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INNOVATION & DIGITALISATION

A report of the ET 2020 Working Group on Vocational Education and Training (VET)

Eight insights for pioneering new approaches

Social Europe

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INNOVATION *&DIGITALISATION*

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Preface

Nicolas Schmit
European Commissioner for Jobs and Social Rights

Giving everyone the right to quality and inclusive education, training and lifelong learning is the first principle of the European Pillar of Social Rights. Now it is time to turn this principle into a reality. Boosting innovation and digitalisation in vocational education and training (VET) to create modern and flexible high quality VET systems, including at higher-level VET, is key to Europe's recovery.

We need to think big, be bold and make the right choices about VET using innovation and digitalisation to deliver the skills needed by young people and facilitate the upskilling and reskilling of adults. This also means looking at reforms and investments.

The Commission has proposed an unprecedented amount of funding for VET and skills in the Resilience and Recovery Facility and the next long-term budget for 2021–2027. Leveraging innovation and digitalisation in VET is essential to successfully drive our economies and societies forward and master the digital and green transitions.

On 1 July, the Commission proposed a European Skills Agenda accompanied by a proposal for a Council Recommendation on VET, that Member States will soon adopt. I welcome the initiative of the EU education ministers to agree on concrete actions for the next five years in the Osnabrück Declaration.

But how can VET better embrace innovation and digitalisation to achieve the critical environmental, social and economic goals that Europe seeks? How can digital tools improve work-based learning, support upskilling and reskilling and also ensure greater social inclusion? How can we use public-private partnerships to leverage investments for innovation and digitalisation in VET? In what ways can VET proactively support innovation in our local and regional economies? And, of course, how do we make sure that more innovation and digitalisation in VET provides a genuine, high-quality learning experience to young people and adults to enable rewarding and sustainable careers? This is a snapshot of just some of the questions raised and answered in this report.

Over the last two years a working group of national experts from Member States, EFTA and candidate countries, facilitated by the Commission, has been addressing such questions. This report presents the outcomes, showing how different countries have successfully introduced some aspects of innovation and digitalisation in VET. It identifies key insights for policy development along with good practices to inspire new approaches.

I would like to thank those who participated in and supported the working group in its work. For governments, businesses, social partners, VET providers and other relevant stakeholders looking for a new impetus on how to introduce or build on innovation and digitalisation for quality VET, I encourage you to learn from the eight insights and make use of the inspirational examples in this report. Ultimately, modernising VET systems across Europe will create a brighter future for young people, adults, companies and society as a whole.

Executive summary

Policy rationale

There is great potential for innovation and digitalisation to boost high quality VET and higher VET. In turn, this could enhance the employability and personal development of young learners and people of working age, ultimately contributing to tackling the major environmental, social and economic challenges of our time.

Despite this promise, the potential of innovation and digitalisation in VET has yet to be fully exploited. Whilst higher education has traditionally been viewed as absorbing and stimulating innovation, the contribution of VET is often understated or unexplored. Meanwhile, climate change, the threat to biodiversity, the rapidly changing world of work, job polarisation, and new technological and digital developments (e.g. industry 4.0, robotisation, artificial intelligence) mean that digital and green skills are now key to navigating a fast-growing and changing world. In particular, people of working age, regardless of their level of education or qualification, need to obtain an initial qualification and continuously update their skills or reskill to enter, re-enter or remain in the labour market.

Against this background, VET systems need to reflect and integrate these changes and redefine their role to support innovative processes and products.

ET 2020 Working Group on Vocational Education and Training (VET WG) 2018–2020

Over two years from 2018 to 2020, the VET Working Group worked to unpack the broad potential of innovation and digitalisation to support higher quality, more flexible and more modern VET, taking account of existing policies and strategies (e.g. smart specialisation strategies for local and regional development), tools (e.g. SELFIE for work-based learning, the self-reflection tool for digitally capable VET schools) and practices (e.g. case study examples and country approaches). In line with its mandate, the Working Group explored a range of key topics linked to innovation and digitalisation, encompassing:

- new pedagogical and andragogical approaches for teachers and trainers, e.g. what and how we teach and train, how we learn;
- new learning environments and organisational developments in training institutions and companies;
- the use of modern learning technologies in VET and higher VET, e.g. open educational resources (OER);
- proactive and flexible VET systems supporting smart specialisation strategy and industrial clusters;
- strengthening key competences by adapting curricula/training programmes and regulations responsive to rapidly changing labour markets;
- governance and financing in terms of cost-sharing and investing in infrastructure;
- quality and excellence in VET;
- support of VET learning mobility, careers without borders and VET internationalisation.

To explore these topics, the VET Working Group conducted a total of 11 meetings, including face-to-face meetings and webinars, as well as peer learning activities (PLAs) in three Member States. In addition, the Working Group had a meeting in Helsinki to discuss the European Vocational Skills Week 2019 and artificial intelligence. This allowed synergies with other ET 2020 working groups, bringing together colleagues from digital education and adult learning working groups. Furthermore, the final meeting involved a joint session with the Adult Learning Working Group.

The VET Working Group also conducted an exercise to map Centres of Vocational Excellence (CoVEs) across Europe in late 2018 and early 2019, which helped to develop the concept of vocational excellence and assisted the development of EU support plans and a new EU initiative[1]. A separate Centres of Vocational Excellence Mapping report[2] presents the findings of this exercise.

While pioneering experimental and innovative practices, the Working Group also collected a comprehensive evidence base of good practice examples across the EU27, EFTA and candidate countries to act as inspiration for developing innovative VET. Throughout the mandate the Working Group aimed to use innovative tools and working methods to gather input from representatives (e.g. Mentimeter, Padlet).

Report objectives

The purpose of this report – the final output of the Working Group on VET – is to examine innovation and digitalisation with the goal of creating more flexible and modern high quality European VET. It considers the impact of innovation and digitalisation on VET as well as the ways VET might support digitalisation and innovation more proactively in the wider economy and society. It examines the challenges and opportunities in teaching and learning, the role partnerships and cooperation can play in VET and the governance and investment frameworks needed, taking into account trends such as ageing populations, globalisation, social inclusion and the circular economy. The report also takes into account the unprecedented economic and social disruption caused by the COVID-19 pandemic, as well as unforeseen opportunities with regard to digital technology fuelled by the crisis.

This report was produced by the ET2020 Working Group on VET, consisting of representatives from Member States, EFTA and candidate countries, social partners, VET providers and European agencies (Cedefop, European Training Foundation (ETF), the Joint Research Centre (JRC)), as well as the OECD. The Working Group was coordinated by Helen Hoffmann and Norbert Schöbel of the European Commission, DG Employment, Social Affairs and Inclusion, and supported by Ecorys. The graphic layout was designed by Martin Straif, silver medallist in the WorldSkills 2019 competition.

This report is based on information gathered from: publications presented and discussed within the VET WG; policies and practices analysed during numerous meetings and PLAs; contributions from invited experts; and input from VET WG members, including a small technical group that included experts from Cedefop and the ETF.

1 https://eacea.ec.europa.eu/erasmus-plus/actions/centres-of-vocational-excellence_en
2 https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8250&furtherPubs=yes

1.0. Introduction

1.1. Innovation and digitalisation in a changing world

Vocational education and training (VET) is in a world of unprecedented change, a characteristic thrown into sharp relief by the COVID-19 pandemic. The global economy is experiencing rapid changes in the way goods are produced and services delivered. At the same time, the world faces the prospect of rapid and unpredictable climate change and environmental degradation. These trends come with significant social consequences. Society itself is being affected by digitalisation, with the internet providing unprecedented access to information and offering people exceptional levels of individualisation. However, this comes with significant risks of which 'fake news' is just one aspect. Such trends are having consequences for social life, citizenship and democratic participation that are only just starting to be appreciated.

Innovation and digitalisation are affecting how people work, with the emergence of new types of employment, such as in the 'gig' economy[3], new occupations and environmental challenges[4]. They are also affecting the skills in demand in the labour market, leading to upskilling and reskilling of the workforce and emphasising the need not just for high quality initial VET (IVET) for labour market entry but also for high quality continuing VET (CVET) for the existing workforce. Skill shortages exist alongside deficiencies in basic skills; in the coming years more medium and high skills are likely to be needed, and VET at higher levels (beyond its traditional 'home' in upper secondary education or just above at EQF levels 4 and 5) will need to become more prominent. Key competences[5] have become more important in a world where occupational change is commonplace and new skills – such as skills for 'green jobs' – are in demand.

Innovation and digitalisation are intrinsic to these developments, both contributing to change but also a vital source of solutions to the challenges we face. Innovation is needed to cope with economic, social and environmental dynamism and instabilities. Digital technologies are already ubiquitous and are becoming further embedded into everyday life and work. In both IVET and CVET there is a need for innovative responses in teaching, learning and organisation, and for the effective deployment of digital technologies to build the flexible, high quality VET systems that can deliver the skills we need socially, environmentally and economically. VET is already changing its roles[6] but does it need to do more to embrace innovation and digitalisation?

3 Hogarth, T. and Papantoniou, A. (2017) New forms of self-employment: the Hollywood model and the gig economy https://skillspanorama.cedefop.europa.eu/en/blog/new-forms-self-employment-hollywood-model-and-gig-economy Cedefop blog

4 International Labour Organisation (2019) Skills for a Greener Future. Geneva: ILO https://www.ilo.org/skills/projects/WCMS_706922/lang--en/index.htm

5 The Council of the EU has defined key competences as combinations of knowledge, skills and attitudes, and has identified eight key competences 'which all individuals need for personal fulfilment and development, employability, social inclusion, sustainable lifestyle, successful life in peaceful societies, health-conscious life management and active citizenship'. They are: literacy; multilingualism; mathematical competence and competence in science, technology and engineering; digital competence; personal, social and learning to learn competence; citizenship; entrepreneurship; cultural awareness and expression.

6 See the set of studies commissioned by Cedefop on the changing role of VET https://www.cedefop.europa.eu/en/events-and-projects/projects/changing-nature-and-role-vocational-education-and-training-vet-europe

1.2. VET has enormous potential for innovation and digitalisation…

There is a great potential for innovation and digitalisation to support high quality and higher VET. Yet, in general, the social and economic contributions of VET have so far been under researched and underappreciated[7], with VET institutions often being seen as simply providing skills rather than having a more extensive role in the innovation ecosystem[8]. Nonetheless, there is increasing awareness and recognition that VET has a much bigger role to play in both innovation and digitalisation[9].

VET is increasingly seen as a driver of innovation and is part of the Lifelong Learning Indicator for the EU Innovation Scoreboard. VET also prepares learners for occupations where creativity is necessary, drives new ideas in business and industry, and helps to close the skills gap (40% of workers being at risk of having their tasks at work replaced by machines)[10].

But more needs to be done. VET is undoubtedly well placed to respond to the skill challenges posed by digitalisation in the economy given its close ties with business, the role of initial VET being at the interface of school and work, the fact that CVET is ideally positioned to upskill and reskill the existing workforce, and the continuing development of higher VET meeting demands for higher skills. However, VET systems are often not flexible enough to respond to the changing needs of the labour market: overall, innovations in pedagogy and digital technologies tend to be implemented sporadically, forming a fragmented picture when VET systems are viewed as a whole; and there is a need for VET to respond to growing demand for higher-level skills by expanding provision at higher levels. Similarly, whilst VET systems are well placed to support competitiveness through the development and diffusion of new technologies, processes and services, e.g. through smart specialisation strategies[11], their role in this respect is in need of development[12]. In the context of environment crises, more needs to be done to develop VET's role in the implementation of the UN Sustainable Development Agenda, as attaining the 17 goals requires highly innovative approaches, many of which can be stimulated through competences developed through VET.

7 Dehmel, A.; Van Loo, J.B. (2014). HRD in the European Union. In: Poell, R.F.; Rocco, T.S.; Roth, G.L. (eds). The Routledge companion to human resource development. London: Routledge, pp. 505-518.

8 Hazelkorn, E. (2018) VET and Smart specialisation: a policy brief, Joint Research Centre 10 December.

9 See examples of the reports published by the Joint Research council on the contribution of VET to smart specialisation, including Hazelkorn (2018) idem; Edward, J. and Hazelkorn, E. (forthcoming) Skills and smart specialisation, Seville, Joint Research Centre.

10 OECD. (2016) Skills for a digital world: 2016 Ministerial meeting on the digital economy, background report, OECD: Paris, pp. 6 and 21.

11 European Centre for the Development of Vocational Training (2012). Learning and innovation in enterprises. Luxembourg: Publications Office. Cedefop research paper; No 27. URL: http://www.cedefop.europa.eu/EN/Files/5527_en.pdf, Cedefop. 2015. Stronger VET for better lives, Cedefop reference series 98, Luxembourg: Publications Office of the European Union, p. 71, URL: http://www.cedefop.europa.eu/en/publications-and-resources/publications/3067

12 ET 2020 VET Working Group (2019) Mapping of Centres of Vocational Excellence, https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8250&furtherPubs=yes

1.3. ...but VET systems need to build their capacity to provide more systematic support

In this context, the VET Working Group (2018–2020) was brought together to address the question:

How can innovation and digitalisation boost high quality VET and higher VET?

In line with its mandate[13], the VET Working Group examined innovation and digitalisation in view of creating more flexible and modern high quality VET systems, taking into account key elements such as governance and financing under tight public budgets, VET learning mobility and internationalisation, as well as trends such as the circular economy and globalisation, and social inclusion. The Working Group also examined innovation and digitalisation in VET's broader sector context and how it links to other parts of the education and training system: the borders between IVET and CVET are becoming increasingly blurred[14], whilst VET at higher levels (HVET) continues to develop and expand[15], as does the link with research organisations and businesses as part of the 'knowledge triangle'[16].

