: invest in your career and your future, by taking time and effort at regular times. Talk about this with your employers too.
- ▶ Invest in your interpersonal skills: Expand your horizons regularly, by engaging with colleagues, partners and mentors. These can be stable in a world of technological change.
- ▶ Experiment with technology: View technology as your toolkit to support your activities. Invest time to get to know new additions to your toolkit.
- ▶ Make technology a talking point: Share your practice, talk about your uncertainty with others, acknowledge the changes technology brings.
- ▶ Find the balance that works for you: Not all activities need to become digital. Find the balance that works for you in your unique digitisation journey.



Expected Impact

The strategies proposed in this vision paper can significantly impact workforce readiness, organizational competitiveness, and societal progress:

1. **Workforce Readiness:** Employees will be better equipped for the demands of a rapidly digitalizing economy. Cedefop's recommendations on adaptable learning frameworks align with this goal, ensuring that employees are ready for both current and future technological shifts (2023). This dynamic approach reduces the risk of skill obsolescence and builds a more resilient workforce.
2. **Organizational Competitiveness:** Proactive investment in skill development will enhance innovation, efficiency, and agility, helping organizations stay competitive. The World Economic Forum identifies closing the skills gap as critical to thriving amid digital transformation. Companies that embrace continuous learning will foster cultures of innovation, enabling quicker adaptation to market changes and enhancing productivity.
3. **Sustainability and Inclusion:** By integrating digital transformation with sustainability efforts, businesses can grow responsibly while promoting equitable access to digital education. Research shows that organizations with strong diversity and inclusion practices are more likely to outperform financially. Making digital skills training accessible to all employees helps bridge the digital divide and fosters inclusive workplaces.
4. **Broader Societal Impact:** On a larger scale, equipping workers with the right digital skills will mitigate job displacement risks and support economic growth. A 2023 European Commission report highlights digital transformation as key to Europe's post-pandemic recovery, emphasizing digital skills as essential to economic resilience.

By implementing these strategies, businesses, educational institutions, and policymakers can drive a sustainable, inclusive, and resilient digital future.

Conclusion: Towards Sustainable Digital Transformation

As we move forward into an increasingly digital landscape, it is essential to approach digital transformation with a balanced focus on both technical and non-technical skills. The future of work will require a blend of digital competencies and transversal skills, such as adaptability, problem-solving, and continuous learning. Organizations must prioritize these skills across all sectors, ensuring that employees—whether in blue-collar or white-collar roles—are equipped to navigate the complexities of the digital age.

Collaboration between educational institutions and businesses is key to overcoming the skills gap and ensuring that workforce development remains relevant. Educational frameworks must be adaptable to evolving technologies, and businesses must invest in ongoing skill development. Furthermore, leadership should foster a culture of learning that emphasizes both individual growth and organizational resilience.

By committing to **flexible, forward-thinking strategies** that integrate both digital literacy and transversal skills, organizations can build a workforce that is prepared for today's challenges and adaptable to the future. With the right investments in education, collaboration, and leadership, the digital transformation can become a sustainable and inclusive journey for all. This vision paper highlights several crucial insights from our research and collaboration on digital skill education, workforce transformation, and the future of work. It has become increasingly clear that closing the digital skills gap is essential for the resilience and adaptability of the global workforce. As digital technologies evolve, the ability to navigate these changes hinges on both technical and transversal competencies. These skills, spanning from programming to critical thinking and adaptability, must be cultivated to ensure the readiness of non-ICT professionals in a digital-first world.



The findings presented underscore the urgent need for action. The growing digital divide threatens to leave large segments of the workforce unprepared for the future, with smaller enterprises and traditionally non-digital sectors particularly at risk. Our research has shown that upskilling is not enough; a holistic approach that also fosters continuous learning, adaptability, and emotional intelligence is vital. Digital transformation should not be seen as a purely technological endeavour but as a profound cultural shift within organizations.

Policymakers, educators, and employers must prioritize the development of digital skills across all sectors. This requires a concerted effort to redesign educational frameworks, support cross-sector collaboration, and create adaptable training programs that address the unique needs of various industries and roles. Investing in these initiatives now will empower workers to thrive in the rapidly changing digital economy, ensuring a future technically proficient workforce capable of leveraging digital advancements for sustainable growth. Prompt action is the shared responsibility of all stakeholders involved in shaping the future of work.

