Advanced draft for the Forum

European Education and Training Expert Panel

Issue paper - Digitalisation of society

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1. Introduction

The strategic framework for European cooperation in education and training (ET 2020)[1] is based on common objectives and supports the improvement of the education and training systems of the European Union's Member States through common tools, mutual learning and the exchange of good practice via the open method of coordination. The value of this cooperation is widely recognised.

Since the adoption of ET 2020 in 2009, European societies and economies have been undergoing fast and extensive transformations that affect the way people live and work – and the way they learn. Consequently, there is a need to strengthen the relevance and impact of European cooperation by better understanding global trends and their implications for EU education and training policies.

As the current strategic framework comes to an end in 2020, the European Commission – Directorate-General for Education, Youth, Sport and Culture – is carrying out wide consultations as part of the preparations for its successor. The European Education and Training Expert Panel has been convened in order to make a strategic contribution by reflecting on the concept of 'embracing change', as well as discussing in what ways new trends are likely to influence education and training in the future, and how they could be addressed through European cooperation over the next decade.

The Panel – composed of 18 international experts[2] – was asked to focus on six thematic blocks, namely: demographic change; inclusion and citizenship; technological change and the future of work; digitalisation of society; environmental challenges; and investment, reform and governance. These were selected by the Commission from a pool of analyses of long-term strategic trends.

For each block, the Panel was invited to address the following scoping questions.

- Which are the major societal developments that will have an impact on how education and training are delivered in Europe in the medium to long term? How can European cooperation best respond to these challenges?

- What should be the strategic objectives of European cooperation in education and training for the next decade? Which should be the priority areas and themes?

The Panel carried out its work between October 2018 and January 2019.

This issue paper reflects the Panel's debates. It first illustrates the trends, challenges and opportunities for education and training that are associated with digitalisation over the coming decade. It suggests issues that could be addressed through European cooperation, and offers a number of concluding remarks.

The information and views set out in this issue paper are those of the Expert Panel members and do not necessarily reflect the official opinion of the European Commission.

[1] Council conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ('ET 2020'), OJEC 2009/C 119/02 (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52009XG0528(01)&from=EN)

[2] The members of the Expert Panel were: Hermann J. Abs, Emmanuel Boudard, Etienne Denoël, Paul Downes, Malcolm Fisk, Silvija Karklina, Eva Klemenčič, Per Kornhall, Sandra Kučina Softić, Carla Morais, Rob Mudde, Serena Pastore, Andrius Plečkaitis, Anna Rabajczyk, Hanne Shapiro, Teresa Sordé-Martí, Gabriela Teodorescu and Raimo Vuorinen.

2. Key challenges and opportunities

The concept of digitalisation covers the increasing use of different types of digital technologies that fulfil a range of functions within a specific application domain, such as education and training.[3] Recent developments in accessible and affordable digital technologies have enabled individuals and organisations to use these technologies in all aspects of their everyday lives. Digitalisation, also referred to as digital transformation, is a multi-layered topic because each one of these technologies and the practices that are related to their use have significant implications for society.

The Council of the EU recently acknowledged that, together with literacy and numeracy, a digital competence is crucial for accessing and progressing in the labour market and engaging in further education and training.[4] Participation in society requires increasing levels of access to digital services, for example for health, government and commerce. Even personal relationships and leisure activities are mediated by the use of technologies, for information search and news, communication, for socialising and entertainment. These changes have implications for individuals: as services and information provided to society become increasingly digital, people will need a set of competencies to take advantage of the opportunities this affords. Digitalisation also opens broader career and entrepreneurial opportunities in relation to innovation development. The Expert Panel identified three major issues that present challenges and opportunities for education and training in relation to the digitalisation of society in the EU.

2.1 The digital skills gap

Contemporary rapid digital transformation of the economy and society means that all EU citizens need increasing levels of digital skills and competences[5] in all aspects of their lives, both at work and at home. Although digital skills are considered to be basic skills, the concept of digitalisation and thus the need for people to possess digital skills covers a range of technologies and practices that have different impacts on different groups of citizens, both in their professional and personal lives. In 2017, more than two-thirds (72 %) of individuals in the EU-28 accessed the Internet on a daily basis.[6] However, 43 % of European citizens do not have basic digital skills,[7] and 13 % never use the Internet, according to 2018 Eurostat data.[8] This is a serious challenge that impedes the full participation of citizens in an increasingly digitalised society, also limiting their employment opportunities. In 2017, one in every four Europeans believed that their digital competence was insufficient for their daily lives.[9]