To organise the analysis, the model shown in Figure 1.1 was used. This places the processes of teaching and learning at the core, whilst also taking into account the need for effective policies, funding and leadership as well as for VET systems to work cooperatively with a wide range of stakeholders. It also considers new approaches to VET excellence that can act as beacons that engage VET in a broader range of activities with wider groups of stakeholders and build on VET's core strengths whilst also taking it in new directions.

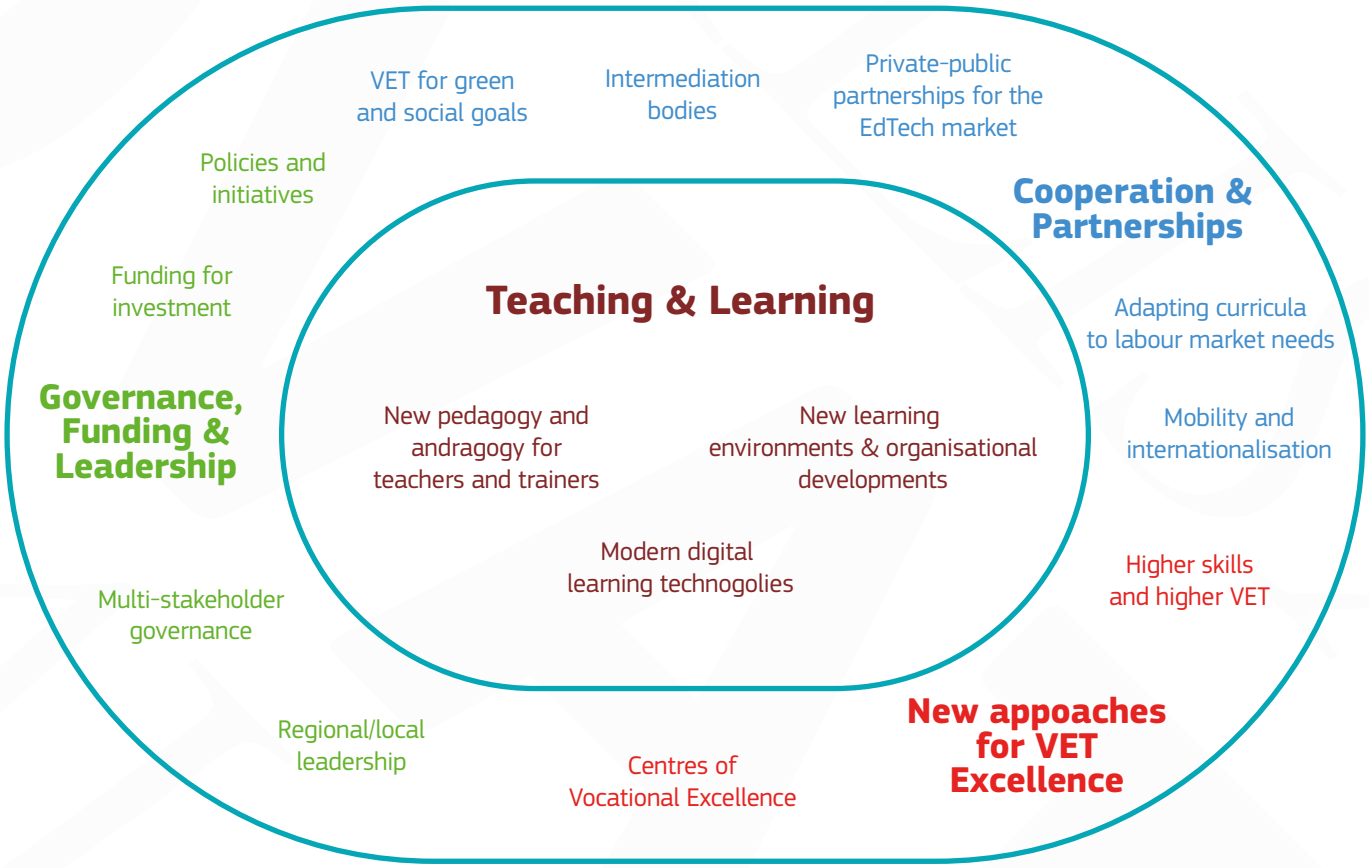
13 See Annex One.

14 Cedefop (2017) The changing nature and role of vocational education and training in Europe. Volume 1: Conceptions of vocational education and training: an analytical framework. URL http://www.cedefop.europa.eu/en/publications-and-resources/publications/5563

15 Cedefop (2019) The changing nature and role of vocational education and training in Europe. Volume 6: Vocationally oriented education and training at higher education levels. URL http://www.cedefop.europa.eu/en/publications-and-resources/publications/5570

16 Joint Research Centre (2017) Higher Education for Smart Specialisation The Case of Navarre, Spain. URL: http://s3platform.jrc.ec.europa.eu/documents/20182/221449/HESS+Technical+report+Navarra.pdf/200cfdc8-9295-4e39-be5d-37d4e906313f

Figure 1.1: Model for exploring the topic of innovation and digitalisation in VET



This report is the culmination of the Working Group's activities around these topics. As the report shows, the Working Group found that VET systems and provision need to be re-orientated in order to better support the major economic, environmental and social shifts taking place and to place VET in a better position to address future developments through innovation. VET linked to innovation and digitalisation has evolved in recent years, but more progress is still required to build the capacity of VET systems to embed innovation and digitalisation. Innovation and digitalisation in particular have the potential to assist the development of CVET and VET at higher levels where it is important to expand capacity to respond to developments in the labour market.

The Working Group found that many examples of good practices in VET exist, from individual activities in schools to national and regional strategies, but they tend to be quite scattered. VET needs to build its capacity to implement systematic approaches to innovation and digitalisation. Building the capacity of VET systems means finding the best combination of bottom-up approaches and leadership involving teachers, trainers and learners with top-level strategy and direction.

VET is also a distinctive sector distinguished from other educational sectors by its strong links to employers and the labour market. As a result, it cannot simply 'copy-paste' practices from other educational sectors: whilst it can learn from experiences elsewhere, VET has to carve out its own innovation and digitalisation pathways that are appropriate to its stakeholders and especially to learners, employers and VET providers.

To assist these processes, the report seeks to provide inspiration for countries to explore how to best make use of innovation and digitalisation in their VET systems by looking at existing European practices, including through EU support. An important way in which the report does this is by showcasing examples of how to innovate and implement digital technologies to inspire policymakers, practitioners and other stakeholders.

1.4. Report structure

The report is structured as follows:

- Chapter 2 provides an introduction to innovation and digitalisation, concluding with a definition to underpin the report.
- Chapter 3 presents the evidence on the effects of innovation and digitalisation.
- Chapter 4 explores the ways innovation and digitalisation are shaping teaching and learning.
- Chapter 5 looks at how VET can work with stakeholders in its wider environment to achieve its goals through cooperation and partnerships.
- Chapter 6 examines governance and funding arrangements that provide the vital framework for developments.
- Chapter 7 looks at two new approaches to VET excellence in higher VET and Centres of Vocational Excellence.
- Chapter 8 identifies a vision, two viewpoints and eight insights based on the analysis of the preceding chapters.

2.0

Understanding innovation and digitalisation

Understanding innovation and digitalisation

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Understanding innovation and digitalisation

This section provides an overview of innovation and digitalisation in VET. It examines innovation and digitalisation separately before looking at the relationship between the two.

2.1. Unravelling the dynamics of innovation

Over the previous decades roughly two thirds of Europe's economic growth is estimated to have been driven by innovation. Additionally, according to data from the 2020 European Innovation Scoreboard, the performance of the EU innovation system, measured as the weighted average of the performance of the innovation systems of all 27 Member States, continues to grow, improving by 8.9 percentage points between 2012 and 2019[17]. Accordingly, investments in research and innovations are expected to generate up to 100,000 new research and innovation jobs between 2021 and 2027. Moreover, for 159 European regions, performance has increased in the nine-year observation period. The 2019 Regional Innovation Scoreboard further demonstrates a strong convergence in regional performance with decreasing performance differences between regions. The most innovative regions in the EU are Helsinki-Uusimaa, Finland, followed by Stockholm, Sweden, and Hovedstaden, Denmark[18]. Helsinki-Uusimaa is one of the fastest growing regions in Europe showing strong cooperation in VET at local and regional level. An example of this cooperation is in the food sector between Fazer company (with a mission to produce new and creative plant-based foods and a commitment to sustainability), the Vantaa Vocational College Varia and the city of Vantaa[19].

In contrast to this broader context, the education sector, including VET, has traditionally been viewed as relatively static and not innovative[20]. Indeed, the OECD's first international survey of teachers, teaching and learning (TALIS) found that just over one quarter of teachers believed more innovation in their teaching would be valued in their schools. Recent surveys of graduate perceptions suggest this might be changing: about 70% of tertiary education graduates working in the education sector think that their workplace is highly innovative compared to 69% in other sectors and industries[21]. More generally, it is crucial for European education and training to become innovative. Innovating would increase productivity, which has been slower to progress in education than in other sectors despite an increase in investment in education[22].

Moreover, education and training institutions need to innovate to stay relevant in the face of technological changes, which make learning outside formal education easier and increasingly common[23]. It has been suggested that current innovations in education and training involving new teaching and learning pedagogies are so fundamental that they correspond to the early stages of a learning revolution: pedagogical examples include problem-based learning and students as co-creators, and the use of technology in classrooms (e.g. virtual learning environments, adaptive learning, immersive environments, mobile learning and flipped classrooms)[24].

17 2020 European Innovation Scoreboard. https://ec.europa.eu/docsroom/documents/42981

18 2019 Regional Innovation Scoreboard. https://ec.europa.eu/growth/industry/policy/innovation/regional_en

19 In the context of the European Vocational Skills Week 2019 in cooperation with the Finnish EU Presidency, a site visit took place to the Fazer company showcasing excellence in VET with its partners.

20 World Economic Forum (2014). Delivering Digital Infrastructure Advancing the Internet Economy. 7. http://www3.weforum.org/docs/WEF_TC_DeliveringDigitalInfrastructure_InternetEconomy_Report_2014.pdf.

21 From surveys REFLEX, the Research into Employment and Professional Flexibility (2005), URL: http://roa.sbe.maastrichtuniversity.nl/?portfolio=reflex-international-survey-higher-education-graduates, and HEGESCO Higher Education as a Generator of Strategic Competences (2008), Lifelong learning programme, URL: http://www.hegesco.org/, –OECD. 2016. Innovating Education and Educating for innovation: the power of digital technologies and skills, OECD: Paris, p. 17 URL: http://www.oecd.org/education/ceri/GEIS2016-Background-document.pdf

22 The phenomenon according to which the productivity of education does not increase in line with investment is widely known as the Baumol disease. See OECD, 2016, Ibid, p. 14 for further information.

23 Bleed, R. (2007). 'A Disruptive Innovation Arrives.' Educause Review 42(1): 72. Barber, M., K. Donnelly, S. Rizvi & L. Summers. 2013. An Avalanche Is Coming: Higher Education and the Revolution Ahead. London: Institute for Public Policy Research. As of 25 May 2016: http://med.stanford.edu/smili/support/FINAL%20Avalanche%20Paper%20110313%20%282%29.pdf

24 Hazelkorn, E and Edwards, J (2019) Skills and Smart Specialisation: The role of Vocational Education and Training in Smart Specialisation Strategies, Luxembourg: Publications Office of the European Union

In the same way, it has been noted that massive open online courses (MOOCs) are changing delivery modes and significantly facilitating access to students for whom the constraints of the traditional/standard experience (time, location, cost, etc.) pose a barrier to entry[25]. These developments are explored in more depth in Chapter 4.

At the same time, digitalisation in VET concerns the purposeful integration of digital technology in educational processes in order to efficiently achieve learning outcomes. Digital pedagogy finds optimal ways to complement traditional ways of teaching in the classroom with modern technologies that allow significantly greater access to educational content and encourage collaborative learning and teaching, both in physical and virtual environments. Significantly, the COVID-19 pandemic suddenly raised the question of how to effectively organise and implement entire educational process in a virtual environment. This shift posed new challenges for teachers and trainers such as how to make intensive use of digital tools and teach in completely virtual environments which has been particularly tricky when it comes to moving practical learning online.

There are many different ways of looking at innovation in general as well as in education and training, as the word cloud demonstrates.

Figure 2.1: Innovation in education and training – key words and perspectives

Source: Generated by the ET2020 VET Working Group, January 2020

25 Hazelkorn, E. (2018) VET and smart specialisation: a policy brief, 10 December, p. 23.

Unravelling the dynamics through which innovation occurs in education and training is crucial to be able to identify the key trigger points that stimulate innovation, in order to design and adopt appropriate policy interventions and measures to support innovations. The OECD (2017: 42-43) provides useful pointers in this respect and suggests that innovation occurs when change takes place among learners, content, resources and educators (including VET teachers and in-company trainers) that the OECD refers to as the 'pedagogical core'. Learners can, for example, change when family and the community are invited, which creates new types of learners. A change in content can occur through a greater focus on inter-disciplinary learning. A change of resources could include new digital resources or redesigning facilities and learning spaces. The profile of educators may change as different stakeholders take responsibility for teaching. More support and training could also change the profile of teachers and trainers.

In addition, the OECD (2017) encourages a '7+3' framework to achieve an innovative learning environment (where 'environment' means the 'organic whole' of learning encompassing more than the physical learning space and including the activity and outcomes of learning, management and leadership). The box below presents this framework.

Box 1: A framework for creating environments for innovation in learning

The OECD's (2017) framework comprises seven principles for the creation of innovative learning environments plus three dimensions required to put the principles into practice effectively. The seven principles consist of:

1. making learning central, encouraging engagement and learners to understand themselves as learners;
2. ensuring that learning is social and often collaborative;
3. being highly attuned to learners' motivations and the importance of emotions;
4. being acutely sensitive to individual differences, including in prior knowledge;
5. being demanding to each learner but without excessive overload;
6. using assessments consistent with these aims, with strong emphasis on formative feedback;
7. promoting horizontal connectedness across learning activities and subjects, in and out of school[26].