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Contributors

Table 1 Contributors

<p>Iren Bencze</p>	<p>Iren Bencze, AI Learning & Development Specialist, Researcher, and Writer</p> <p>Iren has a rich background in AI Learning & Development, with proficiency in adult education and the intersection of digital skills and workforce training in lean environments. In the development of this Vision Paper, Iren was involved in the initial drafting and review of key sections, including the Squad Collaboration Methodology and the literature review. Through multiple rounds of feedback, Iren contributed to shaping the paper's strategic recommendations for policymakers, educators, and employers.</p> <p>Throughout the six-month collaboration, Iren's experience in cross-sectoral AI learning initiatives helped ensure that the research was grounded in practical, real-world applications while promoting innovative, forward-looking solutions for digital upskilling.</p> <p>Although currently transitioning towards new professional opportunities, Iren remains passionate about empowering both individuals and organizations to adapt to digital transformation through responsible AI and continuous learning.</p>
<p>Martina Bekeová</p>	<p>Medical student at Pavol Jozef Safarik University (UPJS) junior researcher at Neurological Department of UPJS and a student member of EAN Movement Disorders Scientific Panel and EAN Coordinating Panel on Rare Neurological Diseases.</p>
<p>Anhelina Bykova</p>	<p>Anhelina Bykova is a Doctoral Fellow of the Foundation for Science and Technology at the University of Azores, Portugal; a Researcher at the Center of Applied Economic Studies of the Atlantic; a Member of the RightsTech Women Association in Geneva, Switzerland, and an Ambassador for EU Code Week in Portugal.</p>
<p>Rober Farell</p>	<p>Robert is on a mission to develop the next generation of digital leaders who can tackle digital transformation in an AI world. He runs an MSc in Digital Transformation, he is a board member of the Compliance Institute, he writes insightful articles and delivers thought provoking lectures & webinars on AI & digital transformation. Robert has trained audiences in North America, the middle east and Europe including Google, HubSpot, Citibank, GE, DocuSign, BT, Almarai and many more.</p>

Luis Fernández Sanz



Luis earned BSc+MSc in Informatics from Universidad Politécnica de Madrid in 1989 and PhD with extraordinary award from Univ. of Basque Country in 1997. He is a full professor at Universidad de Alcalá where he is serving from 2008 and has been leading 20 EU-funded innovation and research projects. He has also been CEO of an ICT service SME (2002-2006) and freelancer consultant. He is the only expert hired and appointed for the three main digital and IT skills reference model of the European Union: DigComp 2.2, EN16234 and the ESCO labour classification. From November 2022 Luis is the president of CEPIS where he has previously been Vicepresident and Member of the Board.

Manuel León Urrutia



Manuel León is a lecturer at the University of Southampton, in a top ranked Computer Science department. Manuel holds a PhD and an MSc in Web Science, an interdisciplinary field that explores the challenges of the web in our society. Certified as Data Ethics Facilitator by the Open Data Institute, he has special interest in data and Artificial Intelligence literacy. Manuel is the Head of Learning of Southampton Data Science Academy, a University of Southampton spinoff that provides Continuous Professional Development programmes in Artificial Intelligence and Data Science to private companies in the UK and worldwide. Manuel is also a faculty member of Winmark's Deep Tech Leadership Certificate, which provides training in Artificial Intelligence for Business to executive and non-executive directors. Manuel has also undertaken several leadership roles in EU funded projects of several programmes (Horizon Europe, Erasmus+, Creative Europe), and written successful bids for these funding schemes.

Kamakshi Rajagopal

Dr. Kamakshi Rajagopal is an interdisciplinary researcher and freelance consultant in educational design and technology, with extensive experience in networked learning and social learning formats, supported by innovative technologies. She holds a Master's degree in Linguistics (2003) and Artificial Intelligence (2004) from KU Leuven (BE). She completed her doctoral research at the Open Universiteit (NL) in 2013, investigating personal learning networks and their value for continuous professional development. Her current research is on studying the complexity of learning environments and more specifically on how teachers and learners can be supported in work effectively in this complexity. Dr. Rajagopal has developed multiple (nationally funded and European) collaborative research projects in primary, secondary and higher

education with partners from the academia, public sector, industry and civil society. Some examples of her projects include the role of teacher networks in educational innovation, thesis circles in higher education, multimodal measurement in collaborative hybrid learning spaces, and mainstreaming Virtual Mobility at higher educational institutions. Since 2023, she has been working on Learning and Development in IT & business consultancy.

Philipp Ramin

Dr. Philipp Ramin is CEO of i40 – the future skills company. i40 trains more than 800,000 learners in companies worldwide in more than 50 future skills in 20 languages and has received the eLearning Award 2022 2023 and the eLearning Award 2024. In addition to his role as CEO of i40.de, Philipp is a member of the supervisory board of the BarthHaas Group, deputy chairman of the supervisory board of Samhammer AG, academic director for the business degree in digitization at the Frankfurt School and an expert in the EU Squad on “Digital Skills in Non-ICT Professions” of the EU Digital Skills and Jobs Platform. He is also the host of the Digikompetenz Podcast and the editor of the “Handbook for Digital Competence Development” and the book “Digital Competence and Future Skills” published by Hanser Verlag.

Alessandro Tomasi

Alessandro Tomasi is an engineer, an educator and an entrepreneur. He is driven by essentialism in his interdisciplinary endeavours, spanning from manufacturing engineering to active learning in education. Alessandro advocates for collaboration rather than competition and he's a keen observer of organizational and interpersonal social dynamics.



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