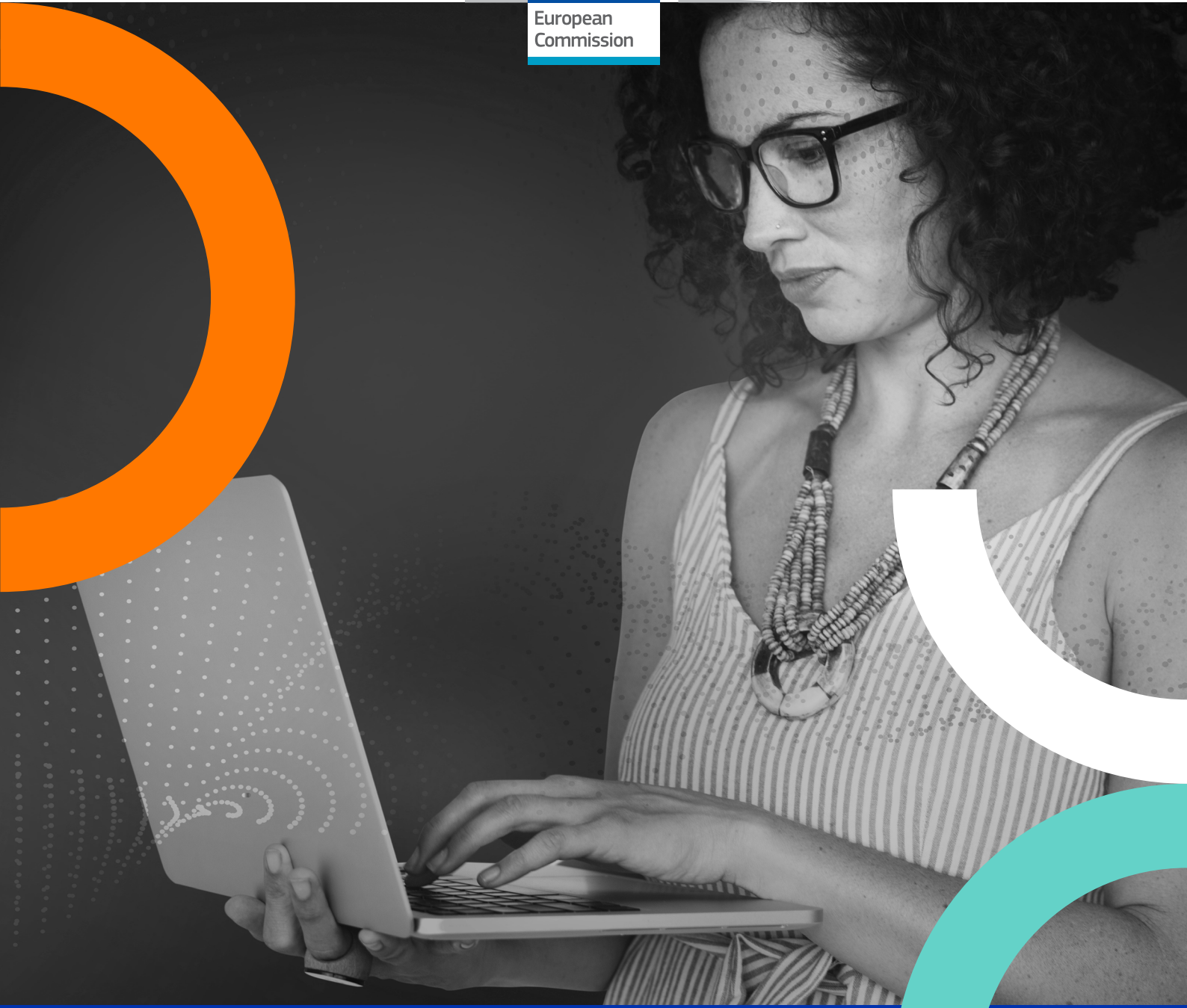


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Short informative paper

Digital Skills Explored

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Abstract

Digital skills are increasingly essential for individual empowerment, economic growth, and societal progress. This article explores the concept of digital skills and highlights the gap between skill demand and availability in the global and European labour markets. It highlights how this deficiency hinders economic development, limits individual opportunities, and restricts societal participation. Despite several EU initiatives aimed at closing this gap, the article stresses that the EU is still falling behind global competitors and its own digital skills targets. It includes the vital role of the private sector in advancing digital upskilling and introduces key frameworks that guide digital competency standards. The text stresses the importance of ethical considerations in technology use and advocates for inclusive policies that ensure universal access to digital education, underscoring the pressing need to create a just and resilient digital future.





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Introduction

In our increasingly tech-driven world, demand for digital skills is continuously growing. Technology shapes how we live, learn, work, and socialise. Digital competencies are fundamental in giving every individual equal opportunity to succeed in life and actively participate in society. The constantly evolving digital landscape relies on individuals using digital technology effectively and safely, with everything from personal finances to socialising necessitating some level of digital competencies. But not everyone has equal access to digital skills education to gain the required skills. This leaves individuals behind both personally and professionally. For example, only 46% of Europeans from rural areas possess basic digital skills in comparison to 61% of the population in urban areas¹. There is also a gap between needed and available digital skills in the labour market, with detrimental effects on economies. To harness the benefits of digitisation, increasing access to digital skills is essential.

We begin this article by defining digital skills and look at some of the most in-demand skills for the global and EU labour markets. We then address the growing digital skills gap and highlight its cost for us as individuals, as well as the societies we live in. Digital education and accessibility of technology can play a crucial role in closing the digital skills gap. We therefore introduce some of the recent EU and private sector initiatives aiming to digitally upskill the European population. We briefly touch upon frameworks that help provide a common language around digital skills. Digital technology does not exist in a vacuum but is informed by the decisions and biases of those who create and use it. In conclusion, the article stresses the crucial need to consider the ethics of the technology we integrate into our lives and the imperative for an ethical approach to applying digital skills.

¹ European Commission. (2022). DESI | Shaping Europe's digital future. Digital-Strategy.ec.europa.eu. Accessed 19 April 2024. <https://digital-strategy.ec.europa.eu/en/policies/desi>





Defining digital skills

There are several definitions of ‘digital skills’, which are sometimes used as a sub-set or synonym of digital competences. For this article, we are using the *Council’s Recommendations on the Key competences for lifelong learning* (2018), which describe digital competencies as

“The confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking².”

We commonly divide digital skills into basic, intermediate, and advanced. The distinction between these levels often depends on the context of where they are being used – for example, an advanced skill for a machine learning engineer in their job is different from what this author (not a machine learning engineer) might already consider advanced use of digital technology in her workplace. There is most consensus around the definition of basic digital skills, usually described as the functional use of digital technologies which allow people to actively participate in society and have become of the same importance as reading, writing or numeracy skills^{3 4 5 6}.

² Directorate-General for Education, Youth, Sport and Culture (European Commission). (2019). Key competences for lifelong learning, Publications Office. Accessed 23 November 2024. <https://data.europa.eu/doi/10.2766/569540>

³ Digital skills critical for jobs and social inclusion | UNESCO. (2018). Ww.unesco.org. Accessed 23 November 2023. <https://www.unesco.org/en/articles/digital-skills-critical-jobs-and-social-inclusion>

⁴ Serafino, P. (2019, March 4). Exploring the UK’s Digital Divide. Office for National Statistics. Accessed 23 November 2023. <https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04>

⁵ Piwec, K. (2022, August 18). What are digital skills? - A comprehensive guide. DevSkiller - Powerful Tool to Test Developers Skills. Accessed 23 November 2023. <https://devskiller.com/blog/what-are-digital-skills/>

⁶ Lloyds Banking Group and the Tech Partnership. (2018). Essential Digital Skills Framework. UK Department of Education. Accessed 23 November 2023. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/738922/Essential_digital_skills_framework.pdf





Digital skills in the workplace

Not all digital skills will have the same impact on your personal and work life. Without the basic skills, you will struggle to participate in almost all spheres of modern life, from connecting with your friends to personal banking. Intermediate and advanced skills, on the other hand, can increase your ability to participate in democratic societies and open new avenues for work opportunities. With exponentially fast advancement of technology, and the penetration of new technologies – such as big data, machine learning, and artificial intelligence (AI) – into the labour market, the demand for digital skills needed for the modern employee is continuously reaching new heights.