And to put the principles into practice requires the following three dimensions:

8. innovation in the 'pedagogical core', i.e. learners, educators, content, resources;
9. becoming 'formative organisations' with strong learning leadership;
10. opening up to partnerships, from immediate families and communities to higher education, cultural institutions, businesses and especially other schools.

26 OECD, (2017). The OECD handbook for innovative learning environments, Paris: OECD, URL: https://read.oecd-ilibrary.org/education/the-oecd-handbook-for-innovative-learning-environments_9789264277274-en#page9

To understand innovation, we also need to appreciate the position of individual practitioners: at some point most innovations, after all, involve what we might term 'micro-decisions' by teachers and trainers in classrooms and workplaces – even when large-scale change programmes are involved.

"Pedagogical innovations require deep changes in teachers' practices and roles in which they are co-designers. Innovations in teaching and learning are not so much assimilated as adopted progressively and creatively by teachers who know how to use their own experiences as 'anchors' for implementation and innovation[27]."

Significantly, most teachers appear to be making decisions about ICT without the benefit of written school plans or strategies of any type: one survey has revealed that only one third of European students attend schools (of all types, general or vocational) that have written statements regarding the use of ICT[28].

It cannot be assumed that all teachers and trainers will embrace the opportunity for change to the same degree and it would be unwise to assume this from a policy perspective. Indeed, change processes are not unproblematic. This can be a particular issue in relation to new technology where older cohorts of teachers and trainers – along with adult learners – may be conservative. There is substantial literature that demonstrates the challenges of change processes, not least because in general 'it has proven difficult to understand what makes teaching "good" or "effective"'[29] and hence understanding what innovations might 'improve' teaching and learning represents a further challenge. Teachers and trainers may be understandably resistant to the risks inherent in change and require support to embrace it, e.g. through continuing professional development (see Section 6.1.1). Significantly, it has been found that 'openness to innovation (amongst teachers) seems to be lower in many European countries than in other parts of the world'[30]. This pattern is hard to explain and even in countries where teacher autonomy is high (as in some Scandinavian countries) innovation rates are low compared to other non-EU countries.

In summary, innovation in teaching and learning rests largely on thousands of decisions made by individual teachers and trainers, often without the support of school strategies. They need the right support to help them to fully understand and assess the risks and benefits of innovation in order to embrace change.

27 OECD (2018) Teachers as designers of learning environments, Paris: OECD, p. 24

28 European Commission, (2019). 2nd Survey of Schools: ICT in Education. DG Communications Networks, Content & Technology. Pp. 23-25. URL: https://ec.europa.eu/digital-single-market/en/news/2nd-survey-schools-ict-education

29 TALIS, (2018) Chapter 2. Teaching and Learning for the Future. Online version, accessed 25.02.20. https://www.oecd-ilibrary.org/education/talis-2018-results-volume-i_d2a4bf35-en

30 TALIS, (2018) Chapter 2. Teaching and Learning for the Future. Online version, accessed 25.02.20. https://www.oecd-ilibrary.org/education/talis-2018-results-volume-i_d2a4bf35-en

2.2. Digitalisation: challenges and responses

Digitalisation raises important opportunities and challenges for European education and training systems and labour markets. It is occurring at a rapid pace across the EU, with developments such as robotisation and artificial intelligence leading to a fourth industrial revolution (industry 4.0)[31]. The digital economy is expanding by more than 10% each year, significantly faster than the economy as a whole[32]. In the EU, the demand for digital technology professionals has grown by 4% annually over the last 10 years, 40% of European businesses cannot find appropriate candidates to fill their positions and the European Commission estimates that there will be a shortage of 756,000 ICT professionals by 2020[33].

The Commission also highlights that 90% of jobs currently require some kind of digital skills, while almost half (44%) of the EU workforce has low basic digital skills, of which 22% has no digital skills at all[34]. The average digital skill use varies across EU Member States. For example, it is only 12% in Romania (41.8% on average across the EU, in 2016 and 2017)[35].

As a result, the EU suffers from a digital skills gap, with the latter group at greater risk of unemployment, poverty and social exclusion; and a mismatch between labour demand and supply. According to the European skills and job survey, 30% of European employees possess qualifications that are not well-matched to those required by their jobs, while about 45% of EU adult workers believe that their skills can be better developed or utilised at work[36]. VET has a major role to play in the reskilling and upskilling of low and medium tech occupations to prevent a polarisation of the labour market and an increase in the digital divide. In addition, IVET is also crucial to train the labour force in the skills of the future: it is estimated that 65% of children entering primary school today will work in occupations that do not currently exist[37].

Against this backdrop, there are many reasons why education and training stakeholders should consider the growing relevance and implications of digitalisation and digitalisation-based innovations. Fundamentally, technology can redefine and transform:

- who learns, e.g. by opening up learning to new groups of people;
- who educates, e.g. the tutor posting videos on Instagram to global audiences;
- the relationships between teachers and learners[38] and amongst learners, e.g. digital platforms enable collaboration such as through shared online writing spaces;
- approaches to learning, e.g. enabling customisation and providing instant, real-time and sometimes more detailed and accurate feedback to learners;
- learning content and resources, e.g. by opening up knowledge that was once inaccessible or promoting 21st century skills using media that are commonplace outside the place of learning;
- learning spaces, e.g. by opening up the virtual, online world and enabling learning anytime, anywhere through mobile devices;
- the costs of learning – though set-up costs can be high, digital technologies can reduce day-to-day costs.

31 See glossary for a definition of these terms
32 World Economic Forum. (2014). Delivering Digital Infrastructure Advancing the Internet Economy. 7. http://www3.weforum.org/docs/WEF_TC_DeliveringDigitalInfrastructure_InternetEconomy_Report_2014.pdf.
33 European Commission (2016), New Skills Agenda for Europe. Employment, Social Affairs & Inclusion. 7. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0381&from=EN
34 European Commission. (2018). Digital Education Action Plan. January 17, 2018. https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en.
35 Cedefop (2019) Skills panorama: digital skills use, URL: https://skillspanorama.cedefop.europa.eu/en/indicators/digital-skills-use
36 Cedefop (2019) European skills and jobs survey, URL: http://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey
37 Europa (2017) The Digital skills gap in Europe. Fact sheet. Luxembourg, URL: https://ec.europa/eu/digital-single-market/en/news/digital-skills-gap-europe
38 OECD (2016), Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills, OECD Publishing, Paris. 68-69. http://dx.doi.org/10.1787/9789264265097-en

An important question is: where does the demand for digitalisation in VET come from? There are three sources of demand:

1. Companies, sectors and professions undergoing changes as a result of digitalisation are likely to express a need for a corresponding digitalisation in VET to meet new digital skill needs. These needs vary considerably across sectors and professions, however[39], and also by company size, with SMEs facing particular challenges in this regard. Some sectors and occupations (e.g. automotive manufacturing) have undergone and continue to experience significant and rapid changes, whilst others (e.g. cleaning) remain relatively untouched, so far. SMEs may struggle to embrace product and process innovations and also to upskill their employees in response to digitalisation. In this context, VET's response to digitalisation is likely to be – and indeed needs to be – differentiated.
2. Teachers and trainers are likely to signal a desire for e-learning tools either in response to needs detected in the industry and/or because of a wish to realise the types of pedagogical and organisational benefits of digital learning noted above. Given the variation of the extent of digitalisation across the industry, it is likely that in sectors/professions of relatively little technological change, a shift to digital teaching methods is likely to be driven from within VET itself, by teachers, trainers and school authorities.
3. Learners may articulate a demand for digitalisation where they are already in work and experiencing digitalisation; and younger learners may desire digitalisation as a result of their exposure to digital technologies and their new skills and expectations with respect to how to learn (e.g. informality and instant engagement). Indeed, this can be a key and challenging source of demand since young learners frequently have better digital skills than their teachers and trainers, creating a gap between demand for and supply of digital learning.

Demand for digitalisation in VET thus comes from all three of the main stakeholders: not just employers and professional occupations, but also teachers, trainers and learners. Employers in some sectors may drive demand for digital learning, whilst in other sectors the demand may come from teachers. Learners' experiences with digitalisation may outpace those of their teachers, opening up a gap between demand and supply.

In this context, it is also important to consider the different types of skill needs emerging in the industry as a result of digitalisation and how digitalisation in VET can meet them. Broadly speaking, it is helpful to recognise three main skill changes resulting from changes in production and services: general digital competence; specific, technical digital skills; and transversal skills, e.g. where new ways of working require strengthened or different mixes of such skills. VET can use digitalisation as an effective support for the development of general digital and transversal competences applicable across a wide range of sectors and occupations; and also technical digital skill development where the pattern of needs is likely to be more heavily differentiated by sector/occupation, as noted above.

In this regard, it is also worth noting that digital learning appears to be associated with particular types of teaching and learning which help to develop skills increasingly needed in the modern workplace: notably social/collaborative learning, project-based learning, learning-by-doing, learning related to real-world issues and learner-centred teaching. For instance, digital technologies can provide platforms where individuals from different subject backgrounds can cooperate in practical ways on real-world topics. Students have reported their teachers using computers in mathematics lessons to a greater extent where the focus is on formulating and solving real-world problems (e.g. in engineering,

39 Sectors and occupations vary considerably in their exposure to automation. See the work of Cedefop https://ec.europa.eu/info/sites/info/files/research_and_innovation/ege/konstantinospouliakas_slides.pdf

biology or finance) and where teachers are more inclined and better prepared for student-oriented teaching practices, such as group work, individualised learning, and project work[40]. Similarly, using ICT in mathematics lessons and exposing students to applied mathematics problems has been shown to be positively associated with students' self-reported use of strategies where they make connections between the task at hand, prior knowledge, other topics and real-life experience[41]. This is not to say that digitalisation causes such teaching and learning methods to be used, but the evidence certainly points to digitalisation facilitating teachers in their quest to adjust pedagogies and curricula to the needs of the modern world.

In summary, digital learning can not only support the development of general and technical digital skills directly needed by modern industry – and for life in general, as highlighted by the COVID-19 pandemic – but also broader transversal skills like teamwork through its association with pedagogies like social/collaborative learning, project-based learning and learner-centred teaching.

In light of these needs, what progress has been made with digitalisation in education in Europe? The European Commission, in its survey of the use of ICT in schools, shows that in upper secondary education, Nordic Member States, including Iceland, Denmark and Sweden, are clear frontrunners in terms of deploying (high-speed) internet to schools[42]. The report also shows the variations in ICT policies across Member States, e.g. through comparing the existence of a written statement about ICT use at school level. Here, the findings revealed that there are large variations across different European countries for all International Standard Classification of Education (ISCED) levels. In some Member States, at ISCED 3 (upper secondary level) only 3–15% of students attend schools that implement written statements about the use of ICT (Slovenia, Greece, Croatia, Hungary) while in other Member States, as many as 75–85% of students attend such schools (Estonia, Finland and the Czech Republic)[43]; although some caution should be exercised here since whether schools have written statements may depend on wider organisational/managerial arrangements and the degree of autonomy of schools within education systems.

These figures show the scale and spread of ICT infrastructure and plans: but to what extent is ICT used in education and training? This question is addressed in section 4 (and 4.4 especially) but here it should be noted that figures from TALIS show a significant rise in teachers letting students use ICT for projects or classwork since 2013[44]. Between 2013 and 2018, the largest changes that took place in Europe occurred in Finland, Romania and Sweden where the percentage of teachers reporting that they frequently or always let students use ICT for projects or classwork increased by 30 percentage points or more.

What does digitalisation in education and training involve? As with innovation, there is a vast array of perspectives on digitalisation (see graphic).

40 OECD (2015), Students, Computers and Learning: Making the Connection, PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264239555-en, p. 16

41 Echazarra, A. et al. (2016), "How teachers teach and students learn: Successful strategies for school", OECD Education Working Papers, No. 130, OECD Publishing, Paris, https://dx.doi.org/10.1787/5jm29kpt0xxx-en.

42 European Commission, (2019). 2nd Survey of Schools: ICT in Education. DG Communications Networks, Content & Technology. Pp. 23- 25. URL: https://ec.europa.eu/digital-single-market/en/news/2nd-survey-schools-ict-education

43 Ibid, 100.

44 TALIS 2018 Chapter 2. Teaching and Learning for the Future. Online version (no page numbers), accessed 25.02.20

Figure 2.2: Digitalisation in education and training – key words and perspectives

Source: Generated by the ET2020 VET WG, January 2020

In this context, it is important to identify a coherent framework that helps us to understand digitalisation systematically. The literature uses various conceptual frameworks to reveal the ways in which digitalisation occurs in educational institutions[45]. The Institute for Information Technology of UNESCO (2003) has assessed the extent to which ICT has been integrated into education systems by applying 'Morel's Matrix'. This model suggests an educational system moves between four distinct phases:

(a) emerging, (b) applying, (c) integrating and (d) transforming[46]. A given learning environment can be positioned on the matrix through the assessment of various criteria, such as content, pedagogy or curriculum.