[3] E.g. internet-enabled computers, mobile devices and software, including the Internet of things, robotics and automation and cloud computing.
[4] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&rid=7
[5] In this issue paper, the terms ‘digital skills’ and ‘digital competencies’ are used interchangeably.
[6] https://ec.europa.eu/eurostat/statistics-explained/index.php/Digital_economy_and_society_statistics_-_households_and_individuals#Internet_usage
[7] EC (2018). Digital Economy and Society Index Report 2018 – Human Capital. https://ec.europa.eu/digital-single-market/en/human-capital
[8] https://ec.europa.eu/eurostat/statistics-explained/index.php/Digital_economy_and_society_statistics_-_households_and_individuals#Internet_usage
[9] European Commission (2017). Special Eurobarometer 460: Attitudes towards the impact of digitisation and automation on daily life. https://data.europa.eu/euodp/data/dataset/S2160_87_1_460_ENG

Basic digital skills are required to participate in the digital economy, but more advanced skills are required to shape its features. Further, in order to use digital technologies critically and effectively, people need to acquire digital skills and apply critical thinking, together with the need to be aware of the importance of cybersecurity issues and their implications. Overall, we can distinguish between digital lifestyle skills (for example, using social media for entertainment purposes), workplace-oriented digital skills and digital skills for inclusion, which includes for instance the ability to engage with the government or to manage healthcare (through the increasing presence of e-services). The acquisition of digital skills should therefore continue and develop throughout the life course: competences acquired at school need to be developed consistently in order to ensure that individuals can respond to changing needs and to the development of digital practices throughout their lives. This also raises questions relating to responsibility for the funding of training.

The digital skills gap is also influenced by a number of factors. In the 1990s, the main reason for people being digitally excluded was lack of access. Today, an increasing number of people access the Internet on a daily basis, but there is still a risk that some groups will become structurally absent.[10] For example, people from rural or remote areas are less likely to have access to digital technologies. Eurostat data[11] confirms that there is, to some extent, an urban–rural divide within the EU-28 in terms of internet access. Whereas households in cities as well as towns and suburbs have comparatively high access rates – 90 % in cities and 87 % in towns and suburbs – internet access is somewhat lower in rural areas (82 %).

Participation in the digital world now increasingly depends on having the necessary skills and competencies, more than having access to digital technology. Nevertheless, some prejudice persists. For instance, the myth of the so-called 'digital natives',[12] an expression used to describe the familiarity of young people who grew up with digital technology, has now largely been debunked: young people are not necessarily more 'tech-savvy' than older generations.[13] Moreover, some authors claim that this discourse obscures children's need for support in developing digital skills.[14] Young people tend to overestimate their digital skills, and in doing this they underestimate the risks associated with digital participation (such as cyberbullying).

Overall, it is estimated that 25.8 % of European adults have low educational attainment[15] and one in four EU adults lacks the skills to effectively use information and communication technology (ICT) for problem-solving.[16] A generational digital gap is highlighted by Eurostat data[17] that looks at individuals

[10] Mirazchiyski, P. (2016). The Digital Divide: The Role of Socioeconomic Status across Countries. Šolsko Polje, 3–4, 23–52.

[11] https://ec.europa.eu/eurostat/statistics-explained/index.php/Digital_economy_and_society_statistics_-_households_and_individuals#Privacy_and_protection_of_personal_identity

[12] Prensky, M. (2001)., Digital Natives, Digital Immigrants. On the Horizon, MCB University Press, Vol. 9, No. 5, October https://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf.

[13] The EU 2014 Horizon Report (https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/horizon-report-europe-2014-schools-edition) emphasises that levels of digital competencies in EU children and teenagers remain inadequate.

[14] Livingstone, S., Haddon, L., Görzig, A. & Ólafsson, K. (2011). EU Kids Online II final report. www.lse.ac.uk/EUKidsOnlineFinalReport

[15] PIAAC – Programme for the International Assessment of Adult Competencies, http://www.oecd.org/skills/piaac

[16] http://uil.unesco.org/fileadmin/keydocuments/AdultEducation/en/EuropeanCommissionEducationandCultureAdultLearninginEuropeChallengesandResponses.pdf

[17] https://ec.europa.eu/eurostat/statistics-explained/index.php/Digital_economy_and_society_statistics_-_households_and_individuals

aged between 16 and 74. For regular internet users, there are significant gaps in usage when looking at age groups and level of formal education (only 40 % are aged between 55 and 74, and only 45 % come from the share of population with a low level of education).