In-demand digital skills

In 2020, the OECD published a report using big data analytics to assess the current trends of in-demand skills within the global labour market⁷. Their findings listed cybersecurity, essential for protecting computers, digital devices, and networks from potential threats, and proficiency in programming, web development, app development, and software engineering. Expertise in customer relationship management systems has been found beneficial for customer service representatives, and digital image and video editing skills were in demand for effectively presenting big data. Cloud technology, e-commerce skills, and proficiency in data analytics tools were found crucial for organisations to stay competitive. And ICT skills for implementing and maintaining computer infrastructure were also highly sought after⁸.



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⁷ OECD (2022). Skills for the Digital Transition: Assessing Recent Trends Using Big Data. In OECD iLibrary. Organisation for Economic Co-operation and Development. Accessed 23 November 2023. <https://doi.org/10.1787/38c36777-en>

⁸ OECD (2022). Skills for the Digital Transition: Assessing Recent Trends Using Big Data. In OECD iLibrary. Organisation for Economic Co-operation and Development. Accessed 23 November 2023. <https://doi.org/10.1787/38c36777-en>



Even before the OECD report, a European Commission report highlighted that digital skills had become so essential in EU workplaces that they were considered transversal. Among the various levels of digital skills, it was basic digital skills that were in highest demand across different occupations, though the report also noted significant demand for advanced digital skills within Member States. Among the later were database management and other data-related analytical expertise, skills enabling work in machine learning and AI, the ability to use computer-aided engineering software, and proficiency in technical drawing software and automation technologies⁹.

Demand for these skills has only grown in recent years, reflecting the struggles of EU businesses to compete on a global scale: Europe is falling behind global leaders like the USA and China in areas such as digital technology adoption and the startup ecosystem, mainly due to limited digital skills, and a slower embrace of technologies like AI and data analytics within businesses⁹. The EU's presence in the ICT sector remains modest – only three European companies are in the top 50 globally by market value¹⁰. Although strides are made in quantum technologies and high-performance computing, Europe still requires substantial investments —around EUR 280 billion— in its digital infrastructure to compete on the global stage¹¹.

The digital skills gap burdens workplaces and the economy

To ensure a significant digital transformation by 2030, with a digitally skilled population and digitised businesses, the European Union launched the Digital Decade policy programme¹². Among its primary goals are at least 80% of Europeans with basic digital skills, 20 million ICT specialists employed, and 75% of businesses using cloud computing, big data, and AI by 2030.

However, according to the latest Digital Decade Report (2024)¹³, which provides an analysis of the EU's advancements towards its targets, only 55.6% of the EU's population has at least basic digital skills, and at the current pace, the number of ICT specialists will reach only 12 million by 2030. A substantial amount of work is still required to meet the 2030 targets.

Research led by Raul Katz and his team using econometric modelling to examine how digitisation, broadband, and ICT regulation affect global economies, showed that increased digitisation has a significant positive impact on economic growth¹⁴. It enhances productivity, reduces unemployment, and improves consumer

⁹ European Commission. (2024). 2030 DIGITAL DECADE REPORT ON THE STATE OF THE DIGITAL DECADE 2024 report EN. Publications Office of the European Union. Accessed 8 October 2024. <https://ec.europa.eu/newsroom/dae/redirection/document/106687>

¹⁰ European Commission. (2024). 2030 DIGITAL DECADE REPORT ON THE STATE OF THE DIGITAL DECADE 2024 report EN. Publications Office of the European Union. <https://ec.europa.eu/newsroom/dae/redirection/document/106687>

¹¹ European Commission. (2024). 2030 DIGITAL DECADE REPORT ON THE STATE OF THE DIGITAL DECADE 2024 report EN. Publications Office of the European Union. Accessed 8 October 2024. <https://ec.europa.eu/newsroom/dae/redirection/document/106687>

¹² European Commission (2021). Europe's Digital Decade | Shaping Europe's digital future. Accessed 3 October 2024. <https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade>

¹³ European Commission. (2024). 2030 DIGITAL DECADE REPORT ON THE STATE OF THE DIGITAL DECADE 2024 report EN. Publications Office of the European Union. Accessed 8 October 2024. <https://ec.europa.eu/newsroom/dae/redirection/document/106687>

¹⁴ Katz, R., & Callorda, F. (2020). How broadband, Digitization and ICT Regulation Impact the Global economy: Global Econometric Modelling. In The UN Agency for Digital Technologies (p. 52). Accessed 8 October 2024. <https://www.itu.int/hub/publication/d-pref-ef-bdr-2020/>





well-being. Specifically, a 10-point increase in their Digitisation Index is associated with a 3% rise in GDP. However, they emphasise that for digitisation to have this kind of impact, it must be widely adopted by businesses.

Businesses acutely feel the lack of digital skills. The 2024 Digital Decade Report highlights that the digital skills gap, especially among Small and Medium Sized Enterprises (SMEs), particularly in rural areas and smaller cities, presents a significant barrier for their ability to compete in the digital economy¹⁵. The most frequently reported impacts by businesses across the Member States were loss of productivity (46%), an expected decrease in the number of customers (43%), unspecified negative impacts (41%), and a decrease in the number of contracts (32%)¹⁶. To remain competitive, businesses need a workforce proficient in digital tools. However, the greatest barrier reported by most workplaces, especially smaller ones, was the cost of closing the digital skills gaps¹⁷. This underscores the need for the European Union to support SMEs in their digital upskilling efforts, particularly as the presence—and lack—of digital skills within businesses impacts the wider economy¹⁸.

The findings by Katz and his team, also suggest that the benefits of digitisation are more pronounced in digitally advanced economies, with more developed digital ecosystems contributing more to GDP growth¹⁹. Richer and more developed societies can of course also finance a faster development of the digital ecosystem. In line with this, UNESCO warns that limited access to technology, skills, and knowledge can further deepen economic and social divides²⁰. The unequal distribution of digital infrastructure, broadband access, and digital education opportunities remains a significant concern for ensuring inclusive growth in the digital era. The EU should put special attention to the digitally underserved regions.

¹⁵ European Commission. (2024). 2030 DIGITAL DECADE REPORT ON THE STATE OF THE DIGITAL DECADE 2024 report EN. Publications Office of the European Union. Accessed 8 October 2024. <https://ec.europa.eu/newsroom/dae/redirection/document/106687>

¹⁶ European Commission, Directorate General for the Information Society and Media, ECORYS, and Danish Technological Institute. (2017). ICT for Work: Digital Skills in the Workplace: Final Report. Publications Office of the EU. Accessed 23 November 2023. <https://data.europa.eu/doi/10.2759/498467>.

¹⁷ European Commission, Directorate General for the Information Society and Media, ECORYS, and Danish Technological Institute. (2017). ICT for Work: Digital Skills in the Workplace: Final Report. Publications Office of the EU. Accessed 23 November 2023. <https://data.europa.eu/doi/10.2759/498467>.