45 For an overview of these conceptual frameworks, see the summary by the education, technology and society research site, URL: https://sites.google.com/site/indicadoresperu/home ; Newhouse, P. (2002). The Impact of ICT on learning and teaching. Perth, Western Australia: Specialist Educational Services, URL: http://www.det.wa.edu.au/education/cmis/eval/downloads/pd/impactreview.pdf; UNESCO. (2003a). Consultative Workshop on Performance Indicators for ICT in Education. Bangkok: UNESCO Asia and Pacific Regional Bureau for Education, URL: http://www.unescobkk.org/fileadmin/user_upload/ict/ebooks/ICTindicators/ICTindicators.pdf UNESCO. (2003b). Developing and using indicators of ICT Use in Education. Bangkok: UNESCO Asia and Pacific Regional Bureau for Education, URL: http://www.unescobkk.org/fileadmin/user_upload/ict/e-books/ICTedu/ictedu.pdf UNESCO. (2003). Measuring ICT use in education in asia and the Pacific through performance indicators. Monitoring the information Society: Data, Measurement and Methods (pág. 9). Geneva: UNESCO, Bangkok. URL: http://www.unece.org/stats/documents/ces/sem.52/6.e.pdf; UNESCO. (2003a). Consultative Workshop on Performance Indicators for ICT in Education. Bangkok: UNESCO Asia and Pacific Regional Bureau for Education, URL: http://www.unescobkk.org/fileadmin/user_upload/ict/ebooks/ICTindicators/ICTindicators.pdf Wagner, Daniel A., Bob Day, Tina James, Robert B. Kozma, Jonathan Miller and Tim Unwin. 2005. Monitoring and Evaluation of ICT in Education Projects: A Handbook for Developing Countries. Washington, DC: infoDev /World Bank, URL: http://www.infodev.org/en/Publication.9.html Inter-American Development Bank (2010), Projects for the use of Information and Communication Technologies in Education. A conceptual framework. Eugenio Severin C, URL: http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=35185543;

46 UNESCO (2003b). Towards policies for integrating information and communication technologies into education, Paris: UNESCO.

Table 2.1: Stages in Morel's Matrix

Criteria:	Phases:			
	Emerging	**Applying**	**Integrating**	**Transforming**
Vision	limited, pragmatic, dominated by interested individuals	driven by ICT specialists	driven by subject specialists	entire learning community involved
Learning pedagogy	teacher centred	teacher-centred; ICT is a separate subject	learner-centred; collaborative	critical thinking; preferred learning styles; collaborative; experimental
Development plan and policies	Accidental; restrictive; no planned funding	limited; centralised policies	individual subject plans for ICT; permissive policies	ICT is integral to overall school development plan (budget, professional development, etc.)
Facilities and resources	limited and non-current digital resources; restricted access	platform that is diverse and adopts different business models; aligned with specific content and pedagogies	diffused access to various digital resources; supports implementation of these in various ways	whole school learning and diverse learning environments; web-based learning spaces; distance education; student self-management software
Understanding of curriculum	ICT literacy; responsibility of individual teachers	use of software and applications in discrete subjects (isolated)	integrated; resource-based learning, problem-solving project methodology	virtual and real-time context modelling; integrated curriculum delivery via the web

Criteria:	Phases:			
	Emerging	**Applying**	**Integrating**	**Transforming**
Professional development	individual interest	training on ICT applications; unplanned	subject-specific; evolving	integrated learning community; innovative; self-managed, personal vision and plan
Community	accidental	some parental and community involvement	subject-based community, providing occasional guidance; global and local net-works	broad-based learning community involving families, business, industry, organisations, universities, etc.; school as a learning tool
Assessment	responsibility of individual teacher; didactic; paper and pencil based	teacher-centred; subject-focused	learner-centred; subject-oriented; integrated; multiple media to demonstrate attainment	continuous, holistic, open-ended, project-based learning community involvement

Source: Adapted from OECD, 2013[47]

47 Groff, J. (2013) 'Technology-rich innovative learning environments', February, Paris: OECD, URL: http://www.oecd.org/education/ceri/Technology-Rich%20Innovative%20Learning%20Environments%20by%20Jennifer%20Groff.pdf

The matrix shows that digitalisation occurs in four stages in educational institutions.

- In the first stage, digitalisation emerges, but still has not penetrated the institution. The vision remains dominated by individual interests, learning and assessments are teacher-centred, there is no plan funding and there are limited resources.
- In the second stage, digitalisation becomes applied, ICT evolves into a separate subject, ICT specialists start to drive the vision, centralised policies are published but limited, facilities and resources are diverse and varied in terms of their business model, there is an isolated use of software, unplanned professional development and some parental and community involvement. Assessments remain teacher-centred and tend to be subject-focused.
- In the third stage, digitalisation becomes integrated. Subject specialists integrate digitalisation in their vision. They move the learning pedagogy to a learner-centred and collaborative approach, with permissive policies for individual subject plans for ICT. There is diffusing access to various digital resources and integrated, resource-based learning. Professional development evolves and a subject-based community emerges with global and local networks. Assessments become integrated and use multiple media to demonstrate attainment.
- In the final stage, digitalisation becomes transforming. It involves the entire learning community. The learning pedagogy is amended to involve critical thinking, preferred learning styles and to be collaborative and experimental. ICT becomes integral to the overall school development. Various facilities and resources are available, including web-based learning and distance education. The web is integrated into the delivery of the curriculum, which contains a virtual element. Professional development benefits from an integrated learning community, where individuals can self-manage their development and the community at large, including families, businesses and industry. Assessments become continuous, holistic, open-ended, project-based and involve the learning community.

Innovations in education, particularly those resulting from new technologies, attract considerable attention and are to some extent a side-effect of the ubiquitous nature of ICT in society, with 71% of EU citizens being online daily or almost daily in 2016[48]. Yet, Bayne and Ross (2014) highlight that it is important for technology to be integrated in a teaching and learning strategy[49]. New technologies do not just support the user to carry out tasks. They make learning happen in a different way, using a network approach rather than in the top-down manner of traditional lectures through new technologies[50]. Hence, it is important to look not only at the new tools provided by digitalisation for use in the classroom (see Chapter 4), but also at how digitalisation changes pedagogies, curricula and learning environments[51].

48 Europe's Digital Progress Report, (2017). Human Capital: Digital Inclusion and Skills in the EU 2017. European Commission. https://ec.europa.eu/digital-single-market/en/european-digital-progress-report

49 See also: Flavin, M. (2013). 'Disruptive Conduct: The Impact of Disruptive Technologies on Social Relations in Higher Education.' Innovations in Education 53(1). doi:10.1080/14703297.2013.866330

50 50 Bayne, S. & J. Ross. (2014). The Pedagogy of Massive Online Open Courses, the UK View. York: Higher Education Academy. As of 25 May

51 For a visual representation of digital forms of learning, updated every year, see Institute for Media and Communications research (Institute für Media und Competenzforschung), MMB Institut (2019) Digital Learning forms (Digitale Learningforme), p. 28, URL: https://www.mmb-institut.de/wp-content/uploads/mmb_Uebersicht_Digitale-Lernformen_2019.jpg

2.3. Defining the relationship between innovation and digitalisation

It is clear from the foregoing discussion that innovation and digitalisation are closely related and both exhibit a broad range of perspectives. Indeed, distinguishing the two is hard to maintain on a practical level: much of the literature makes no clear distinction and suggests that digitalisation is currently the dominant driver of innovation in education and training. As the OECD has put it: 'it is difficult to imagine innovation strategies in education without a strong focus on developing digital skills among students and learners'[52].

The definition included in the OECD's Oslo Manual constitutes the most widely accepted definition of innovation and has been adapted by the OECD (2016) to education[53]. A definition is also used by Eurostat, which is valuable for being concise and easy to understand[54] and the 2021–2027 regulation for the European Institute of Innovation and Technology also provides an innovation definition[55]. Drawing on these definitions, the following definition relevant for VET is used in this report:

Innovation is the use of new or significantly redesigned teaching and learning tools, methods or environments (such as digital learning tools, MOOCs or virtual reality) or new organisational methods (for example using a new app or software to interact with employers) aimed at improving the quality of VET in response to environmental sustainability and social and economic needs.

In this definition, innovation implies the introduction of a new element and is different from change or reform[56]. However, what is considered as new in one environment may not be in another, hence, innovation is context dependent[57]. In addition, innovations are implemented at different speeds. Some innovations are slow and incremental rather than rapid and involving a sudden step change[58]. With regard to digitalisation in education and training, the changes involved go beyond the introduction of digital tools in curricula and pedagogy (digital tools are described in Section 4.2): they also involve changes in organisations, including the culture of an organisation, its processes and the requirements for certain jobs (as described in Section 6.4). Furthermore, VET has a broader innovation function in generating the development or adoption in companies and other organisations of new or improving existing products and services (see Section 6.1.2 which discusses the broader role of VET).

52 OECD. (2016). Innovating education and educating for innovation, OECD: Paris, p.65.

53 Organisation for Economic Cooperation and Development (OECD)-Eurostat. (2005). Oslo Manual for collecting and interpreting innovation data, 3rd edition. See also the adapted definition in OECD (2016) Innovating education and educating for innovation, OECD: Paris, p. 16

54 Innovation is the use of new or significantly improved ideas, products or methods where they have not been used before'. Eurostat (2012). Statistics explained, glossary: innovation. https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Innovation

55 https://ec.europa.eu/education/sites/education/files/document-library-docs/proposal-regulation-eit.pdf

56 OECD. (2016). Idem, pp 15-16

57 Hoareau McGrath et al. (2016). Governance and adaptation to innovative modes of higher education provision, final report, Erasmus multilateral project, p. 14, URL: https://www.rand.org/pubs/research_reports/RR1571.html

58 Brennan, J., Ryan, S., Ranga, M., Broek, S., Durazzi, N., and Kamphuis, B. (2014) Innovation in higher education: final report, p. 5 URL; http://www.lse.ac.uk/business-and-consultancy/consulting/assets/documents/study-on-innovation-in-higher-education.pdf

It should be noted that not all innovation relies on digitalisation and not all digitalisation is linked to radical innovation. For example, arguably the most significant innovative trend of recent years, learner-centred education, does not depend on digital technologies. Although, at the same time, digitalisation can considerably aid this pedagogical development. Similarly, many recent organisational innovations (such as those described in Section 6.4) do not depend on digital technologies.

On the other hand, it is easy to assume that digitalisation = innovation. But many forms of digitalisation do not significantly change how or where teaching and learning take place, though they may still be valuable additions to the repertoire of teaching and learning strategies:

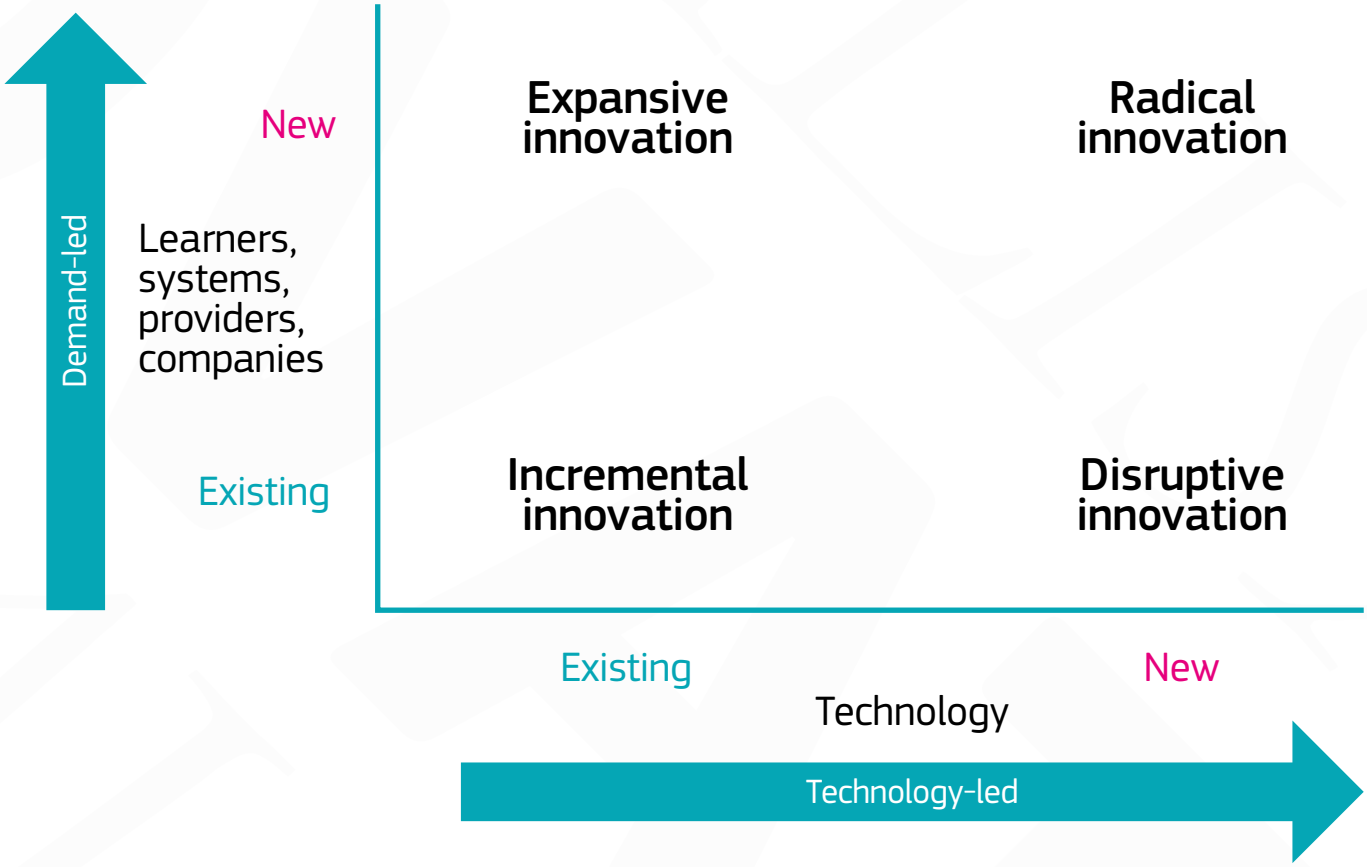
'[…] the mere presence of technology is not by itself sufficient to innovate […] nor should innovation be assumed to be synonymous with going digital, as this may only be reproducing traditional methods and pedagogies with a different format.' OECD (2017)[59]

Where digital technologies do affect learning, it is evident that different digital technologies vary considerably in their effects on learning processes and, equally, the same digital technology may also vary in its effects. What makes the difference is how technology is used. For example, in schools, the advent of the internet and interactive whiteboards first enabled teachers and trainers to access more resources than ever before whilst often there was little impact on learning processes. However, the same technology also opens up possibilities for pedagogical change towards blended learning and 'flipped classrooms'.