At the higher end of the digital skills spectrum, when considering people who embark on ICT studies and careers, there is a gender divide, evidenced by a growing gap between male and female participation in the digital sector in education, careers and entrepreneurship.[18] In the EU, women are underrepresented in ICT professions: fewer than one in five ICT professionals are female.[19] While both girls and boys have similar levels of interest and competency in digital technology, fewer girls go on to develop this interest for their studies or for a career. This phenomenon is the result of a number of factors that deter young women from the field.[20] The interest of girls in STEM subjects begins when they are between 11 and 12 but drops significantly when they are 15 or 16,[21] precisely when critical study (and career) choices are about to be made. Data trends and qualitative analysis suggest that gender inequality in the digital sphere is essentially a result of the persistence of strong unconscious biases about what is appropriate and the capacities of each gender.

In this respect, however, the Expert Panel found that there were already several efforts underway at European level to overcome these challenges. For example, the EU's Digital Education Action Plan[22] , launched in January 2018, contains 11 actions to support technology-use and digital competence development in education. Moreover, the Commission has issued a range of frameworks to detail key competences of both learners and teachers. These include the updated second version of the DigiComp Framework[23], which identifies components of digital competency and targets citizens at large, and the Digital Competence Framework for Educators[24], describing the pedagogical digital competences of teachers. Digital competence should be acquired in the lifelong and life-wide learning continuum and digitalisation should cover the entire range of formal, non-formal and informal, general and vocational learning undertaken by citizens after leaving initial education and training.

Despite these efforts, which are considered by the Expert Panel to be a step in the right direction, the challenge regarding these digital skills gaps requires a holistic vision, with policy, research and practice aligned in supporting the development of digital skills.

2.2 Impact of digitalisation on learning

Digitalisation can be challenging for educational systems simply because of the speed at which it is advancing, which makes it difficult for educational systems to adapt. The Expert Panel believes that digitalisation can help meet some current educational challenges, but some examples of the implementation of digitalisation have shown mixed results, as reported in the OECD's 2015 report correlating the performance of students in PISA tests with their use of technologies in the classroom.[25] The report states that students who use computers quite often at school tend to have

[18] See EC study on women in the digital age, http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=50224
[19] 83.9 % of employed ICT specialists are male, 16.1 % female (Source: Eurostat, 2015).
[20] Cybersecurity Nexus. (2017). State of Cyber Security 2017. https://cybersecurity.isaca.org/state-of-cybersecurity
[21] Microsoft (2017). Why Europe's girls aren't studying STEM https://www.microsoft.com/empowering-countries/en-us/gender-equality/what-keeps-girls-from-pursuing-a-stem-career/
[22] https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en
[23] https://ec.europa.eu/jrc/en/digcomp
[24] https://ec.europa.eu/jrc/en/digcompedu
[25] OECD (2015). Students, Computers, and Learning: Making the connection.

somewhat better learning outcomes than students who rarely use computers, but that students who use computers very frequently at school fare a lot worse in most learning outcomes, even after accounting for social background and student demographics. This report also noted that 'technology can amplify great teaching but great technology cannot replace poor teaching'. The mixed effects of technology on learning in schools are also reported in other international research,[26] and recent research has been raising concerns about effects on mental health.[27]

As quality of education and learning outcomes depend on multiple factors that are difficult to isolate, new efforts to assist in reflecting and capturing the value of the use of digital technologies at school, such as SELFIE,[28] are welcome as they facilitate critical reflection on how educational organisations use digital technologies for teaching and learning.

The availability of Massive Open Online Courses (MOOCs) has raised hopes about a revolution in the delivery of instruction. However, progress has been relatively slow and significant additional work is needed to ensure the quality and relevance of online courses, including accreditation. As we look beyond 2020, this will be an increasingly important discussion. Despite this mixed evidence, however, the Expert Group would like to convey the positive message advanced by the Bologna Follow Up Group (2018): 'Digitalisation provides the opportunity to achieve personalized education according to prior knowledge and needs, tailored curricula and learning units, individual guidance, etc.'[29]

Within a successful non-formal online education sector there is a growing area of 'shadow' informal learning, both for professional and personal development, where people use video content provided by freely available channels on popular platforms, delivered by non-formal and formal education institutions as well as enthusiasts and NGOs. Much of the success of informal learning, particularly with the Millennial Generation and beyond, can be attributed to the close integration and widespread use of videos within social networks and the structuring of content into smaller parts.