¹⁸ Katz, R., & Callorda, F. (2020). How broadband, Digitization and ICT Regulation Impact the Global economy: Global Econometric Modelling. In The UN Agency for Digital Technologies (p. 52). Accessed 8 October 2024. <https://www.itu.int/hub/publication/d-pref-ef-bdr-2020/>

¹⁹ Katz, R., & Callorda, F. (2020). How broadband, Digitization and ICT Regulation Impact the Global economy: Global Econometric Modelling. In The UN Agency for Digital Technologies (p. 52). Accessed 8 October 2024. <https://www.itu.int/hub/publication/d-pref-ef-bdr-2020/>

²⁰ UNESCO Office Bangkok and Regional Bureau for Education in Asia and the Pacific. (2022). Digital transformation in education in Asia Pacific: policy brief. Asia-Pacific Regional Education Minister's Conference, 2nd, Bangkok. Accessed 8 October 2024. <https://unesdoc.unesco.org/ark:/48223/pf0000381972>





Impact of the Digital Transformation on work tasks

While digitisation undeniably drives economic growth, it also influences individual workers. How they are impacted depends on their skill levels. The difference in how low- versus high-skilled workers are affected by digitisation can be explained by the tasks they perform. Low-skilled workers, who often have the weakest economic standing, are most likely to work in occupations most at risk of automation²¹. From 2012 to 2019 alone, the rise in the proportion of low-skilled workers within occupations most vulnerable to automation was about 6 %²². Tasks rendered obsolete by digital technologies often differ from those created by new technologies or new-technology adoption²³. We can distinguish between

1. tasks which have been traditionally routinely performed by humans and can be executed equally well or more efficiently by machines,
2. tasks that are irreplaceable by machines, and
3. new complementary tasks generated by adopting digital technology²⁴.

For instance, robots typically directly compete with manual labour requiring low to medium skill levels, which explains why low-skilled workers are in occupations most at risk of automation. But tech-driven job transformations are not limited to low-skilled workers alone. AI-powered automation is also increasingly able to handle high-level cognitive functions like problem-solving and decision-making, which were traditionally considered crucial in high-skilled sectors such as healthcare and business. Examples of changes in job tasks can therefore be found from low- to high-skilled employment. For example, food deliverers increasingly rely on the use of mobile food-delivery applications²⁵, workers in manufacturing use computer-aided design software to facilitate product design, and doctors can increasingly use AI to support triage and diagnosis of patients²⁶.

Even when occupations are not rendered obsolete, how they are performed is changing. Ensuring access to training, upskilling, and continuous learning will continue to be essential to navigate the digital transition and benefit all workers — particularly those who must retrain to keep their jobs, or transition away from declining fields²⁷.

²¹ Balsmeier, B., & Woerter, M. (2019). Is This Time Different? How Digitalization Influences Job Creation and Destruction. *Research Policy*, 48(8). ScienceDirect. Accessed 10 March 2024. <https://doi.org/10.1016/j.respol.2019.03.010>

²² UNESCO Office Bangkok and Regional Bureau for Education in Asia and the Pacific. (2022). Digital transformation in education in Asia Pacific: policy brief. Asia-Pacific Regional Education Minister's Conference, 2nd, Bangkok. Accessed 8 October 2024. <https://unesdoc.unesco.org/ark:/48223/pf0000381972>

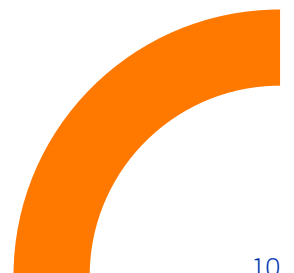
²³ Balsmeier, B., & Woerter, M. (2019). Is This Time Different? How Digitalization Influences Job Creation and Destruction. *Research Policy*, 48(8). ScienceDirect. Accessed 10 March 2024. <https://doi.org/10.1016/j.respol.2019.03.010>

²⁴ Balsmeier, B., & Woerter, M. (2019). Is This Time Different? How Digitalization Influences Job Creation and Destruction. *Research Policy*, 48(8). ScienceDirect. Accessed 10 March 2024. <https://doi.org/10.1016/j.respol.2019.03.010>

²⁵ Asian Development Bank x LinkedIn. (2022). 'Digital Jobs and Digital Skills: A Shifting Landscape in Asia and the Pacific'. Manila, Philippines: Asian Development Bank. Accessed 23 November 2023. <https://doi.org/10.22617/SPR220348>

²⁶ Sætra, H. S., & Fosch-Villaronga, E. (2021). Healthcare Digitalisation and the Changing Nature of Work and Society. *Healthcare*, 9(8), 1007. MDPI. Accessed 10 March 2024. <https://doi.org/10.3390/healthcare9081007>

²⁷ UNESCO Office Bangkok and Regional Bureau for Education in Asia and the Pacific. (2022). Digital transformation in education in Asia Pacific: policy brief. Asia-Pacific Regional Education Minister's Conference, 2nd, Bangkok. Accessed 8 October 2024. <https://unesdoc.unesco.org/ark:/48223/pf0000381972>





Upskilling for the future

In 2021, a report by the World Economic Forum anticipated a potential disappearance of up to 85 million (then existing) jobs by 2025, while projecting the emergence of 97 million new jobs. All the new jobs would demand advanced technical skills, owing to what they referred to as “the new division of labour between humans, machines, and algorithms²⁸”. But technological advancement is not spreading into all sectors evenly. For example, the OECD reports that there are about 3 million people employed as commercial drivers across 15 EU Member States. If driverless vehicles would eliminate the need for drivers, that would create a large labour market shock within the EU²⁹. But it is difficult to predict accurately how new technologies will affect specific jobs and which sectors will be affected most. In short, we know things are changing, but we don’t always know in which way.

The uncertainty suggests that focusing solely on the currently most in-demand digital skills won’t be sufficient to equip the population for the significant disruptions caused by digitisation. The European Union’s policies and initiatives should address the need for skills that will enable EU citizens to adapt swiftly to an unpredictable future. To build a resilient Europe, there must be a stronger emphasis on transversal skills that are applicable across various occupations, as well as non-digital skills that can facilitate the adoption of new technologies, such as problem-solving and other cognitive abilities. The OECD report notes that specialist digital occupations already require competencies ranging from advanced digital skills to high-level cognitive capabilities³⁰. High-level cognitive skills do not render workers irreplaceable by future technology, but they can support them in adapting to a new reality by learning how to use digital technology faster or solve problems not yet solvable by technology.

With the future upskilling needs in mind, we should not ignore the unequal access of digital education, which might advance the already existing inequalities in access to the labour market. There is a need to support the most technology-excluded part of the population in accessing technology and developing the needed digital skills to avoid their exclusion from the more and more digitalised society.

²⁸ World Economic Forum, and PricewaterhouseCoopers (Pwc). (2021) Upskilling for Shared Prosperity - Insight Report. World Economic Forum. Accessed 23 November 2023. https://www.pwc.com/gx/en/issues/upskilling/shared-prosperity/upskilling_for_shared_prosperity_final.pdf

²⁹ OECD. (2022). Skills for the digital transition: Assessing recent trends using big data. Organisation for Economic Co-operation and Development. Accessed 23 November 2023. https://www.oecd-ilibrary.org/employment/skills-for-the-digital-transition_38c36777-en

³⁰ OECD. (2022). Skills for the digital transition: Assessing recent trends using big data. Organisation for Economic Co-operation and Development. Accessed 23 November 2023. https://www.oecd-ilibrary.org/employment/skills-for-the-digital-transition_38c36777-en





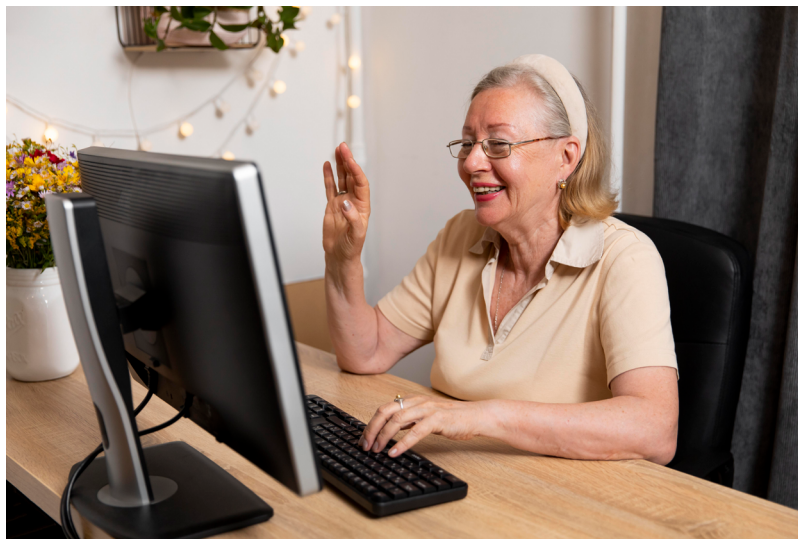
The individual aspect

The need for digital upskilling is not exclusive to the labour market. As digital skills became core to many everyday activities – from communicating to taking care of personal matters – those without skills are left behind.