It is important to be alert to such differences. This report does not examine in depth types of digitalisation that involve little or no innovation in teaching and learning. This is not to say that innovation in VET should involve digitalisation; it is simply to highlight the report's focus. In other words, the report reflects Hazelkorn's assertion (highlighted at the start of this chapter) that we are in the early stages of a learning revolution where major shifts are taking place in how people learn. The evidence suggests we are starting to experience forms of innovation that are disrupting existing – and often long-established – ways of teaching and learning and introducing often radical changes, linked to new technologies on the one hand and to the emergence of demand for new skills driven by digitalisation in the labour market on the other (see Figure 2.3).

59 The OECD Handbook for Innovative Learning Environments, p. 46.

Figure 2.3: Types of innovation in VET



Source: adapted from Jorge Lopez, 2015.[60]

60 Jorge Lopez, (2015). Types of innovation, constant contact tech blog. https://techblog.constantcontact.com/software-development/types-of-innovation/

As we will see later, not all innovations are radical and disruptive, nor do they involve sudden change: much progress is small-scale and incremental. Nonetheless, it is important to be aware of the overall nature of the changes starting to take place within VET learning environments in response to the radical and disruptive changes taking place outside, and which were given a further boost by the COVID-19 pandemic, which caused a sudden jump in the necessity of remote online learning as evidenced in the country examples below.

Box 2: Country responses in COVID-times

Greece and remote learning during COVID-19

The Hellenic Ministry of Education has adopted a series of actions related to promoting education during the COVID-19 pandemic. Distance education platforms and software that extends students' access to all educational levels of formal schooling have been implemented, encompassing 399 vocational upper secondary schools and public institutes of vocational training. As regards public secondary/non-tertiary VET (IEK), the percentage of courses translated into non-synchronous education reached up to 97%, with trainers actively participating in distance education at 81%, and 96.5% of registered students participating.

More specifically, three pillars of distance learning have been developed: synchronous teaching methods (live lessons on Webex platforms for all levels of education), non-synchronous teaching methods (educational material on websites and platforms, available to all teachers and students of all educational levels) and educational television programmes for elementary school students.

Remote learning has been made accessible through internet connections offered free of charge or by phone. Platforms with digital educational material were also accessible to all and included e-books[61], digital educational material[62], digital seminars through the Aesop platform[63], and other e-tools including WebEx meetings, e-me[64] and e-class[65]. Disadvantaged students were able to borrow electronic equipment donated by the private sector or bought by municipalities to help them study at home when schools were closed.

In terms of support measures for teachers, daily online training sessions were held to introduce synchronous teaching methods. In addition, the Hellenic Support Service for the eTwinning action offered an online course 'Staying home with eTwinning'. This aimed to train teachers in the use of concurrent and non-concurrent models of online teaching.

Source: Written contribution from Greek WG members, 2020[66]

61 http://ebooks.edu.gr/new/
62 http://photodentro.edu.gr/aggregator/
63 http://aesop.iep.edu.gr/
64 https://auth.e-me.edu.gr/?eme=https://e-me.edu.gr/&cause=no-token&eat=8bee1630b0729a95fc493d735b00858c
65 https://eclass.sch.gr/
66 This example is based on an internal document prepared specifically for this report by Greek members of the Working Group based on recent articles, parliamentary discussions and E-twinning materials. For more information, please see: https://seminars.etwinning.gr/

Denmark and online guidance for school leaders

In relation to the COVID-19 pandemic, the Danish Ministry of Children and Education has also provided online guidance for school leaders on how to deal with emergency education including remote teaching during the pandemic. In addition, the Ministry has provided didactical counselling and tools for teachers who have to do remote teaching and, in cooperation with the vocational education institutions, collected good examples on use of digital platforms and teaching materials which can contribute to the improvement of the preparation, completion and evaluation of teaching. Teachers have been able to access a number of centralised ICT resources, such as the Aula platform (used in all public schools), Lectio, Ludus or other platforms (used in upper secondary schools), to send teaching plans, lesson plans and information on homework to students and parents. Students were then responsible for completing the work. Parents were informed about their role in supporting the distance lessons, as were the teachers. Online help for teachers has been provided both the public and the private sector. Multiple publishers of teaching materials have made their content free and available online during the school closures.

Source: CEDEFOP, 2020[67]

Romania – available digital education platforms and tools

In Romania, the Ministry of Education has provided online platforms for free use during COVID-19. Distance education has further been made possible by using various applications including Google Classroom, Google Meet, Google Hangouts, Zoom, Microsoft Teams, Livresq, Webex Meetings, Windows 10 and Office 365 applications, Skype and WhatsApp. The Ministry of Education also initiated a series of educational television programmes with the national TV provider.

Croatia – online work-based learning solutions

In Croatia, in response to COVID-19, the Agency for VET and Adult Education (AVETAE) took steps to set up a learning portal by gathering materials and editing them for online publishing with the aim to provide support as opposed to replacing IVET and CVET providers in the implementation of distance learning. The process was shaped and run by AVETAE who moved ahead with setting up the online portal in the span of 72 hours. It was subsequently launched 12 March 2020[68]. All materials on the portal have been reviewed and edited. A VET portal was set up covering 13 VET sectors, with transversal and joint topics. In this context, work-based learning (WBL) was a big challenge so the Agency sent out a call for all VET schools to send their digital contents to be published. Through chambers and the employer's association, companies were also asked to send their materials. Overall, around 5,660 materials were published, including video lessons, video/voice-over PowerPoints, e-courses, webinars and research projects. Recommendations for assessments and grading during distance learning in VET (with practical examples) were also published, with contributions from approximately 100 teachers[69].

Source: Cedefop, 2020[70], Nastava.asoo, 2020[71]

67 https://www.cedefop.europa.eu/en/news-and-press/news/denmark-reactions-covid-19-outbreak
68 https://nastava.asoo.hr
69 Ibid
70 https://www.cedefop.europa.eu/es/news-and-press/news/romania-responses-covid-19-outbreak
71 https://nastava.asoo.hr

Turkey's vocational schools – crucial efforts to contain the pandemic

In Turkey, dozens of vocational schools have joined forces and begun producing essential items in the fight against the COVID-19 pandemic, becoming one of the most important actors of the country in containing the country's COVID-19 outbreak. Essential items produced include objects such as masks, disposable equipment and cleaning materials. With the help of 3D printers, the schools are also mass-producing face shields with enough capacity to supply up to half a million of them per month. In stepping up to assume this critical role, these vocational schools have also helped to improve the public perception of VET in the country.

Source: WG meeting input, 2020[72]

Key issues highlighted in Chapter 2

Not all digitalisation leads to innovation, and not all innovation relies on digitalisation. But, even before COVID-19, we were starting to experience innovation that was radical and disruptive, linked to the demand for new skills which is driven by technological change and the growing use of digital technologies in VET. Social/collaborative learning, project-based learning, learning-by-doing, learning related to real-world issues and learner-centred teaching all help to develop the skills needed in the modern workplace and all are associated with digital learning.

Demand for digitalisation in VET comes as much from teachers, trainers and learners as it does from external stakeholders like employers. Indeed, learners' experiences with digitalisation may outpace those of their teachers, opening up a gap between demand and supply.

Innovation in teaching and learning depends on the 'micro-decisions' of individual teachers and trainers as much as school plans or national policies: they need the right support to help them fully understand and assess the risks and benefits of innovation.

72 Input provided by WG member during July 17 Webinar (2020).

3.0

The effects of innovation and digitalisation

The effects of innovation and digitalisation

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The effects of innovation and digitalisation

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The effects of innovation and digitalisation

In this section we examine the evidence regarding the potential effects of innovation and digitalisation. Consideration is given to how innovation and digitalisation may widen access, shape the ways learners learn and the outcomes achieved by learners, as well as the efficiency and effectiveness of provision and how learners' achievements are (or should be) recognised and validated. Principally these effects impact individual learners but they may also affect educational institutions.

3.1. Widening access

One effect of innovation and digitalisation relates to widening access. Certain innovations, particularly those pertaining to open access, have been hailed for their potential to widen access[73]. For example, digitalisation supports learners in transition, e.g. moving between different grade levels or institutions, switching from individual to collaborative work, or even recovering from sickness. Mobile learning can help to provide continuity for learners during these periods of transition, when traditional educational opportunities may not be accessible[74]. However, the European Commission notes that careful consideration is required when selecting digital tools in formal education (such as robot or programming environments like Scratch), because gender, social background and age may influence how students engage with and are motivated by these digital tools[75]. Indeed, it is legitimate to ask whether digitalisation might widen or reduce inequalities in VET. Socially disadvantaged families may lack equipment, infrastructure (as the COVID-19 pandemic has highlighted) and digital tools and accompanying pedagogies may be inadequate for learners with special needs without being adapted. Especially with regard to CVET – where access is already unevenly distributed – digital technology may, without public intervention, have the potential to benefit those who already have the capability to access learning opportunities rather than those who do not.

Digitalisation also allows access to boundless educational materials and experiences that previously would not have been possible, or accessible only in discrete locations (e.g. a university library). This has important implications for how learners assess the quality of what is on offer and highlights the need for teachers to act as 'intermediaries' in facilitating access to such resources. It also has implications for how learners have their learning experiences validated.

73 See for example Taylor, J. (2017) The Real power of an inclusive digital strategy, URL: https://www.jisc.ac.uk/blog/the-real-power-of-an-inclusive-digital-strategy-09-jan-2017; See also: Hazelkorn (2018: idem, 29)' s example of VET and the automotive industry in Västra Götaland, Sweden; where a number of initiatives have been developed to attract interest in the automotive sector and widen its access in order to meet the challenges of a shrinking supply of labour due to demographic change and a change in skill requirements.

74 For more information, please see: http://www.motill.eu/images/motillbooklet_en.pdf

75 European Commission (n/a) Annex 1: key messages from PLAs, p. 6.

3.2. Changing how learners learn

A key effect of innovation and digitalisation is changing the way learners learn. The main ways in which this can happen are by:

- Broadening the range and reach of learning experiences, e.g. by providing access to a vast range of resources online, through video-based teaching and learning (such as through anatomy lessons in virtual or augmented reality for medical personnel).
- Enabling students to contextualise and apply their learning in the real world by accessing learning opportunities outside the classroom, e.g. augmented and virtual reality allows students to rehearse risky processes in safe and controlled conditions[76].
- Facilitating communication, connection and collaboration. In the past, student groups were largely confined to those within physical reach, e.g. those in a school or local community. Schools can now easily connect to share information and collaborate via social media. They can also connect and collaborate with learners in different countries.
- Encouraging more learner-centred learning by inspiring students to take more responsibility in directing and managing their own education and allowing teachers space to personalise learning for students. For example, in video-based teaching and learning the learner is actively engaged and interacts with the video materials by controlling the pace of viewing, answering embedded questions and quizzes, adding reflective layers of information to the video, and directly manipulating or even creating video material from scratch[77].

These types of effects are widely reported to increase student interest and attention in lessons and to boost their motivation, such as in the case of augmented reality[78].

76 Delello, (2014), idem. Singhal, S., Bagga, S., Goyal, P., & Saxena, V. (2012) 'Augmented chemistry: Inter-active education system', in International Journal of Computer Applications, 49(15), pp.1–5. Wojciechowski, R., & Cellary, W. (2013) 'Evaluation of learners' attitude toward learning in ARIES augmented reality environments', in Computers & Education, 68, 570–585.

77 Cattaneo, A., Evi-Colombo, A., Ruberto, M. & Stanley, J. (2019). Video Pedagogy for Vocational Education. An overview of video-based teaching and learning. Turin: European Training Foundation.

78 Delello, J. A. (2014). 'Insights from pre-service teachers using science-based augmented reality', in Journal of Computers in Education, 1(4), pp. 295–311. Kamarainen, A. M., Metcalf, S., Grotzer, T., Browne, A., Mazzuca, D., Tutwiler, M. S. and Dede, C. (2013) 'EcoMOBILE: Integrating augmented reality and probeware with environmental education field trips' in Computers & Education 68: 545-556. Karasavvidis, I., & Kollias, V. (2017). Understanding Technology Integration Failures in Education: The Need for Zero-Order Barriers. In Reforms and Innovation in Education. Springer Science, pp. 99-126. Perez-Lopez, D., & Contero, M. (2013) 'Delivering educational multimedia contents through an augmented reality application: A case study on its impact on knowledge acquisition and retention', in Turkish Online Journal of Educational Technology- TOJET, 12(4), pp. 19–28. Tomi, A. Bin, & Rambli, D. R. A. (2013) 'An interactive mobile augmented reality magical playbook: Learning number with the thirsty crow', in Procedia Computer Science, 25, pp. 123–130.

3.3. Shaping the outcomes of learning

There is much discussion on the potential benefits of innovation/digitalisation in terms of the outcomes for individuals from their learning. For example, Ng (2015) explains that digital technologies could increase learning outcomes by:

a) increasing students' motivation;

b) promoting cognitive development;

c) providing interactive resources and real-life experiences that can be practiced before entering the real work experience;

d) facilitating the demonstration of what students have learnt;

e) providing means of communication and collaboration (between students and teachers, teachers and parents, among students and among teachers);

f) catering learning material and resources to the pace of each student;

g) enabling research through the availability of large data sets;

h) enabling the continuity of learning from inside the classroom to outside the classroom. Nonetheless, evidence is beginning to accumulate around the effects on learning outcomes. For example, video clips have been shown to increase the amount of content remembered by learners[79].