Digitalisation can enable a greater focus on personalised learning through efforts to tailor education to individual needs, moving away from standardised models of delivery towards the provision of bespoke interactive learning experiences. Big data represents one possible approach: in Singapore, for example, teachers make significant use of student data to build personalised learning steps.[30] Machine learning can then be applied to this data to develop artificial intelligence teaching options, which could potentially create new options for delivery of teaching material. Personalisation of learning therefore requires the re-centring of delivery mechanisms around personal progress, taking advantage of digital technologies and learning analytics which allow the personal progress of students to be tracked.[31] In addressing these changes, however, the Expert Panel discussions have highlighted the need to manage risks associated with privacy and to set appropriate ethical standards.

While today most teaching material is still delivered in the classroom, individual learning enables people to approach problems in their own way, acquire knowledge and skills at their own pace and maximise outcomes. This is the case not only for the most talented students, but it also helps some

[26] ICILS (2003). Preparing for Life in a Digital Age. The IEA International Computer and Information Literacy Study. International Report; Grönlund, Å. et al. (2014). Unos uno årsrapport 2013. Örebro, Örebro universitet; Skolforskningsinstitutet (2017). Digitala lärresurser i matematikundervissningen. 2017:01. Systematisk översikt. Stockholm, Skolforskningsinstitutet.
[27] OECD (2018). Children & Young People's Mental Health in the Digital Age.
[28] https://ec.europa.eu/education/schools-go-digital/about-selfie_en
[29] BFUG Position Paper, Bologna Digital (Version 1.2, 2 May 2018).
[30] EPSC (2017). 10 Trends Transforming Education as We Know It.
[31] OECD (2015). Students, Computers, and Learning: Making the connection.

individuals who may be lagging behind to catch up, although digital competencies and learning how to learn are both needed to benefit from this opportunity. Personalised learning requires a major change in the organisation and delivery of education and on-the-job learning for teachers. It also requires delivery to be re-centred around personal progress, and the deployment of new technologies and resources, which make student-centred learning a challenging approach.

In classrooms, digital tools can increase teachers' options, potentially allowing them to devote more time to individual students without detriment to the rest of the class. Self-guided learning or interactive learning materials, for example, can have a profound effect on classroom dynamics. Yet these changes increase the need to support teachers, for example in the development of their own digital skills, in discovering how digital technologies can help them in their teaching, and in enhancing pedagogical practices. If teachers are to increasingly adopt a coaching or mentoring role, a shift would also be needed in their mindset, which needs to be well planned and implemented as part of a wider systemic change.

2.3 Living and working in a digitalised world

Digitalisation is a so-called 'megatrend' that includes a wide variety of technologies, each with its own life cycle and development projections. As with each adoption of a technical innovation, the integration of technologies in everyday life and in learning is expected to pass through a so-called 'hype cycle', which is particularly valid for technologies considered to be disruptive. Hype cycles describe inflated expectations in the beginning while the technology is maturing and before the real applications have been validated, commonly followed by a trough of disillusionment – people tend to overestimate the effect of a new technology in the short term and underestimate it in the long term. Therefore, a realistic and critical approach is needed while encouraging research and experimentation in relation to the application of digital technologies in training and education. Before building a policy agenda and starting significant investment and rollout, then, the responsibility of education policymakers lies in better understanding what technology advances can yield in terms of quality and accessibility of education, and identifying when and where the value (and potential risk) is created in specific use cases.

Other trends include the shift in Europe's economy from manufacturing to services: sector-level employment developments in the EU have shown declining shares of employment in non-IT-intensive industry and agriculture, and increasing shares in IT-intensive business services and information and communication services. In parallel, employment opportunities grew within more knowledge-intensive activities in expanding global value chains already seen prior to 2010; these trends have been driving increases in the employment of people with ICT user skills (average of 20 % in total employment). One challenge of digitalisation in general, and disruptive technology in particular, is therefore linked to job destruction in some sectors and job creation in higher added-value sectors, such as ICT, which has implications for the education system and for career guidance. For example, the number of ICT professionals in the EU increased by 36.1 % from 2007 to 2017, over 10 times as high as the increase (3.2 %) for total employment. Therefore, the education system has a role to play in helping those at risk due to automation move into higher-value and quality jobs.[32]

It should also be noted that it is difficult to predict how quickly and how comprehensively digital transformation will take place, and to what extent companies will pursue a strategy of pure automation

[32] Employment and Social Developments in Europe 2013
https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=7684

or how far they will see digital technologies as a way to transform business models and create more added value. The strategic choices of companies will not only have a marked impact upon work organisation practices and skills; they could also influence whether Europe will be capable of harvesting innovation and job creation and entrepreneurial opportunities as a result of digital disruption.