Given the growing demand for digital skills in today's workplaces, it is no surprise that these skills enhance an individual's chances of landing a better job, advancing in their career, and boosting productivity. Advanced skills, such as programming and AI development, are particularly linked to better job prospects and higher wages³¹. But even just basic digital skills are required in about 85% of jobs in the European Union³².

Without basic digital skills, tasks such as managing finances, accessing online healthcare services, and participating in digital learning also become challenging. For instance, during the pandemic there was a four-fold increase in individuals seeking online courses highlighting the growing reliance on digital skills in education³³. But participating in online learning is only possible for those who (1) know how to access digital tools, and (2) have sufficient digital infrastructure (e.g., basics, like having a laptop, and Wi-Fi).

Purchasing goods online, which is especially beneficial for people with limited mobility, is on average 13% cheaper than buying in physical stores³⁴ and can also save time. Saving time has also been highlighted as a benefit of applying basic digital skills when using government services or online banking³⁵.



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³¹ Feijao, C., Flanagan, I., Christian, V. S., & Gunashekar, S. (2021). The global digital skills gap: Current trends and future directions. RAND. Accessed 8 October 2024. https://www.rand.org/pubs/research_reports/RR1533-1.html

³² Feijao, C., Flanagan, I., Christian, V. S., & Gunashekar, S. (2021). The global digital skills gap: Current trends and future directions. RAND. Accessed 8 October 2024. https://www.rand.org/pubs/research_reports/RR1533-1.html

³³ Feijao, C., Flanagan, I., Christian, V. S., & Gunashekar, S. (2021). The global digital skills gap: Current trends and future directions. RAND. Accessed 8 October 2024. https://www.rand.org/pubs/research_reports/RR1533-1.html

³⁴ Serafino, P. (2019). Exploring the UK's Digital Divide. Office for National Statistics. Accessed 23 November 2023. <https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04>.

³⁵ Serafino, P. (2019). Exploring the UK's Digital Divide. Office for National Statistics. Accessed 23 November 2023. <https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04>.





Digital skills are also crucial for participating in today's socially connected world. People without these skills may struggle to engage in social media, instant messaging, or video calls, which are increasingly essential for maintaining personal and professional relationships³⁶. This can lead to social isolation. In terms of participation in social life, basic digital skills proficiency increases communication with friends and family by up to 14%³⁷. The advantages of communication were also evident in the findings of the 2023 Lloyds Bank study³⁸ in which 40% of respondents who use the internet reported that being online reduced their feelings of loneliness. This benefit is even more pronounced among online users with disabilities, who are 27% more likely to report being lonely compared to those without disabilities³⁹.

The increasing digitalisation of healthcare, including telemedicine and digital health platforms, also means that people without digital skills may face barriers to receiving medical care. The use of telehealth has grown, especially during the COVID-19 pandemic⁴⁰. Many healthcare providers now offer consultations via video calls, online platforms, or mobile apps. Individuals lacking digital literacy may struggle to book appointments, attend virtual consultations, or access online medical records. This might be even more pronounced in rural or underserved areas where telemedicine is becoming a vital tool⁴¹.

In terms of personal security, the digital transformation of society has also brought along more opportunities for cyber threats, with the number and sophistication of cyberattacks steadily increasing⁴². Citizens need digital skills to protect themselves from unethical digital practices. Such skills include recognising phishing emails and webpages trying to steal sensitive information, understanding the importance of software updates, optimal password management, and social engineering awareness.

³⁶ Feijao, C., Flanagan, I., Christian, V. S., & Gunashekar, S. (2021). The global digital skills gap: Current trends and future directions. RAND. Accessed 8 October 2024. https://www.rand.org/pubs/research_reports/RR1533-1.html

³⁷ Serafino, P. (2019). Exploring the UK's Digital Divide. Office for National Statistics. Accessed 23 November 2023. <https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04>.

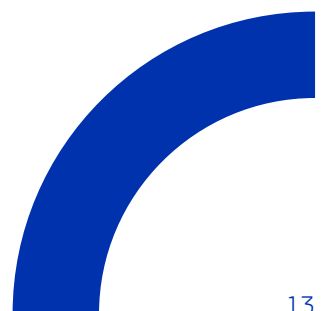
³⁸ Lloyds Bank. (2023). 2023 Consumer Digital Index. Accessed 23 November 2023. https://www.lloydsbank.com/assets/media/pdfs/banking_with_us/whats-happening/231122-lloyds-consumer-digital-index-2023-report.pdf.

³⁹ Serafino, P. (2019). Exploring the UK's Digital Divide. Office for National Statistics. Accessed 23 November 2023. <https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04>.

⁴⁰ Feijao, C., Flanagan, I., Christian, V. S., & Gunashekar, S. (2021). The global digital skills gap: Current trends and future directions. RAND. Accessed 8 October 2024. https://www.rand.org/pubs/research_reports/RR1533-1.html

⁴¹ Feijao, C., Flanagan, I., Christian, V. S., & Gunashekar, S. (2021). The global digital skills gap: Current trends and future directions. RAND. Accessed 8 October 2024. https://www.rand.org/pubs/research_reports/RR1533-1.html

⁴² Cybersecurity Strategy | Shaping Europe's digital future. (2020). European Commission. Accessed 23 November 2023. <https://digital-strategy.ec.europa.eu/en/policies/cybersecurity-strategy>.





Recent EU Initiatives

To tackle the digital skills gap, support the digital transformation, boost the economy, and help EU citizens using digital skills in both professional and personal settings, the EU has introduced several initiatives.

*The European Declaration on Digital Rights and Principles*⁴³ serves as a vital framework to guide the upskilling and digital inclusion needed for citizens to thrive in the digital age. The Declaration, rooted in the EU Charter of Fundamental Rights and aligned with EU legislation and policies, underscores a commitment to a human-centric digital transformation. By prioritising people and their rights, the EU aims to support solidarity and inclusion, ensure freedom of choice online, foster participation in the digital public space, enhance safety and security, and promote a sustainable digital future. Through the Declaration, the EU and its Member States pledge to actively promote digital literacy and protect individuals from cyber threats, so that all citizens can fully participate in and benefit from the digital transition.

The *EU Skills Agenda*⁴⁴, is a comprehensive five-year plan (until 2025) aimed at enhancing individuals' and businesses' skills across the EU. Its objectives include increased participation in learning, particularly among low-qualified adults, and ensuring basic digital skills for most of the population. Aligned with the *European Green Deal*⁴⁵, it focuses on sustainable growth and innovation, and – learning from the COVID-19 pandemic – it emphasises adaptability and crisis response. Its key components include

- a Pact for Skills (a collective action to address skills challenges)
- Skills Intelligence (enhancing understanding of skills needs)
- Support for Upskilling (EU backing for national upskilling initiatives)
- Vocational Education and Training Recommendations
- Promoting STEM Graduates
- Lifelong Learning Initiatives (including tools such as individual learning accounts and micro-credentials)
- an Investment Framework (improving conditions for public and private investment in skills).