Notwithstanding such intended outcomes, as the European Commission notes, there is much less concrete evidence on the positive impacts on learning outcomes[80]. Indeed, innovation may not always add value, especially to learning outcomes. Issues already associated with digital learning and those heavily debated include problems of students plagiarising the work of others and the need to ensure proper safeguards are in place around young students' use of the internet. Some digital technologies may make tasks easier, reducing the thinking required by learners, and counter-balancing any positive gains in terms of learning outcomes – the 'shallowing hypothesis'[81]. A striking finding from the OECD's global PISA survey is that '… limited use of computers at school may be better than not using computers at all, using them more intensively than the current OECD average tends to be associated with significantly poorer student performance'[82]. However, it is essential to note that this is an association and not a causal relationship: it is possible that ICT is being used in the hope of improving student performance and that this strategy is not working. This demonstrates the complexities of deploying digital learning well: there is no easy or straightforward relationship between ICT and student performance – what matters is the actual way teachers and trainers use it and their ability to integrate it into teaching processes[83].

VET practitioners need support to develop the skills and knowledge in this regard and at the level of VET systems there needs to be awareness of the potential strengths and weaknesses of different forms of digital learning through realistic assessments of the pros and cons of proposed innovations and digital technologies.

79 Berk, R. A. (2009). Multimedia teaching with video clips: TV, movies, YouTube, and mtvU in the college classroom. International Journal of Technology in Teaching and Learning, 5(1), pp. 1–21

80 European Commission (n/a) Discussion document for the kick-off of the ET2020 Working Group digital education: learning, teaching and assessment, p. 2.

81 E.g. Kong, Y., Seo, Y. S., & Zhai, L. (2018). Comparison of reading performance on screen and on paper: A meta-analysis. Computers & Education, 123, 138-149; Clinton, V. (2019) Reading from paper compared to screens: A systematic review and meta-analysis. Journal of Research in Reading, 42: 288– 325. https://doi.org/10.1111/1467-9817.12269; Delgado, P., Vargas, C., Ackerman, R., & Salmerón, L. (2018). Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. Educational Research Review, 25, 23-38. https://www.sciencedirect.com/science/article/pii/S1747938X18300101

82 OECD (2015), Students, Computers and Learning: Making the Connection, PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264239555-en p. 16

83 Comi, S. et al. (2017), "Is it the way they use it? Teachers, ICT and student achievement", Economics of Education Review, Vol. 56, pp. 24-39, http://dx.doi.org/10.1016/j.econedurev.2016.11.007.

3.4. Effects on the efficiency and effectiveness of learning

There is some debate around the efficiency and effectiveness of innovations/digitalisation. For example, some problem-based learning courses cover about 80% of the same curriculum compared to a conventional course in the same amount of time but such gains may be offset by changes in traditional assessment methods (e.g. examinations) can have significant transaction costs and may increase the time spent in preparing new material[84]. As before,

VET systems need to be aware of and account for the most effective and efficient outcomes of potential innovations.

3.5. Effects on how learning is recognised and validated

Educational institutions are in the midst of dealing with shifting boundaries between formal and non-formal education. Opportunities such as MOOCs raise the issue of the validation and recognition of non-formal training, and the multiplication of alternative modes of validation, such as badges or certificates of completion. These alternative types of validation change the options available to individual learners and challenge the role of education institutions in validating learning (through qualifications). They can potentially lead to a need for more cooperation between formal and non-formal education providers on the topic of validation[85]. VET needs to be equipped to deal with these developments at a system-wide level, rather than leaving it to individual providers to work out as this risks developing a 'patchwork quilt' of approaches to validation that is potentially inequitable to learners (the type of validation available might simply depend on where you happen to live).

84 Major, C. and Palmer, B. (2001) 'Assessing the effectiveness of problem-based learning in higher education: Lessons from the literature', in Academic exchange quarterly, 5 (1), pp. 4--9.

85 European Commission (n/a) Key messages from PLAs, p. 6.

3.6. Recognising the complexity of effects

The evidence presented in this section has highlighted both the positive effects of digitalisation and innovation and the challenges they raise. It has also drawn attention to the weakness of the evidence base, which means it is more accurate to talk about the potential benefits of digitalisation, whilst also flagging the risk that certain technologies may not deliver expected positive effects but on the contrary return negative outcomes. A key conclusion arises from this: the complex nature of the challenges means it should not be left to individual schools, teachers, trainers and employers to navigate their way through the decision-making processes involved. Yet in Section 2.1 it was noted that micro-decisions of individuals about which technologies to use typically dominate this landscape: teachers tend to use small bits of e-learning when it is useful to do so. A lack of coordination or organisation of teachers' engagement with technology is likely to lead to lost opportunities. In-company trainers – who are not normally required to possess much expertise in respect of pedagogies – are also likely to need support to understand how digital learning technologies might support work-based learning. System-level support including comprehensive approaches to initial training and continuing professional development is needed to help teachers and trainers make the right choices for the learners, whilst not reducing the autonomy teachers enjoy which provides the fertile ground for innovation.

Key issues highlighted in Chapter 3

Innovation and digitalisation have potential to widen access to VET, but careful consideration needs to be given as to how factors like socio-economic backgrounds and gender affect the up-take of innovations to ensure perverse effects – such as negative learning outcomes – do not occur. Where digital access is already uneven, particular care has to be taken, as highlighted by the COVID-19 pandemic.

Innovation and digitalisation can also have positive effects in terms of how people learn, how motivated they are to learn and what the outcomes of learning are. However, there is a shortage of evidence on what works and why. The relationship between ICT and student performance is not straightforward. The key success factors are how teachers and trainers use technology and their ability to integrate it into teaching/training processes. But how are they to come to grips with the vast – and growing – array of digital possibilities in a context where typically their engagement with technology lacks coordination or organisation?

VET practitioners need support to develop the skills and knowledge required to assess the potential strengths and weaknesses of different forms of digital learning and, at a system level, VET needs to be clear as to the main efficiency and effectiveness impacts of potential innovations. Systemic supports like validation methods are required to ensure the benefits of new ways of learning are maximised. Without this, we will see a 'patchwork quilt' of approaches developing which is potentially inequitable to learners. System-level support is needed to help teachers and trainers make the right choices for learners, without reducing the autonomy teachers enjoy, which provides the fertile ground for innovation.

4.0.

Teaching and learning

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This section looks at pedagogies and learning environments in VET before considering the different types of digital learning technologies now available. It concludes by considering how pedagogical innovations and digital learning technologies might be better used in VET.

4.1. Innovations in pedagogy and learning environments[86]

'[...] pedagogies are not technical tools that can navigate easily through different environments, but ideas and strategies used by professionals able to adopt and adapt them to the needs of learners'[87].

A range of pedagogies exists[88] and here we focus on those most relevant to VET and explore how digital technologies may support them: embodied, experiential, blended and game-based learning[89]. They are not mutually exclusive but can be 'organised and combined in different ways to enhance their effectiveness and to create unique approaches to teaching and learning[90].' Furthermore, it is important to note that pedagogies should not be seen in isolation from other dimensions of teaching and learning, notably quality management within schools and the creation of communities of practice.

At its core, VET is a form of embodied and experiential learning. Embodied learning emphasises the use of the body in educational practice in order to connect the physical, the emotional and the social[91]. It is at the core of vocational training, because the applications of the psychomotor and physical aspects of activity and performance are central. A student cannot learn to be a good cook without the embodied learning of how an ingredient would affect the flavour of the food, or become a hairdresser without the embodied knowledge of how different kinds of hair (curly, coarse...) will turn out when cutting/curling/colouring it. With regard to digital learning, this raises important questions for the place of simulations such as augmented and virtual reality in supporting VET.

Experiential learning is learning through reflection on doing[92]. It has a clear and obvious fit with VET that includes learning in workplaces or simulated environments. Various digital technologies can support experiential learning, and some have been in use for some time and are well established (e.g. video-based teaching and learning – see box below) and flight simulation, which enables highly realistic experiential learning at lower cost and risk than the real thing. Hardware and software is highly sophisticated but, for this reason, also expensive. Such technology has wide application, such as in the health sector in simulating health care[93], and in the timber industry in sawmill operation[94]. Most recently, virtual reality has emerged to enable more immersive simulation, as in the case of motor vehicle or industrial spray painting[95]. In short,

there is enormous potential for digital technologies to enhance the type and scale of experiential learning in VET.

86 This section deals with pedagogies and learning environments together since digital technologies are breaking down the difference between the two: thanks to the advent of virtual spaces and mobile technologies a different environment can be brought into the classroom at the switch of a button.

87 OECD, (2018), Teachers as Designers of learning environments, p. 32

88 This classification draws on OECD (2018) Teachers as designers of learning environments, Paris: OECD, p. 38. See the glossary at the end of the text for a definition of the terms.

89 There are also other pedagogies relevant to some aspects of VET, e.g. computational thinking which sits at the juncture of mathematics, ICT and digital literacy and uses ICT platforms to develop problem solving by consolidating logical skills with core computer science concepts. It is likely to have particular application in VET areas such as engineering or problem solving/trouble shooting on manufacturing production lines. See Wing, J. M. (2006). Computational thinking, in Communications of the ACM, 49(3): 33-35

90 OECD, (2018), p. 25

91 Smymaiou, Z., Sotiriou, M. , Georgakopoulou, E. , Papadopoulou, O. (2016) 'Connecting Embodied Learning in educational practice to the realisation of science educational scenarios through performing arts", International Conference "Inspiring Science Education', Athens 22- 24 April, pp. 37-45.

92 Felicia, P. (2011) Handbook of Research on Improving Learning and Motivation. Hershey: Information Science Reference; Kolb, D. (1984) Experiential Learning: experience as the source of learning and development. Englewood Cliffs, NJ: Prentice Hall. p. 21-23

93 E.g. at the University of Saskatchewan, Canada, https://www.youtube.com/watch?time_continue=82&v=7TOyrYwuel.4

94 https://www.mimbus.com/en/portfolio/wood-ed-factory-en/

95 https://www.mimbus.com/en/portfolio/simspray-en/#product-sheet-quote

Box 3: Learning through video making: evidence from the European Training Foundation

Learning through video making is particularly effective if coupled with an experiential learning approach since it initiates, extends and invites reflective processes. Video making exemplifies the learn-by-design approach in which learners individually or collaboratively learn through the process. Its power stems from the fact that it helps to capture the experiences of the learners, regardless of who they are – VET learners, teachers and other professionals can all benefit. Learners can video-record their experiences and actively learn from the video recording in a number of different ways. For example, teachers can record themselves at work and then make a self-assessment of their practice or ask a colleague to comment, or they can share their video through a video study group or club where group members can assess shared practice. Video making is powerful cognitively and also in terms of motivation.

Source: Cattaneo, A., Evi-Colombo, A., Ruberto, M. & Stanley, J. (2019)[96]

An increasingly popular form of experiential learning in VET is project-based learning. This is a learner-centred approach involving active exploration of real-world challenges through projects organised around a key question or challenge (see Section 2.2). Project-based learning is valuable in teaching not only technical but also key competences which have become increasingly important in the labour market as noted in Section 1.1, a role emphasised by European institutions[97]. Competence-based approaches such as project-based learning[98] are well understood in vocational education, and fit adult and part-time learners particularly well[99].

Box 4: Romania – simulated training firms in initial VET

The National Centre for TVET Development (NCTVETD) in Romania employs the concept of the simulated training firm in initial VET. The simulated training firm is an interactive method to learn and acquire entrepreneurship skills by integrating interdisciplinary knowledge. Students are asked to form groups that are coordinated by a teacher and create a virtual company with all the necessary staff and activities. They register the virtual company on the electronic platform called the Romanian Coordination Centre of Training Firms (ROCT) and simulate all the registration steps for a real company and its economic activities. They make internal and external transactions and simulate all activities regarding payments including social security, health insurance and taxes. The training firm simulation concept positions students as the main actors in all related activities and has become a highly successful approach to project-based work.

Source: European Centre for the Development of Vocational Training (Cedefop), 2020[100]

96 Cattaneo, A., Evi-Colombo, A., Ruberto, M. & Stanley, J. (2019). Video Pedagogy for Vocational Education. An overview of video-based teaching and learning. Turin: European Training Foundation

97 European Council (2018) Council recommendation for key competences in lifelong learning. URL: https://ec.europa.eu/education/education-in-the-eu/council-recommendation-on-key-competences-for-lifelong-learning_en

98 See glossary for a definition.

99 Weise, R. (2014) Got skills? Why online competence-based education is the disruptive innovation for higher education, in Educause, 27-35, URL: https://er.educause.edu/~/media/files/article-downloads/erm1462.pdf

100 Cedefop (2020). Developments in vocational education and training policy in 2015-19: Romania. Cedefop monitoring and analysis of VET policies. https://www.cedefop.europa.eu/en/publications-and-resources/countryreports/developments-vocational-education-and-training-policy-2015-19-romania – [Felicia or others, please let us know if you'd like us to replace this reference with a NCTVETD source – we couldn't find one!]

Blended learning combines face-to face teaching or activity-based learning typically in classroom settings with computer-based or online learning:

'The main goal of blended learning is to maximise the benefits of technology and digital resources, to improve the differentiation of instruction according to students' needs, as well as fostering classroom interaction.[101]'

Forms of blended learning include blending within individual lessons and the inverted/flipped classroom, in which students work on material first (typically online and as homework) and then use face-to-face classroom time for teacher interaction, group work and other activities to apply the 'theoretical' learning and to check and deepen understanding[102]. Blended learning requires a significant commitment to re-think the roles of the teacher/trainer and student. It involves greater learner independence, with the potential to personalise learning through self-paced programmes and small-group work. Hence the method may work best for the most autonomous students; less independent students may need more support or 'scaffolding'. Of the different types of blended learning, the flipped classroom has been the most common form to date. Not all subjects are equally 'flippable'; flipped classrooms may work best when content is more 'linear' (e.g. science and maths).

Blended learning has a close and direct relationship with digitalisation. Computer technology offers direct instructions and access to resources, freeing teachers/trainers from a lot of routine activity to focus on the application of concepts and more interactive classroom activities. A growing range of open educational resources and open courseware continues to be developed (see below).

Blended learning can demand digital infrastructure and design. It also assumes teachers have technological pedagogical and content knowledge ('TPACK') to operate relevant technologies; and an understanding of interactions between pedagogy, content and technology in order to successfully integrate technologies.