Automation technologies will continue to automate routine manual and cognitive work function; skills that are hard to automate are higher-order cognitive and social skills. At the same time, these higher skills and underlying capabilities are difficult to acquire in a traditional learning environment. These skills also correlate strongly with higher-order functional literacy and numeracy skills which, in turn, depend on people having previously acquired basic skills. Given that 25.8 % of European adults have low educational attainment, digitalisation creates a further sense of urgency to ensure that all citizens have access to basic skills which will allow them to function in the digitalised society and labour market of the future.[33]

On the other hand, dialogue between technology enthusiasts and doubters needs to be supported, as disappointment and hesitancy on the part of educational institutions to adopt proven and broadly available digital technology may reinforce an existing clash between traditional schooling and digitally delivered alternative forms of learning, thus widening the digital divide and the skills gap in communities. Another key concern when deploying any technology designed for interactive use in education should be the teacher community, which often faces its own challenges in using technology for educational purposes, particularly if teachers have not been involved in designing the application of technology.

Arguments for the use of digital technology in education are often based on an underlying dualism: either with a claim that technologies provide individual and social emancipation, or that technologies bring a 'fast food' approach to education.[34] This binary attitude towards technologies in general, and digital technologies in particular, is possibly the consequence of the above-mentioned hype and deception cycle. However, digital education is not a matter of either/or: it is not about computers on every desk or being online all the time, and it also does not claim that technology solves everything. There are certain aspects of technology that are necessary, there are uses of technology that are inspiring and there are times where it is better not to use technology at all. Moreover, even when it is necessary or inspiring, there may be some side effects that need to be taken into account.

In a changing world and a more unpredictable future, lifelong learning is becoming a central element in people's lives, and digital learning is in many cases already making this more accessible, flexible and cheaper. This means that there cannot be a binary argument on the integration of digital technologies in education: digital technologies are part of people's everyday lives, and should be part of their learning experience. Traditional classrooms most probably will continue to dominate formal education, but need to overcome being seen as simply lecturing and 'death by PPT'. Different types of the blended learning concept, including both classroom and distributed learning environments, in

[33] The Danish Ministry of Education conducted an analysis in this regard: Epinion, April 2017 Analyse af individer og virksomheders brug af voksen- og efteruddannelse.
[34] Knox, J. (2016). Posthumanism and the MOOC: Opening the Subject of Digital Education. *Studies in Philosophy and Education*, *35,* 3, 305–320.

which teachers are mentors and instructors, is already a significant part of education reality, although with minor improvements when compared to pure classroom education.[35]

The development of digital skills also has consequences for employability. Digitalisation is changing the types of jobs available, as well as the skillsets required for existing jobs. It is estimated that around 43 % of adult employees in the EU labour market have experienced changing technologies, such as new ICT systems or machinery, in their workplace in the past five years, and 14 % of workers' jobs face a very high risk of automation. A survey by Eurostat published in December 2018, shows that the job tasks of 16 % of employed internet users in the EU had changed due to new software or computerised equipment in the 12 months prior to the survey, and 29 % had had to learn how to use new software or equipment for their job. Furthermore, 9 % of those surveyed admitted that they needed further training in the use of computers, software or applications.[36]

In addition, the proportion of workers who stay in the same job for more than 10 years is decreasing, a trend that is likely to continue beyond 2020. In some Member States, digitalisation and ICT-sector employment is facing skill shortages which has a significant impact on the labour market, with average wages for ICT jobs increasing above those in finance and insurance.[37] Therefore, a challenge present from 2019 onwards is how to respond to these demands and ensure that all citizens acquire the digital skills they need for a fulfilling life and productive work, providing them with accessible, clear and real learning, upskilling and reskilling opportunities.

The reliance on digital technology for everyday activities has consequences for people's lives, both as citizens and in their roles as consumers, learners and employees. The Internet and social media play a central role in broadcasting news and connecting people, but they are also used to disseminate 'fake news' and misinformation. There is therefore an increasing need to educate citizens as critical consumers of online content services and electronic media, equipping them with the skills and methods to validate statements objectively or spot manipulative data, and help them to make informed choices.[38] Moreover, digitalisation affects our lives as citizens interacting with e-government[39] or e-health services (79 % of EU Member States have a national e-health policy or strategy and 74 % of health policies refer specifically to e-health or ICT in health[40]).