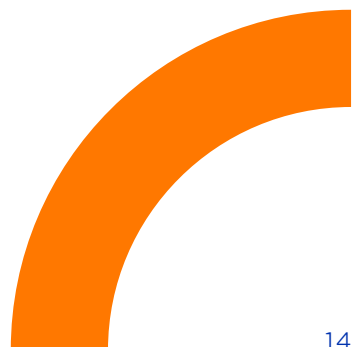
The Member States have adopted the EU Council's *Recommendation on improving the provision of digital skills and competences in education and training*⁴⁶, highlighting the necessity of digital proficiency for social inclusion, well-being, employability, and active citizenship. Emphasising the need for ambitious action to

⁴³ European declaration on digital rights and principles | shaping Europe's digital future. (2022). European Commission. Accessed 19 April 2024. <https://digital-strategy.ec.europa.eu/en/library/european-declaration-digital-rights-and-principles>

⁴⁴ New Skills for Europe - Employment, Social Affairs & Inclusion - European Commission. (2020). European Commission. Accessed 19 April 2024. <https://ec.europa.eu/social/main.jsp?catId=1223&langId=en>

⁴⁵ European Commission. (2019). The European Green Deal: Striving to be the first climate-neutral continent. Commission.europa.eu; European Commission. Accessed 8 October 2024. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

⁴⁶ Council of the European Union. (2023). Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training [Recommendation]. Accessed 8 October 2024. <http://data.europa.eu/eli/C/2024/1030/oj/eng>





support the green and digital transitions, it advocates for quality, inclusive education and training systems. The Recommendation also addresses the digital divide and gender-gaps in digital adoption. It stresses the role of education in promoting a responsible and ethical use of technology and the need for ongoing efforts to improve digital literacy across all levels of education and training.

Responding to the impact of digital transformation on society, and the disparities in access to digital technologies and digital skills, the *Digital Education Action Plan (2021-2027)*⁴⁷ was adopted in 2020. This EU strategy sets out a common vision of high-quality, inclusive and accessible digital education in Europe, aiming to bring education and training systems into the digital age. It includes two main priorities: (1) creating and supporting a high-performing digital education ecosystem, and (2) fostering digital skills and competences. To support both priorities, the EU also established the *European Digital Education Hub (EDEH)*, a platform used to facilitate the cooperation and exchange within digital education at the EU level.

Supporting innovation under the Digital Education Action Plan and contributing to the EDEH's goals, the [DigiEduHack](#)⁴⁸ is an EU initiative designed to encourage collaboration between grassroots projects, and support innovation and creativity in digital education. It offers a platform for students, educators, entrepreneurs, and digital education enthusiasts to explore the latest trends and technologies through local events, such as 24-hour hackathons, where participants collaborate to solve digital education challenges. The initiative has attracted nearly 10,000 participants since its inception in 2019.

Additionally, the European Commission has introduced the *Digital Skills and Jobs Coalition (DSJC)*⁴⁹, a collaborative initiative addressing the digital skills gap across Europe. The Coalition aims to achieve several goals, including training one million young unemployed individuals for available digital jobs, supporting workforce upskilling and retraining, particularly for SMEs, modernising education and training to integrate digital tools and skills, and utilising available funding to support digital skills initiatives and raise awareness about their importance for employability, competitiveness, and societal participation. To encourage the replication and scalability of successful initiatives across the EU, the European Commission annually awards the European Digital Skills Awards to the best initiatives. Organisations participating in the DSJC can share their initiatives on the *Digital Skills and Jobs Platform*⁵⁰, which offers access to high quality resources related to digital skills and jobs. National Coalitions, established in 25 EU Member States, further contribute to the platform, by sharing insights into national digital skills policies, best practices, training opportunities, events, and resources. By connecting with these coalitions, users can gain insights into the digital skills landscape

⁴⁷ European Commission. (2021a). Digital Education Action Plan (2021-2027) | European Education Area. Education. ec.europa.eu. Accessed 15 March 2024. <https://education.ec.europa.eu/focus-topics/digital-education/action-plan>

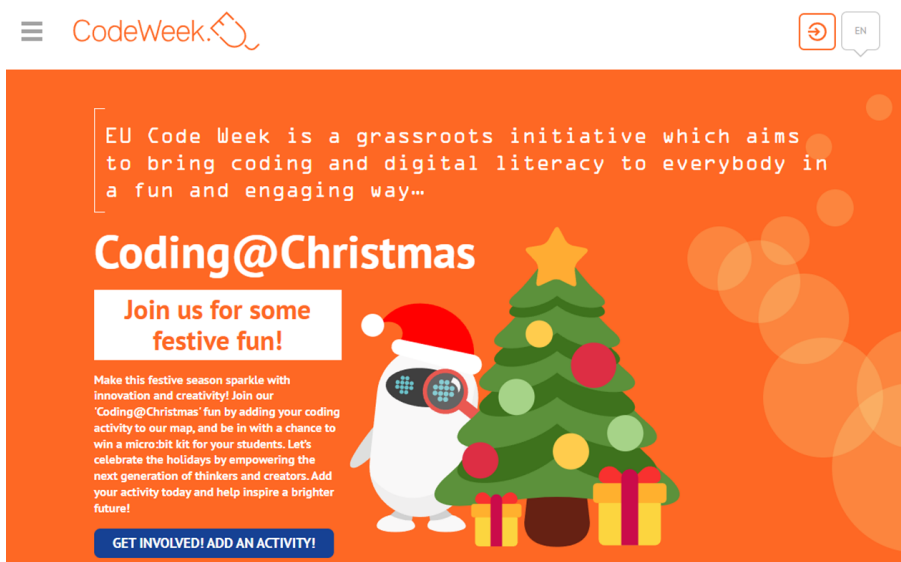
⁴⁸ Homepage—DigiEduHack 2024. (2024). Digieduhack.com. Accessed 8 October 2024. <https://digieduhack.com/>

⁴⁹ Digital Skills and Jobs Coalition | Digital Skills and Jobs Platform. (n.d.). Digital Skills & Jobs Platform; Directorate-General for Communications Networks, Content and Technology, European Union. Accessed 19 April 2024. <https://digital-skills-jobs.europa.eu/en/about/digital-skills-and-jobs-coalition>

⁵⁰ Good Practices (n.d.). Digital Skills & Jobs Platform; Directorate-General for Communications Networks, Content and Technology, European Union. Accessed 27 November 2023. <https://digital-skills-jobs.europa.eu/en/inspiration/good-practices>



within their respective countries. A helpful feature of the platform is the Test your digital skills tool⁵¹, which allow individuals to assess their digital skills, understand their training needs, and find appropriate digital skill training opportunities for their skill level.