Blended learning is becoming increasingly popular but unfortunately there is a lack of data on how far it is applied in VET[103]. In higher education, the European Commission (2018) found that the transition to blended learning was far from complete, and stated that Higher Education Institutions (HEIs) and their teaching staff require substantial learning technology and instructional design to support the transition[104]. Similar challenges are likely to apply in VET. Moreover, a distinctive issue for VET to address is:

> ***how might blended learning be applied to situations where two learning environments are involved – the classroom and the workplace?***

Blending may mean rethinking the timing and location of delivery of some parts of the curriculum between schools/teachers and companies/trainers. The box below provides an example of how blended learning has been applied in VET.

101 Paniagua, A. and Istance, D. (2018) Teachers as Designers of Learning Environments: The Importance of Innovative Pedagogies. Educational Research and Innovation, OECD Publishing, Paris, p. 86

102 Although there are in fact several ways to 'flip' classrooms, see Winger, A. (2019) Five Ways to Flip the Online Classroom on its Head, Learn Magazine. https://eleammag.acm.org/featured.cfm?aid=3310379

103 Although we might gain some understanding from a 2020 School Education Gateway survey (of teachers in all types of primary and secondary education, including VET) which found that during the COVID-19 pandemic 67% of respondents had had their first experience of online teaching whilst a further 25% had 'some previous experience but very limited'. This suggests that experience of online/remote learning is low, though of course this is different to the use of non-online technology in classrooms (and the survey was based on opt-in rather than purposive sampling). https://www.schooleducationgateway.eu/en/pub/viewpoints/surveys/survey-on-online-teaching.htm

104 European Commission (2018) Teaching, learning and digital change. Working Group on Digital Skills and Competences 2016-2018. Annex 1: Key messages from the PLAs document, 11.

Box 5: Omnia's Edutech Bootcamp

Omnia's Edutech Bootcamp in Finland is an intensive blended learning experience for VET students who are challenged to ask questions, try things out and learn through a mix of collaborative, hands-on and online learning. VET teachers collaborate through social media and cloud-based services to support learning, as well as create and share content.

Source: Vainio et al., 2017[105]

Game-based learning or 'gamification', is based on using play as a pedagogical tool to engage learners and facilitate learning[106]. Learning is experiential, with inquiry, problem-solving and decision-making within the 'game worlds' being key elements. Games provide learners with continual feedback/assessments; they enable teachers and learners to constantly re-calibrate an activity as decisions instantly affect what happens next. It is thought that gamification could be particularly suitable for students at risk of under-achieving or early school leaving, with videogames especially appealing to boys at risk.

With respect to the digital aspects of game-based learning, the use of videogames is a major new trend. Other examples where digital technologies have been deployed include the use of computer models in programmes in economics and business schools that are designed to replicate real-world conditions and respond to inputs and decisions made by students. Digital gaming, however, can be costly, involving significant investment in design and may struggle to engage learners used to the immersive, highly realistic and sophisticated world of commercial videogames.

Box 6: SOLAS, Ireland – a game-based approach to delivering further education and training (FET)

SOLAS, the Further Education and Training Authority in Ireland has developed an innovation fund to support FET providers to engage with the industry and align their offer to the needs of reskilling and upskilling.

In this context, the Galway Roscommon Education and Training Board (GRETB) is currently leading an innovation project which aims to introduce a game-based approach to delivering further education and training to aquaculture. This project will provide digital resources to support the aquaculture industry to include an aquafarm simulator and a range of game-based resources. The simulator will use real-life occurrences to prompt applied problem solving and risk recognition. The game-based resources will encourage active problem solving accompanied by a point system to create a pathway to elevate learners to more complicated tasks reflecting the specialised theoretical content of units. These resources will inform the development of accredited on-the-job training and CPD opportunities within the industry, while also supporting the teaching and learning leading to accredited aquaculture awards which have already been developed in conjunction with Bord Iascaigh Mhara, the Irish state agency responsible for developing the Irish seafood industry.

Source: SOLAS, 2019[107]

105 Vainio, L. ; Oksanen-Ylikoski, E. & Ylikoski, T. (2017) Finland: VET and Omnia, in Latchem, C. (ed) Using ICTs and Blended Learning in Transforming TVET. UNESCO and Commonwealth Of Learning, 139-141. https://www.theseus.fi/bitstream/handle/10024/124177/Vainio_Oksanen-Ylikoski_Ylikoski.pdf?sequence=1&isAllowed=y. To learn more about Omnia, please see: https://www.omnia.fi/internationalomnia.

106 Gamification means the application of principles and elements of games in non-game contexts, which includes not just learning but also other spheres like employment: https://en.wikipedia.org/wiki/Gamification Accessed 07.05.19

107 SOLAS, the Further Education and Training Authority, Ireland. http://www.solas.ie/

Significantly for VET, 'gamification has been used extensively to support learning in training and one-off activities'[108]. Almost 50% of documented gaming for learning purposes in 2014 took place in 'training or extracurricular activities rather than strictly academic courses' (only 10% took place in primary and secondary education). Thus, gaming is a notable contrast to many other innovative pedagogical developments linked to digitalisation where the main developments have been outside the world of training, gamification is particularly suitable for developing transversal skills, although research on the potential of games for VET highlight that they can foster not only social skills but also occupational competences[109].

These findings suggest that

gamification is a good fit with some important aspects of VET and its expansion has the potential to bring a number of benefits.

VET's client group frequently includes people with negative experiences of 'traditional' pedagogies used in schools and gaming may help to engage their interest. Also, VET's engagement with key competences in terms of programme/qualification design has tended to vary and gaming may offer a cost-effective way of improving their incorporation into curricula – games focused on key competences could be 'sector-neutral' and used across VET programmes.

The European Commission has supported initiatives related to gamification in VET through Erasmus+ as the examples included in the boxes below show.

Box 7: GVETS: Introducing gamification in VET for social workers supporting migrant children

GVETS is a two-year Erasmus+ project aiming to develop an interdisciplinary capacity-building programme through gamification for new professionals working with children in migration environments in order to improve their capacity and strengthen their role in the protection of children. The consortium's ambition is to compile the knowledge, experience and expertise of all seven partner organisations in the project, focusing on the integration of gamification elements in content related to migration, children and intercultural education to provide training opportunities through the use of technology tools.

Source: GVETS, n/a[110]

108 OECD (2018) Teachers as designers of learning environments, Paris: OECD, p. 38. See the glossary at the end of the text for a definition of the terms, p. 98

109 De Witt, C. (2013) New forms of learning for vocational education: mobile learning – social learning – game-based learning, BiBB BwP Special edition, p. 30, URL: https://www.bibb.de/veroeffentlichungen/de/publication/download/7056

110 GVETS (n/a) 'GVETS: Introducing gamification in vocational education and training for professionals and social workers in the field of migrant children protection and support', URL: https://bit.ly/2JoOxtQ

4.2. Digital learning: from DVDs to artificial intelligence

'Technology [...] is everywhere and we cannot imagine learning environments[111] not harnessing the potential of digital technology in some way(s)'[112].

Digital learning in VET spans a wide range of tools and resources. Technology like laptops, DVDs, interactive whiteboards and digital video cameras are widely used within classrooms and work-based learning settings. But the last decade has also seen the growing use of online tools and resources as internet content has expanded enormously and internet access has become ever faster and easier through the rolling out of 4G connectivity. Virtual and augmented reality have also become increasingly common. As a result,

> ***in the last 10–15 years there has been a major increase in the potential to decouple teaching and learning from time and place and a massive increase in the ability to offer learners new and different experiences, and provide faster, more tailored feedback.***

The frontier of digital learning now involves 5G, artificial intelligence and learning analytics. COVID-19 has highlighted both the potential for digital technologies to play a greater role in VET and also the shortcomings in VET's ability to embrace them.

As a result of these developments of the last decade or so, an 'average' VET school or work-based learning environment is likely to contain a mix of digital technologies that are being used by teachers and trainers in a wide variety of ways. 'Old tech' like digital video cameras may sit alongside the latest VR headsets. Both have their place (see the example above in Section 4.1 regarding the ETF's work on videos); as was recently observed, 'no-tech, low-tech and hi-tech' approaches to teaching and learning all have a role to play in VET[113].

In the following sections we focus on the most significant recent developments: online digital learning, simulations (learning using virtual reality, augmented reality and artificial intelligence) and the use of digital technologies in assessments.

4.2.1: Online learning

The wide range of digital learning that is available online is highly diverse, ranging from individual pieces of content that might be used in single lessons with students, through to full courses being run online. Online digital learning ranges from learning resources that might be used by teachers and trainers in formal settings through to a vast and growing array of informal and non-formal learning opportunities posted by experienced (and sometimes not so experienced!) professionals on social media platforms.

Open educational resources (OER) and open courseware (OCW) are teaching and learning materials, course modules and entire courses in digital formats that have been posted online by their authors for free use, i.e. they are openly licensed. As such, educators and learners can freely copy, use, adapt and share these resources. Open access materials, not surprisingly, do not automatically provide credit towards a qualification but rather have the broader purpose of supporting education. For example, the Open Courseware initiative of the Delft University of Technology in the Netherlands[114] is explicitly designed not to replace degree-granting higher education or for-credit courses but to exist alongside them, to provide content that supports education, whether it be for academic staff, enrolled students or self-learners.

111 The definition of 'learning environment' used here is the "organic whole" of learning that goes beyond the physical learning space to include the activity and outcomes of learning, management and leadership.

112 OECD (2017) The OECD Handbook for Innovative Learning Environments, p. 46

113 Ashwani Aggarwal, ILO, speaking at the European Alliance for Apprenticeships Live Discussion on Challenges and opportunities in the VET Sector posed by the COVID-19 pandemic 17 June 2020. https://ec.europa.eu/social/main.jsp?langId=en&catId=1147&eventsId=1663&furtherEvents=yes https://mail2.mclink.it

114 https://ocw.tudelft.nl/

OER and OCW can foster pedagogical innovation, avoid unnecessary replication, lessen costs related to producing and distributing course material and amplify access. In this context, various platforms such as Open Author[115] can help teachers build open educational resources, lesson plans and courses and then publish them for educators and learners to access. Examples of VET institutions across Europe using open courseware include Romania's Politechnica University of Bucharest through their computer-science open courseware,[116] Germany's SlideWiki.org (developed at the University of Leipzig)[117] and Turkey's Middle East Technical University's METU courseware[118].

Digital repositories provide a useful means of storing, managing, reusing and curating digital materials for the purpose of education, research and administration. They are often used to store aforementioned online material such as OER and OCW (as well as MOOCs – see below) and can be subject-focused or institutionally focused, stand-alone, networked or federated[119].

Box 8: INDIRE, Italy – a multimedia resource bank facilitating ICT training

INDIRE has a rich resource bank for professional development related to the use of ICT in schools, including over 1,400 text or multimedia resources (including over 10 hours of video tutorials), many of which introduce subject-specific uses of ICT. Training is often blended, combining face-to-face sessions with online activities and materials.

Among other resources, INDIRE hosts a platform for best practices, tools and resources for schools known as D.I share. D.I. share allows school professionals and the broader education community to:

- Find out and share methodological, didactic and interdisciplinary best practices that are possible sources of inspiration for formal and informal educational activities. In this sense, D.I. share constitutes a repository of didactic experiences carried out by schools to facilitate peer learning, reproducibility, exchanges of ideas, sharing of didactic strategies and the implementation of innovative methods.
- Access innovative content for classroom teaching. D.I. share aims to provide selected and constantly updated didactic resources and the teachers will have the possibility to easily identify useful materials.
- Communicate and document didactic practices. D.I. share will provide easy-to-use tools to highlight didactic experiences, best practices and innovative methods to colleagues.
- Create dialogue with other teachers on the theme of innovation in order to facilitate the development of professional communities and to understand what works and what does not.

Since the academic year 2018/19, INDIRE has also enriched its resource bank with an online support environment consisting of various training and tools for newly recruited and role-transition teachers.

Source: Indire.it[120]

115 For more information, see: https://www.oercommons.org/
116 For more information, see: https://ocw.cs.pub.ro/courses/
117 For more information, see: https://www.uni-leipzig.de/en/
118 For more information, see: http://ocw.metu.edu.tr/
119 Latchem, C. (2017) 'Using ICTs and Blended Learning in Transforming TVET', UNESCO and Commonwealth of Learning, URL: https://unevoc.unesco.org/go.php?q=UNEVOC+Publications&lang=en&akt=id&st=&qs=6029&unevoc=1
120 For more information about all ongoing INDIRE activities (as of January 2020), please see: http://www.indire.it/progetto/didatec/

To add the most value to educational and training processes, digital resources e.g. digital databases, e-resources and e-textbooks should not merely be digital versions of existing paper material. For example,

> ***e-textbooks look beyond the format of traditional textbooks by providing interactive and personalised learning, allowing individualisation and differentiation of teaching.***

Alongside those resources described above that have a specific connection to education and training, mention should also be made of the growing array of other, commercial platforms that can support learning, including: community platforms that can support learner and teacher/trainer groups, e.g. Google+ communities; and file-sharing platforms, e.g. Dropbox.

The advent of online learning tools and programmes has led to rapid growth in people accessing open and distance learning, pioneered in previous generations by organisations like the UK's Open University[121]. Distance education, facilitated by e-learning and online learning, has become increasingly popular, particularly in higher education.[122] Six percent of Europeans took part in an online course in 2015, a percentage which was more than twice as high as in 2007.[123] It is worth noting that substantial differences remain in the use of online learning tools across Member States: in Finland, some 13 percent participated in online courses, while only a corresponding three percent participated in Poland and Slovakia in 2015.[124]

In this category of digital learning technologies, Massive Open Online Courses (MOOCs) have been one of the most talked about phenomena in terms of curricular and pedagogical innovation. They have generated much interest in higher education especially whilst in VET their potential remains to be exploited.