[35] Charles Dziuban et al. Blended learning: the new normal and emerging technologies https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-017-0087-5#Sec14

[36] https://ec.europa.eu/eurostat/web/products-press-releases/-/9-20122018-AP?fbclid=IwAR0odZmHjXrcnvYAV8_Jd_1Xg7ravtiPToc8fA_hYCyp8Lus8m-7D2q7YzA

[37] Gross monthly earnings (Nov. 2018), Official Statistics Portal Lithuania, https://osp.stat.gov.lt/informaciniai-pranesimai?articleId=5973390

[38] OECD (2015). Students, Computers and Learning: Making the Connection. PISA. Paris: OECD Publishing.

[39] https://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:E-government_statistics

[40] http://www.euro.who.int/en/health-topics/Health-systems/e-health/data-and-statistics

3. Looking towards 2030: priority areas of action

The following key themes for future European cooperation over the coming decade emerged.

Narrowing the digital skills gap:

- The development of digital competence should be addressed from a lifelong learning perspective, based on both formal and non-formal education.
- Supporting the development of digital skills in education and training systems should be a core strategic priority over the next decade.
- Teacher training is critical in realising the benefits of the digitalisation of education.

Making the most of digitalised learning:

- The trend towards making learning experiences more bespoke should continue across all forms of education and training, including adult education, balancing the benefits for learners and educators while accommodating concerns about ethics and privacy.
- The EU could propose an exchange of best practices in terms of the digital tools and infrastructures and learning tools available to educators, as well as case studies of best practices, both at the classroom and system levels.
- The use of ICT should be included in the design of guidance services which are integrated into education systems to ensure optimal use and integration of digitalised learning.
- Career services should mainstream the use of modern technology and expand understanding of ICT and labour market information in study programmes.

Reaping the benefits beyond classrooms:

- Digitalisation can be of wider benefit to society, for example helping to better forecast job market needs and respond to changes aimed at minimising any qualifications mismatch.
- In order to respond to the changing nature of the labour market as a result of digitalisation, Member States and the European Commission could start a pilot of Europe-wide monitoring and early warning systems. The aim would be to facilitate adjustment of education in response to changes in the labour market, building on experience of the Member States.
- Digitalisation of society means that workers are more likely to change jobs several times over their working lives. Access to career counselling, training opportunities to facilitate job transitions and the screening of job offers are all vital tools.
- Blended educational systems between formal and informal learning may become the norm in creating more opportunities for prospective learners throughout their working lives.
- Changes in education and training systems should be made in a way that they recognise the unconscious biases that hinder greater access to digitalisation for some social groups.

3.1 Narrowing the digital skills gap

The impact of digitalisation on society means that there should be a strong focus on enhancing digital skills and competencies, ranging from the ability to operate a digital device and understanding information and media literacy to knowing how to stay safe online and troubleshooting, configuring and programming skills. This should be addressed from a lifelong learning perspective, in both formal and non-formal education, focusing on all age groups, as well as inclusive digital education for marginalised groups and older citizens.

Supporting the development of digital skills in education and training systems should be a core strategic priority over the coming decade to meet the growing demand for these types of skills. The integration of digital skills into education and training should involve close cooperation with social partners and employment services to adapt those skills to labour market needs. Building on existing initiatives in the context of qualifications frameworks, future measures could for example include the creation of demand-driven work-based learning, traineeships and apprenticeships. Direct and close collaboration of public education and private businesses is not yet widespread and tends to be more project-based, except in countries with traditionally strong dual vocational education and training (VET) systems and sustained levy-based funding.[41] In some industries with skills shortages and rapidly growing employment, such as the ICT sector, this is already happening as innovative bottom-up initiatives for professional reskilling programmes are developed to meet top-down policy implementations.[42]

The Expert Panel would like to stress that teacher training is critical in developing the benefits of the digitalisation of education; training that addresses digital skills, new methodologies and new learning options needs to be provided to teachers. In addition, there is a need to listen to the needs of educators and students alike when they are using technologies for teaching and learning. This will likely require some flexibility and a rethinking of teacher training and development. Besides training, it is very important to support teachers in their use of new technologies and in course and curriculum design. One way of supporting the integration of digitalisation into education would be to encourage the exchange of best practices and to support the upscaling of success stories from Erasmus+.

3.2 Making the most of digitalised learning

The Expert Panel stressed that the trend towards more bespoke learning experiences should continue. This is the case for formal education in institutions such as schools, universities and VET centres, but it is also fundamental in the case of adult learning.