Screenshot of CodeWeek website. <https://codeweek.eu/>;
© European Commission 2024

Many EU programmes fund the development of digital skills across the EU to make digital education as widely accessible as possible. The European Commission oversees the strategic direction and policies for the Erasmus+ Programme, including its focus on digital education. A significant portion of Erasmus+ funding is allocated to initiatives that aim to address the growing need for digital competencies. National Agencies in each country are responsible for promoting digital education initiatives, evaluating applications, and distributing funds. [EdDiCo](#)⁵², a project funded by the Erasmus+ Programme, which ran between 2019-2022, empowered educators to leverage technology to improve their teaching. [StrategyHack](#)⁵³, another Erasmus+ project, focused on accelerating digital education within Higher Education institutions by offering capacity-building courses and a model management system to foster high-quality digital learning environments aligned with the EU Digital Education Action Plan's priorities. The *Digital Europe Programme (DIGITAL)*⁵⁴ strategically funds initiatives to address the challenges of digital transformation and cultivate a skilled talent pool of digital experts. Through the DIGITAL programme, new learning and training opportunities are made available in critical technological domains such as AI, data, cybersecurity, quantum, and high-performance computing. For example, the EU Code Week⁵⁵, launched in 2013 by the Young Advisors for the Digital Agenda Europe and supported through the DIGITAL programme, is a grassroots movement that fosters coding and digital literacy

⁵¹ Test your digital skills. (n.d.). Digital Skills and Jobs Platform; Directorate-General for Communications Networks, Content and Technology, European Union. Accessed 19 April 2024. <https://digital-skills-jobs.europa.eu/en/digital-skills-assessment>

⁵² EdDiCo. (n.d.) Eddico.eu. Accessed 19 April 2024. <https://eddicco.eu/>

⁵³ Home. (n.d.). StrategyHack. Retrieved 27 January 2025, from <https://strategyhack.eu/home/>

⁵⁴ Home. (n.d.). StrategyHack. Retrieved 27 January 2025, from <https://strategyhack.eu/home/>

⁵⁵ The digital europe programme | shaping europe's digital future. (2025, January 16). <https://digital-strategy.ec.europa.eu/en/activities/digital-programme>



through coding-related events during a selected week each year⁵⁶. Launched in 2013 by the *Young Advisors for the Digital Agenda Europe* and supported through the DIGITAL programme, is a grassroots movement that fosters coding and digital literacy through coding-related events during a selected week each year.

Looking at the initiatives and programmes, there is ample evidence that the European Union is addressing the digital skills gap to empower its citizens in both personal and professional contexts. The Digital Education Action Plan, the Digital Skills and Jobs Coalition, and the EU Skills Agenda provide robust frameworks for upskilling and digital inclusion. Comparing these initiatives to findings from the Digital Decade report⁵⁷, it is also evident that the EU's efforts align with identified skills needs, particularly in areas such as cybersecurity, programming, and data analytics.

However, the Digital Decade report also highlights a pressing need for the EU to accelerate the progress. Some of the initiatives mentioned above are relatively recent and their effects may not be realised for several years. The ongoing commitment to these initiatives will be crucial in the coming years, if we want to ensure that EU citizens are ready to meet the demands of an increasingly digital economy. While substantial progress has been made, the EU still faces significant challenges in achieving its 2030 targets, especially in areas like basic digital skills and the number of ICT specialists⁵⁸. The Digital Decade report also highlighted the slow pace of digital transformation across businesses and SMEs. For successful upskilling of the EU population, public- and private sector collaboration will be essential⁵⁹.

⁵⁶ Eu code week. (n.d.). Retrieved 27 January 2025, from <https://codeweek.eu/>

⁵⁷ European Commission. (2024). 2030 DIGITAL DECADE REPORT ON THE STATE OF THE DIGITAL DECADE 2024 report EN. Publications Office of the European Union. Accessed 8 October 2024. <https://ec.europa.eu/newsroom/dae/redirection/document/106687>

⁵⁸ European Commission. (2024). 2030 DIGITAL DECADE REPORT ON THE STATE OF THE DIGITAL DECADE 2024 report EN. Publications Office of the European Union. Accessed 8 October 2024. <https://ec.europa.eu/newsroom/dae/redirection/document/106687>

⁵⁹ European Commission. (2024). 2030 DIGITAL DECADE REPORT ON THE STATE OF THE DIGITAL DECADE 2024 report EN. Publications Office of the European Union. Accessed 8 October 2024. <https://ec.europa.eu/newsroom/dae/redirection/document/106687>





The role of the private sector

Private sector initiatives within Europe have stepped up to support the digital upskilling of EU citizens through different programmes. These programmes offer a range of training opportunities, from basic digital literacy to advanced technical skills, aimed at enhancing employability and bridging the skills gap across the region. Examples include SAP’s “Digital Skills for Today”⁶⁰, which provides free learning and certification, and Vodafone’s “Code First Girls”⁶¹, which focuses on increasing diversity in tech by empowering women through coding education.

The private sector’s digital upskilling initiatives are well-tuned to the current in-demand digital skills. Programs like Capgemini’s Digital Academy⁶² and SAP’s training initiatives focus on key areas such as programming, software engineering, data analytics, and cloud technology—skills that are essential for businesses looking to strengthen their digital capabilities. By prioritising these skills, they directly address the growing need for expertise in digital competencies that are vital in today’s job market. This alignment helps businesses to build a workforce capable of navigating the digital economy. These initiatives often share common features, such as a focus on hands-on learning and the flexibility of hybrid learning models, making it easier for individuals to access relevant training regardless of their location.

Moreover, the companies often collaborate with universities and NGOs across the EU to enhance the impact and reach of their initiatives. This collaboration typically involves co-developing curricula, providing mentorship and resources for students, and facilitating internships or job placements to ensure a smooth transition from education to employment. For instance, SAP partners with academic institutions to integrate its training programs into their courses, while Vodafone collaborates with NGOs to broaden access to its coding programs for women from diverse backgrounds.

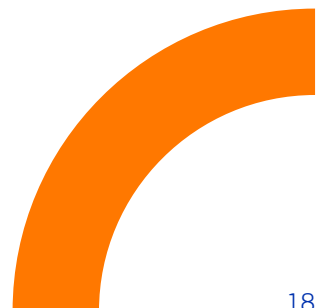
Social economy organisations also provide digital upskilling and reskilling opportunities for vulnerable people. In particular, Work Integration Social Enterprises (WISEs) have a strong pedagogical dimension targeting their employees, which include long-term unemployed, persons with disabilities, older persons, migrants, and other groups who are at risk of being excluded from the labour market. A project bringing together WISEs around Europe was the ‘*WISE for Digital Upskilling*’, co-funded by the Erasmus+ Programme from 2020 to 2022, which aimed to enhance the digital competencies of vulnerable individuals to improve their employment prospects. The initiative developed free training courses for job coaches and WISEs, covering numeracy, literacy, digital skills, and job coaching⁶³.

⁶⁰ Digital skills and free certifications | SAP learning. (n.d.). Retrieved 9 October 2024, from <https://learning.sap.com/digital-skills>

⁶¹ About us | code first girls—Empowering women in tech. (n.d.). Code First Girls. Retrieved 9 October 2024, from <https://codefirstgirls.com/about-us/>

⁶² Digital | Capgemini academy. (n.d.). Retrieved 9 October 2024, from <https://academy.capgemini.nl/en/digital-transformation/digital>

⁶³ Wises for digital upskilling. (n.d.). Retrieved 27 January 2025, from <https://www.ensie.org/projects/wise-for-digital-upskilling>





Another model that shows success in digital upskilling are Social Enterprises, which create job perspectives specifically within the IT sector for vulnerable groups. For example, [Simplon.co](https://www.simplon.co/)⁶⁴ is a French social enterprise providing free and intensive training bootcamps for jobseekers and other vulnerable populations to help them find a job in the tech sector. A similar social impact-driven enterprise is BeCode , active in Belgium. It provides competitive and responsible coding school and training programmes on digital technologies, accessible to all and free of charge. Simplon and [BeCode](https://becode.org/)⁶⁵ have developed strategic partnerships with IT and Telecom companies such as Meta, Orange, Microsoft and SAP, as well as several foundations and public services.



⁶⁴ Simplon—Formez-vous à la Tech simplement. (n.d.). Retrieved 27 January 2025, from <https://www.simplon.co/>

⁶⁵ BeCode – Learn to code, find a job. (n.d.). Retrieved 27 January 2025, from <https://becode.org/>



A brief introduction to digital skills frameworks

To achieve successful collaboration in digitally upskilling the population across public and private institutions in all EU Member States, a common language around digital skills needs to be spoken. Digital skills frameworks can facilitate this by establishing standardised definitions and benchmarks enabling stakeholders to communicate effectively and coordinate their efforts.

The *European Digital Competence Framework for Citizens (DigComp 2.0)*⁶⁶ offers a common language for describing digital skills across the EU Member States. The DigComp 2.0 has been created by the Joint Research Centre on behalf of the European Commission and covers digital skills from foundational to a highly specialised level, providing detailed examples of knowledge, skills and attitudes. It includes use cases related to 21 digital competencies divided into five areas:

- Information and data literacy,
- Communication and collaboration,
- Digital content creation,
- Safety, and
- Problem solving⁶⁷.

The use cases illustrate how a competency could be used at the workplace or within a learning process. *Implementation Guides* which support the use of DigComp by employers, employees and jobseekers accompany the framework⁶⁸. Additionally, two *Communities of Practice*⁶⁹ are available to support the implementation of DigComp across the EU.

Digital skills and competency frameworks such as DigComp 2.0 are useful for several reasons:

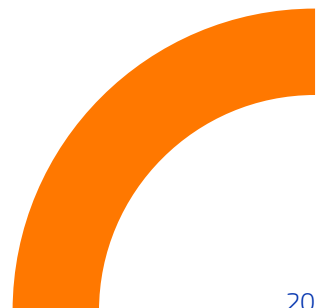
- They provide structured guidance for describing digital skills and competencies;
- They help in evaluating skills gaps, allowing for targeted educational and training interventions to bridge the gaps;
- They help policymakers with valuable insights for formulating effective policies to address digital skill needs in different contexts;
- Employers can use the frameworks to better name and describe the skills and upskilling needs within their place of work;
- Employees, jobseekers, and learners can use the frameworks to identify and name their own abilities and explore their skill gaps.

⁶⁶ Ferrari, A. (2013). DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe. LU: Publications Office of the European Union. Accessed 23 November 2023. <https://data.europa.eu/doi/10.2788/52966>.

⁶⁷ Joint Research Centre (European Commission), Vuorikari, R., Kluzer, S., & Punie, Y. (2022). DigComp 2.2, The Digital Competence framework for citizens: with new examples of knowledge, skills and attitudes. In Publications Office of the European Union. Publications Office of the European Union. Accessed 23 November 2023. <https://data.europa.eu/doi/10.2760/115376>.

⁶⁸ DigComp Implementation Guides. (n.d.) European Commission. Accessed 15 March 2024. https://joint-research-centre.ec.europa.eu/digcomp/digcomp-implementation-guides_en.

⁶⁹ Sanz, V. (2019, October 21). Join DigComp Community of Practice (CoP) • ALL DIGITAL. ALL DIGITAL. Accessed 10 March 2024. <https://all-digital.org/invitation-to-digcomp-cop/>





Next to DigComp 2.0, several frameworks and taxonomies have been developed globally, such as

- the *Global Skills and Competency Framework for a Digital World (SFIA 8)*⁷⁰, a comprehensive framework (initially rooted in the ICT community) covering various professions like Business Transformation, Data Science, and Cybersecurity,
- UNESCO's *ICT Competency Framework for Teachers*⁷¹ created to guide teacher training in integrating ICT into education, and
- the UK Departments of Education's *Essential Digital Skills Framework*⁷² describing foundational skills applied to everyday life and work contexts, to help digital literacy beginners navigate the digital world effectively.

Although not limited to digital skills, ESCO⁷³ (European Skills, Competences, Qualifications, and Occupations), the EU's multilingual classification system for skills, competencies, and occupations, serves as an essential framework for establishing a shared understanding of skills within the EU labour market. ESCO offers detailed descriptions for 3,008 occupations and 13,890 skills associated with those occupations. All the skills and occupations are translated into 28 languages, including all official EU languages, as well as Icelandic, Norwegian, Ukrainian, and Arabic.

The diversity of frameworks across different contexts helps us understand digital skillsets relevant to various sectors, across different proficiency levels, and geographical regions. The frameworks mentioned here offer an introduction to the digital skills framework landscape, but there are many others available. For further exploration, UNESCO offers a useful database on digital skills frameworks, available [here](#).

⁷⁰ SFIA: The global skills and competency framework for a digital world. (n.d.). Sfia-Online.org; The SFIA Foundation. Accessed 23 November 2023. <https://sfia-online.org/en>.

⁷¹ UNESCO ICT Competency Framework for Teachers. (n.d.) OER Commons; UNESCO. Accessed 15 March 2024. <https://oercommons.org/hubs/UNESCO>.

⁷² Essential digital skills framework. (n.d.). GOV.UK. Retrieved 31 July 2024, from <https://www.gov.uk/government/publications/essential-digital-skills-framework/essential-digital-skills-framework>

⁷³ What Is ESCO?. (2024). European Commission. Accessed 19 April 2024. <https://esco.ec.europa.eu/en/about-esco/what-esco>.





A note on ethical considerations

As we explore the significant strides made in digital skills education and the crucial role of these skills in enhancing individual opportunities and economic growth, we need to acknowledge that digital technologies do not operate in isolation. The development and use of digital skills are deeply intertwined with broader societal issues, including fairness, inclusivity, and responsible use⁷⁴. As we equip citizens with digital skills, we must also empower them to engage in discussions about the ethical implications of the uses (and missuses) of digital technology. This brings us to the ethical considerations surrounding digital skills.

Ethical aspects of digital skills can be defined as the consideration of moral principles guiding the use of digital technology⁷⁵. Due to the evolving nature of digital technologies as well as different definitions and understandings of ethical behaviours across societies, it is difficult to present a conclusive list of considerations around the ethical use of digital technology. A nuanced and ongoing dialogue around ethical aspects of digital skills needs to be held on a societal level. A non-conclusive list of ethical considerations might include:

- **Privacy and Data Security:** Ensuring individuals understand how to protect their personal information online and recognise potential data breaches.
- **Digital Divide and Inequality:** Eliminating the gap between those who have access to digital skills and technology and those who do not (particularly marginalised or remote communities)
- **Algorithmic Transparency:** Creating greater transparency in how algorithms are being developed and used, especially those that impact decision-making within areas that affect us all (e.g., within administrative law⁷⁶, cybersecurity⁷⁷, or the decision-making of self-driving cars⁷⁸). As machine learning algorithms increasingly impact decision-making processes, it becomes more important to examine the ethical implications of these technologies, addressing issues such as fairness, transparency, and accountability⁷⁹.
- **Cybersecurity Awareness:** Understanding the importance of cybersecurity measures, both at a personal level (such as recognising phishing attempts) and at an organisational level, to protect against increasing cyber threats and attacks.

⁷⁴ O'Brien, J. (2020). Digital Ethics in Higher Education: 2020. EDUCAUSE Review. Accessed 23 November 2023. https://er.educause.edu/-/media/files/articles/2020/5/er20_2103.pdf.

⁷⁵ Kumar, S. (2024). Ethical Considerations in Digital Education. In *Online and Digital Education* (pp. 155–177). Crosby. Accessed 8 October 2024. https://www.researchgate.net/publication/382017625_Ethical_Considerations_in_Digital_Education.