In terms of learner performance, the Expert Panel acknowledges the development of systems that acquire and process student data towards a more effective learning experience. However, such digital tools, although beneficial, raise a number of privacy and data security issues that cannot be ignored. For example, there are applications and software that track student online behaviour. The benefits that might come from learning analytics, for instance, should be discussed in light of individual student privacy. The EU could lead the discussion in this regard, including balancing the benefits for learners and educators with concerns about ethics and privacy.

There should be continued investment in digital tools in schools, universities and VET centres, but also the development of digitally enabled pedagogies which support teachers and adult educators in providing learning experiences that are better adapted to students' needs. The EU could propose an exchange of best practices in terms of the digital tools and infrastructures and learning tools available to teachers in order to avoid wasting resources on reinventing the same digital tools and infrastructure.

Targeted efforts are needed to address how the digital world affects teaching methodologies. Evidence clearly shows that simply transferring existing content into digital format is not sufficient. However, efforts to seamlessly blend the digital and the traditional have largely remained fragmented,

[41] Paul Vroonhof et al. (2017). Business Cooperating with Vocational Education and Training Providers for Quality Skills and Attractive Futures.
[42] http://akademija.lt/ as public VET and private businesses partnership in Lithuania.

despite recent EU working group efforts. Beyond 2020, new teaching and learning methodologies that take the potential of digital education and training into account, including those aimed at computational thinking and embedding basic and advanced skills and knowledge in digital technologies within other subjects, should be the focus of particular attention.[43]

To make most of digitalised learning, the use of ICT needs to be included in the design of the guidance services that are integrated into education systems. Digitalisation and the use of ICT acts as a tool to assist, enhance and further develop traditional approaches to the provision of career guidance services, resources and tools.[44] It should be noted, however, that integrating ICT into career services is not just about using ICT-based methods, nor giving extra ICT classes; it is about mainstreaming the use of modern technology and expanding understanding of ICT and labour market information in study programmes. The goal should be to integrate the use of modern technology, in combination with more 'traditional' methods. In designing training programmes for career practitioners and teachers, therefore, thought should be given to the competencies that practitioners need to develop in terms of modern technology and ICT.

An evidence-based foundation for the design of pre-service and in-service training within a coherent framework of career practice emphasises a developmental approach to capacity building. A four-level conceptual framework was successfully applied to curriculum development in an international summer course for ICT in guidance and counselling, and this offers a basis for further development of the wider training curriculum. The framework includes an information approach, a communication approach, a collaborative career exploration approach and a co-careering approach. Shifts in competency range from operational understanding of different technologies and tools and how they meet the information needs of different audiences to creating and maintaining a reliable online presence.

Although ICT is increasingly used in career services, wider global implementation of online services remains a challenge due to inadequate access to ICT and information, inadequate staff skills and competencies and inadequate integration of ICT in services. Access can also be limited due to costs and a digital divide amongst the individuals and the lack of local context-related content in local languages. Lack of national-level cooperation in practice and policy development across sectors can also result in inadequate integration of ICT in career services. While technology widens access to services and products, different technologies and systems are not necessarily compatible and this prevents the exchange of information and data.

3.3 Reaping the benefits beyond the classroom

Studying how the digital transformation is affecting society and the labour market can be beneficial for education planning. Educational organisations and stakeholders therefore need to prepare before taking informed and evidence-based decisions to better forecast labour market needs and to help minimise the qualifications mismatch. In addition to the European Skills Index and Skills Panorama[45] and 10-year country-level skills forecasts by CEDEFOP,[46] Member States are conducting periodic expert long-term skills anticipation analyses. Some have launched first pilots for annual forecasting of

[43] https://www.iea.nl/icils

[44] European Lifelong Guidance Policy Network (2015). The Guidelines for Policies and Systems Development for Lifelong Guidance: A Reference Framework for the EU and for the Commission. ELGPN Tools No. 6. Saarijärvi, Finland.

[45] https://skillspanorama.cedefop.europa.eu/en/indicators/european-skills-index

[46] http://www.cedefop.europa.eu/en/publications-and-resources/country-reports/skills-forecasts

sectoral job demand for education policymaking, based on multiple data sources and monitoring student job progression after leaving the education system. This is based on relevant data integration and analytics (such as the National Human Resources Monitoring System by MOSTA, Lithuania[47]). Others also provide data on job opportunities as a service to citizens (e.g. the Danish Labour Market Balance[48] which provides data on job opportunities for approximately 850 occupations by region covering the entire labour market).