⁷⁶ Oswald, M. (2018). Algorithm-assisted decision-making in the public sector: Framing the Issues Using Administrative Law Rules Governing Discretionary Power. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 376(2128), 20170359. Accessed 8 October 2024. <https://doi.org/10.1098/rsta.2017.0359>

⁷⁷ Taddeo, M., McCutcheon, T., & Floridi, L. (2019). Trusting Artificial Intelligence in Cybersecurity Is a double-edged Sword. *Nature Machine Intelligence*, 1(12), 557–560. Accessed 8 October 2024. <https://doi.org/10.1038/s42256-019-0109-1>

⁷⁸ Hao, K. (2018). Should a self-driving Car Kill the Baby or the grandma? Depends on Where You're from. MIT Technology Review. Accessed 8 October 2024. <https://www.technologyreview.com/2018/10/24/139313/a-global-ethics-study-aims-to-help-ai-solve-the-self-driving-trolley-problem/>

⁷⁹ Theodotou, D. M. (2022). ELearning skills 2030: Digital ethics. ELearning Industry. Accessed 8 October 2024. <https://elearningindustry.com/elearning-skills-2030-digital-ethics>



- **Digital Addiction and Mental Health:** Awareness of the potential for digital technology to contribute to addiction, decreased attention spans, and other mental health issues due to excessive screen time and over-reliance on digital devices.
- **Intellectual Property Rights:** Understanding the ethical and legal aspects of content creation, including respect for intellectual property rights, copyright laws, and the responsible sharing of digital content – especially with the rise text-to-image AI models⁸⁰ and other generative AI tools.
- **Digital Literacy:** Ensuring that people are educated on digital literacy to protect them from online exploitation, misinformation, and manipulation. This might also include addressing the ethical issues surrounding the use of technology for propaganda, spreading misinformation, and influencing public opinion through targeted advertising and fake news.
- **Environmental Impact of Technology:** Considering the carbon footprint of digital technologies, including the energy consumption of data centres, e-waste, and the environmental costs of producing and disposing of digital devices. With scientists shaking us vigorously to wake up and act within the “critical and unpredictable new phase of the climate crisis”⁸¹, findings, such as that using ChatGPT to draft emails uses much more resources than we expected⁸² should (1) be taught hand-in-hand with digital skills, and (2) perhaps even make us (re)consider our casual use of technology.

Digital technologies are not neutral entities; rather, they mirror the biases of their human creators and users⁸³. Discussions on the ethical use of digital skills, particularly on a decision-making level, need a diversity of perspectives. This once more highlights the importance of digital skills education, as effective participation in discussions on digital ethics relies on an understanding of the relevant digital technologies.

The EU has acknowledged the need for education on digital ethics by updating their DigComp framework. The DigComp 2.2 update focuses particularly on people’s interaction with AI, covering the knowledge, skills and attitudes needed for safe and effective interaction. This includes:

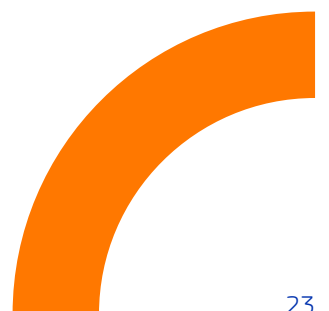
- the awareness and understanding of the challenges and ethical questions raised by AI (such as the human biases in the data on which AI depends),
- an awareness of deep fakes,
- questions around policies on data ownership and AI governance,
- questions of accuracy of AI systems’ output in different languages and cultural contexts, and

⁸⁰ Heikkilä, M. (2022). The Algorithm: AI-generated Art Raises Tricky Questions about ethics, copyright, and Security. MIT Technology Review. Accessed 8 October 2024. <https://www.technologyreview.com/2022/09/20/1059792/the-algorithm-ai-generated-art-raises-tricky-questions-about-ethics-copyright-and-security/>

⁸¹ Ripple, W. J., Wolf, C., Gregg, J. W., Rockström, J., Mann, M. E., Oreskes, N., Lenton, T. M., Rahmstorf, S., Newsome, T. M., Xu, C., Svenning, J.-C., Pereira, C. C., Law, B. E., & Crowther, T. W. (2024). The 2024 state of the climate report: Perilous times on planet Earth. BioScience. Accessed 10 October 2024. <https://doi.org/10.1093/biosci/biae087>

⁸² Pollard, J. (2024). AI Data Centres Using Much More Water than Expected. Asia Financial. Accessed 10 October 2024. <https://www.asiafinancial.com/ai-data-centres-using-much-more-water-than-expected>

⁸³ Theodotou, D. M. (2022). ELearning skills 2030: Digital ethics. ELearning Industry. Accessed 8 October 2024. <https://elearningindustry.com/elearning-skills-2030-digital-ethics>





- the potential ethical consequences of AI systems, such as high energy consumption needed for certain processes and the corresponding environmental impact or potential job losses or reallocations⁸⁴.

The EU has also proposed a regulatory framework proposal on AI, to increase its safe use by EU citizens, and to protect all people who would encounter processes powered by AI (including non-EU citizens, such as immigrants arriving at EU borders)⁸⁵. Through its digital upskilling initiatives, the EU is also addressing overall digital literacy, and its 2020 *Cybersecurity Strategy for the Digital Decade*⁸⁶ proposes strategic initiatives for the EU to address the lack of cyber-skilled citizens.



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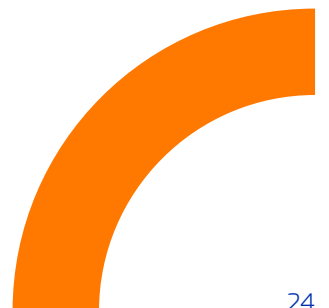
In the same vein, the authors of the Strategy acknowledge the lack of cybersecurity skills among the workforce, highlighting the almost 450 cybersecurity incidents in 2019 which affected crucial EU infrastructures⁸⁷. Paired with the findings from the 2024 Digital Decade Report, we are reminded that there is still a lot of work to be done within the EU Member States when it comes to digital upskilling - and it needs to be done faster.

⁸⁴ Joint Research Centre (European Commission), Vuorikari, R., Kluzer, S., & Punie, Y. (2022). DigComp 2.2, The Digital Competence framework for citizens: with new examples of knowledge, skills and attitudes. In Publications Office of the European Union. Publications Office of the European Union. Accessed 23 November 2023. <https://data.europa.eu/doi/10.2760/115376>.

⁸⁵ European Commission. (2024b, March 6). Regulatory framework on AI | Shaping Europe's digital future. European Commission; Directorate-General for Communications Networks, Content and Technology, European Union. Accessed 23 November 2023. <https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai>

⁸⁶ The EU's Cybersecurity Strategy for the Digital Decade | Shaping Europe's Digital Future. (2020). Digital-Strategy. ec.europa.eu. Accessed 8 October 2024. <https://digital-strategy.ec.europa.eu/en/library/eus-cybersecurity-strategy-digital-decade-0>.

⁸⁷ The EU's Cybersecurity Strategy for the Digital Decade | Shaping Europe's Digital Future. (2020). Digital-Strategy. ec.europa.eu. Accessed 8 October 2024. <https://digital-strategy.ec.europa.eu/en/library/eus-cybersecurity-strategy-digital-decade-0>





To conclude

As we continue to navigate an increasingly tech-driven world, digital skills are no longer just an advantage—they are a necessity for personal growth and professional success. This article explored the evolving landscape of these crucial skills, underscoring the widening gap between the digital competencies required by the EU and global markets and those currently available. The consequences of this skills deficit reach far beyond missed job opportunities; they encompass lost time, money, security, and social connections that are vital to individual well-being. Yet, the path to acquiring these skills is not equal for all. Comprehensive policies breaking down barriers and making digital education and technology accessible to everyone are direly needed. While the EU has launched several initiatives aimed at equipping its citizens with these essential skills, the pace of development still lags behind that of global leaders, as well as the EU's own ambitions. Realising the full potential of digitisation demands a unified effort from policymakers, businesses, and educational institutions alike. Equally important is a continued dialogue around the ethical use and development of digital technologies—one that amplifies diverse voices to ensure that our digital future is both resilient and inclusive for all.