In response to growing job automation, concerns about robotisation from the industrial shop floor to process automation software, natural language processing bots and other machine learning (artificial intelligence) applications in customer service, Member States and the European Commission could start a pilot of Europe-wide monitoring and early warning systems based on proven empirical data. The aim would be to facilitate adjustment of education in response to changes in the labour market. It would also be important to monitor technology advances and their actual deployment, including market uptake scenarios and attractiveness in terms of return on investment, as well as ongoing job market shifts at specific qualification and skill levels. This data-intensive exercise would convey a message to citizens and the education and training system about qualification mismatches and provide a basis for easing labour market tensions.

In terms of adult learning, the digitalisation of society means that workers are more likely to change jobs several times over their working lives, with necessary periods of upskilling. Access to career counselling, training opportunities to facilitate job transitions and screening job offers all require digital skills. Educational systems that blend together formal and informal learning may become the norm in increasing opportunities for prospective learners. In the near future, lifelong learning may simply become the norm for all adults. Some type of online passport could certify all learning progress. Online courses such as MOOCs can also be an important part of these changes.

There should also be a focus on promoting access to learning content anywhere and at any time by providing opportunities for real inclusion. A significant step towards this would be to design changes so that they recognise the unconscious biases that hinder greater access to digitalisation for some social groups. Potential limitations in the use of technology relate to the quality and validity of existing educational information and career resources. Furthermore, information might be out of date or include intentional or unintentional bias. One challenge is related to linking educational data classified by discipline with labour market data which is classified by occupation or qualification requirements. Moreover, ICT services might include online career assessment tools or automated online interpretation, which may not be properly validated. In addition, individuals and groups in society differ in their capacity to source, interpret and apply labour market information. The data might be difficult to use and services might not provide sufficient support for individuals who need specific assistance. Indeed, in guidance, confidentiality and security of personal data is often mentioned as a limitation in using technology.[49] Finally, actions could be targeted to particular groups to reduce the digital divide. The governments of Member States should also recognise that certain marginalised groups such as prisoners, migrants and refugees or those in health institutions, could also benefit from greater access to digital education.

[47] https://www.mosta.lt/en/

[48] https://www.star.dk/en/labour-market-monitoring/labour-market-balance/

[49] Sampson, J. P. & Osborn, D. S. (2014). Using Information and Communication Technology in Delivering Career Interventions. In P. J. Hartung, M. L. Savickas & W. B. Walsh (eds.), *APA Handbook of Career Intervention, Volume 2: Applications* (pp. 57–70). Washington, DC: American Psychological Association. doi:10.1037/14439-005

4. Concluding remarks

Digitalisation is having a profound and fast-moving effect on society and the labour market. The EU has a significant role to play in helping national education and training systems adjust to these changes and should concentrate on two aspects. First, by encouraging education and training systems to meet the digital skills needs of present and future generations. This could be achieved by encouraging teachers to self-assess and upskill or by identifying and working on the skills that learners need to acquire in order to navigate their social and professional life with confidence.

Second, the EU could provide greater support to individual Member States on how to use digitalisation as an educational tool as part of an efficient educational provision with evidence-based impact. As noted above, digital tools can increase teachers' teaching options, potentially allowing them to devote more quality time to individual students without detriment to the rest of the class. It should be noted, however, that self-guided learning can have a profound effect on classroom dynamics. There is therefore a need to support teachers by providing them with tools to help them discover how digital technologies can help them in their teaching and in enhancing pedagogical practices, leading to better learning outcomes.

The EU can also support further research into developing systems that better anticipate skills gaps by gathering and providing better qualification-matching data, by the open exchange of best practices and by the closer cooperation amongst Member States on the topic of preparing citizens for lifelong learning in digital skills. There should also be a focus on building and scaling sustainable systemic models of collaboration between VET and higher education with industries in which there are job opportunities.

Furthermore, to support the integration of digitalisation, building synergies between national and structural funds in education that support groups more likely to fall behind in terms of digital skills and competencies should also be considered, thus ensuring inclusive education and equal opportunities for all.

In developing national career information and resources, policymakers need to identify the gaps in their existing knowledge regarding a more advanced understanding of the role of ICT in career services. In general, a deeper understanding is needed for the development and successful implementation of existing and emerging technologies for blended service delivery. If ICT is viewed solely as an information delivery channel, or if the development of tools for different user groups remains fragmented, the full potential of the technology cannot be exploited, either in the formatting of lifelong guidance policies or for integrated service delivery. As part of national strategies for digital skills, the long-term goal must be to bridge the technological gap between organisations that are well equipped and those that are not.

Areas for further reflection include how Europe can balance the need to focus on digital skills and other transversal social and personal competencies, especially for VET students, and a closer examination of the gaps that have been identified in digital proficiency and how education and training might address them.