MOOCs require teachers to adapt the traditional face-to-face curricular content to a MOOC format, for example splitting modules into short sets of segments. MOOCs also challenge the traditional ways of validation and certification – educational institutions traditionally have a monopoly regarding the award of diplomas or educational accreditation. MOOCs, which often occur outside traditional educational institutions, call for different models, including badges, statements of participation or online certificates.

It has also been predicted that as digitalisation advances, the accessibility of big data and sophisticated algorithms will facilitate the deployment of 'interactive tutors' that generate assessment and teaching strategies that are optimised for each individual student in MOOCs[125].

Examples of European MOOCs include: EduOpen, an Italian network of academic institutions offering MOOCs for various qualifications[126]; the Hungarian portal MeMOOC[127] built by the University of Miskolc using the OpenEdx environment; Poland's Copernicus College[128] launched in 2015; and the Polish Navoica platform launched in 2018 by the Ministry of Science and Higher Education in cooperation with the Young Science Foundation, which is the country's first nationwide platform and which brings together universities, research institutions, business and non-

121 For more information, please see: www.open.ac.uk

122 Kaplan, A., Haenlein, M. (2016). "Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster". Business Horizons. 59. (4): 441–50.

123 Berger, T., and Benedikt Frey, C. (2016) 'Digitalisation, Jobs, And Convergence In Europe: Strategies For Closing The Skills Gap', in European Commission DG Internal Market, Industry, Entrepreneurship and SMEs: 36. http://eskills-scale.eu/fileadmin/eskills_scale/all_final_deliverables/scale_digitalisation_report.pdf

124 Berger, T., and Benedikt Frey, C. (2016) 'Digitalisation, Jobs, And Convergence In Europe: Strategies For Closing The Skills Gap', in European Commission DG Internal Market, Industry, Entrepreneurship and SMEs: 36. http://eskills-scale.eu/fileadmin/eskills_scale/all_final_deliverables/scale_digitalisation_report.pdf

125 Woolf, B.P. (2010). Building intelligent interactive tutors: Student-centered strategies for revolutionising e-learning. Morgan Kaufmann.

126 For more information, please see: http://www.eduopen.org/

127 For more information, please see: http://memooc.hu/

128 For more information, please see: https://www.copernicuscollege.pl/

governmental organisations and whose courses are available free of charge to anyone interested in learning and acquiring new competences and skills[129].

MOOCs may also contribute to lifelong learning by providing modularised approaches to education that enable workers to acquire tailored skills and competences at any stage of their career, without carrying out an extensive academic programme[130]. In this way, MOOCs provide opportunities for both flexible and low-cost ways to reskill and upgrade workers' skillsets throughout their working life[131].

Box 9: INTEF, Spain – MOOCs, NOOCs, SPOOCs, Edu Pills and Open Badge Backpacks in teacher training

Innovative teacher training accessible for teachers to improve their skills offered by the National Institute for New Technologies and Teacher Training (INTEF) include:

- An online tutored course to be offered from September–November 2019 for VET teachers named 'Professional Future'.
- Massive Open Online Courses (MOOCs), each with its own Facebook group and Twitter hashtag for teachers to connect and help each other. The hashtags and Facebook groups continue after the end of the MOOC to create communities of teachers.
- NANO Open Online Courses (NOOCs), which give participants the opportunity to explore, learn and be evaluated on a key element of a competence, a skill, or an area of knowledge in a period of time that can go from a minimum of 1 hour to a maximum of 20 hours of effort in total.
- Self-paced Open Online Courses (SPOOCs), in which courses can be undertaken by the learner at their own pace, without any time limits.
- EduPills, a micro-learning app to acquire and/or develop digital abilities, skills and competences in a fast and simple way (3–8 minutes).
- Insignias INTEF Open Badge Backpack, which stores, imports, downloads and shares digital badges on social media related to training in competences.

Source: INTEF, 2019[132]

Alongside these online opportunities for formal learning, mention should be made of the rapid growth in opportunities for informal and self-learning made possible by the internet. Many forms of social media, including social networking sites (such as Facebook, LinkedIn, Microblog and Twitter), video sharing platforms (e.g. YouTube), blogs and wikis promote and host learning opportunities with prominent examples being in language learning and music. Such provision raises important questions of quality and reliability.

129 For more information, please see: https://navoica.pl/

130 Berger, T., and Benedikt Frey, C. (2016) 'Digitalisation, Jobs, and Convergence In Europe: Strategies For Closing The Skills Gap' European Commission DG Internal Market, Industry, Entrepreneurship and SMEs: 37

131 Berger, T., and Benedikt Frey, C. (2016) 'Digitalisation, Jobs, and Convergence In Europe: Strategies For Closing The Skills Gap' European Commission DG Internal Market, Industry, Entrepreneurship and SMEs: 37.

132 The National Institute for New Technologies and Teacher Training (INTEF), (2019). The education meeting point. https://enlinea.intef.es/

The table below identifies the strengths and weaknesses of online learning.

Table 4.1: Strengths and weaknesses of online learning resources and courses

Strengths	Weaknesses
• Educators and learners can freely copy, use, adapt and share digital resources. • Lessens the costs of producing and distributing course material. • Increases access to learning materials. • Opens up more possibilities for informal and non-formal learning. • Can be reused and repurposed to meet specific needs. • Encourages lifelong learning[133]. • Promotes and enables personalised learning[134]. • Decreases risk of unnecessary replication and 'silos' in teaching practices across institutions • MOOCs are regarded by many as an important tool to widen access to higher education (HE) for millions of people (as long as they have internet connection) and can help to democratise content. They allow access to knowledge from universities all over the world, which was previously not possible[135].	• Creation and maintenance of comprehensive OCW entails substantial initial and ongoing investments for personnel. Quality translation into other languages and cultural contexts involves even more investment. This is one of the reasons why English is still the dominant language, and fewer open courseware opportunities are accessible in other languages[136]. • The problem of decentralisation makes it difficult for teachers to determine the best free resources, and a lot of these repositories are not well organised which makes it harder for the resources to be discovered as searching for the proper OER/OCW is a time-consuming process for users[137]. • There can be some legal issues around intellectual property rights[138]. • Financial sustainability, the ability of a project to continue its operations, covering the costs of producing and ensuring the capacity to use and reuse material can be complex[139].

133 William and Flora Hewlett Foundation, (2013)
134 ibid
135 Patru, Mariana; Balaji, Venkataraman (2016). Making Sense of MOOCs: A Guide for Policy-Makers in Developing Countries (PDF). Paris, UNESCO. pp. 17–18, 21–22, 24. ISBN 978-92-3-100157-4.
136 Tarasowa, Darya; Darya Tarasowa; Ali Khalili; Sören Auer; Jörg Unbehauen (2013). "CrowdLearn: Crowd-sourcing the Creation of Highly-structured E-Learning Content". 5th International Conference on Computer Supported Education CSEDU 2013.
137 Davis, (2016)
138 Open Educational Resources (2013) Legal Aspects of OER, URL: https://openeducationalresources.pbworks.com/w/page/25308415/Legal%20Aspects%20of%20OER
139 Wiley, D. (2007) On the Sustainability of Open Educational Resource Initiatives in higher education, Paris: OECD, URL: https://www.oecd.org/education/ceri/38645447.pdf

Strengths	Weaknesses
• Providing flexibility in where and (often) when to access material, MOOCs facilitate personalised learning as well as lifelong learning. • MOOCs open up a wealth of new business opportunities, for example in terms of support services to create platforms[140]. • Digitalisation helps to address the issue of the rising costs of higher education (known as the Baumol disease[141], according to which staff costs will increase at a faster pace than inflation and productivity in higher education because these staff costs cannot be compensated by innovation). With MOOCs, some of the costs of certain services can be reduced, for example by reducing the need for real-time teaching[142].	• Quality assurance is also a challenge. Kortemeyer argues that the issue of quality control in OER is significant because OER is used as a one-way path, where instructors download OERs from a repository, upload them into a content management system, and deliver and deploy them without assessing learning success or providing feedback on the original asset for further adaptation or correction[143]. • Additionally, if improvements are made, it is difficult to replace the original version of the content easily[144]. • Educators face difficulties in repurposing OER within traditional pedagogical practices[145]. Some authors have pointed to low overall completion rates in MOOCs[146].

140 McGrath, C (2017). MOOC a fad or a revolution? Bullet points for blog post. Title from: http://journals.sagepub.com/doi/pdf/10.1177/1052562913509226
141 Baumol, J. and Bowen, G. (1966) Performing arts: the economic dilemma, New York: The Twentieth Century Fund
142 Mulder, F., & Jansen. D. (2015). MOOCs for opening up education and the OpenupEd initiative. In C. J. Bonk, M. M. Lee, T. C. Reeves, & T. H. Reynolds (Eds.), MOOCs and open education around the world. New York, NY: Routledge.
143 Kourtmeyer, (2013)
144 https://oerknowledgecloud.org/sites/oerknowledgecloud.org/files/1952-3638-1-PB.pdf
145 Wiley et al., (2014)
146 Justin, Pope (15 December 2014). "What Are MOOCs Good For?". MIT Technology Review. Retrieved 29 March 2016. https://www.technologyreview.com/s/533406/what-are-moocs-good-for/

Strengths	Weaknesses
• By widening educational access at tertiary level, MOOCs are an important tool to achieve goal 4 of the 2030 Agenda for Sustainable Development[147].	• The recognition of learning and the value of MOOCs in the labour market is currently debated (various initiatives, like digital badges, are developing). Additionally, the MOOC guide highlights six general weaknesses:[148] 1. Relying on user-generated content can create a chaotic learning environment; 2. Digital literacy is necessary to make use of the online materials; 3. The time and effort required from participants may exceed what students are willing to commit to a free online course; 4. Once the course is released, content will be reshaped and reinterpreted by the massive student body, making the course trajectory difficult for instructors to control; 5. Participants must self-regulate and set their own goals; 6. Language and translation barriers.

147 Patru, Mariana; Balaji, Venkataraman (2016). Making Sense of MOOCs: A Guide for Policy-Makers in Developing Countries (PDF). Paris, UNESCO. pp. 17–18, 21–22, 24. ISBN 978-92-3-100157-4.
148 "Benefits and Challenges of a MOOC". MoocGuide. 7 July 2011. Retrieved 4 February 2013. http://moocguide.wikispaces.com/2.+Benefits+and+challenges+of+a+MOOC

In relation to online tools, it is worth noting the effect that the advent of mobile devices like smartphones and tablets has had: mobile learning can be used to increase students' access to education, support teachers' professional development and strengthen teaching and learning both inside and outside traditional school settings. Examples include UnivMobile in France[149] and the European project 'REACH the hard to reach: how to engage young learners in workplace training via mobile assisted learning'[150] implemented across Italy, Norway, Spain and Turkey. Mobile learning has the potential to connect learning venues and workplaces in VET[151]. A review of mobile learning projects aimed at lifelong learning was conducted in Hungary, Ireland and Italy as part of the EU-funded project MOTILL[152].

As an extension of mobile learning, some schools have piloted the Bring Your Own Device (BYOD) approach, where students can bring their own mobile phones or tablets as support for their learning. BYOD has been piloted in Germany in a project called 'Start in die nächste Generation' (Start in the next generation). The pilot, originally based on six schools, has been scaled up to 50[153].

149 For more information, please see: https://unif.fr/univmobile/

150 For more information, please see: http://www.reach-project.eu/

151 De Witt, C. (2013) New forms of learning for vocational education: mobile learning – social learning – game-based learning, BwP Special edition, p. 30, URL: https://www.bibb.de/veroeffentlichungen/de/publication/download/7056

152 For more information, please see : http://www.motill.eu/

153 ETF (2018) Digital Skills and Online learning in the former Yugoslav Republic of Macedonia, URL: https://www.etf.europa.eu/en/publications-and-resources/publications/digital-skills-and-online-learning-former-yugoslav-republic

Table 4.2: Strengths and weaknesses of mobile learning

Strengths	Weaknesses
• Relatively inexpensive opportunities as the cost of mobile devices is significantly less than PCs and laptops (decrease in training costs, textbook costs etc.); • Able to access information and educational opportunities faster than other media; • Learners can access teaching material in different locations using portable devices; • Exchange of information can be encrypted or private; • Multimedia content delivery and creation options; • Continuous and situated learning support; • Access to personalised content; • Remote and flexible access to knowledge, expanding opportunities for lifelong learning; • Improved literacy levels[154].	• Depends on connectivity and battery life. • Screen size and key size[155]; • Meeting required bandwidth for nonstop/fast streaming[156]; • Number of file/asset formats supported by a specific device; • Reworking existing e-learning materials for mobile platforms; • Limited memory[157]; • Cost of investment[158] vs risk of sudden obsolescence[159]; • Flexibility also means it can lead to poor work-life balance; • Digital divide caused by accessibility and cost barriers for some end users; • Difficult to support learning across many cultural contexts – differences in custom, language and culture challenge the temptation to produce a one-size-fits-all online course[160]; • Frequent changes in device models/ technologies/functionality etc.; • Disruption of students' personal and academic lives[161]; • Risk of distraction by other non-learning apps[162].

154 Agence Française de Développement, Agence universitaire de la Francophonie, Orange, & UNESCO. (2015). Digital Services for Education in Africa. Savoirs communs, 17.
155 Maniar, N.; Bennett, E.; Hand, S.; Allan, G (2008). "The effect of mobile phone screen size on video based learning". Journal of Software. 3 (4): 51–61. CiteSeerX 10.1.1.460.9863. doi:10.4304/jsw.3.4.51-61.
156 For more information, see: https://en.wikipedia.org/wiki/Bandwidth_(computing)
157 Elias, Tanya (February 2011). "Universal Instructional Design Principles for Mobile Learning". International Review of Research in Open and Distance Learning. 12 (2).
158 Cordock, R. P. (2010). The future of mobile learning. Training Journal, 63-67. Retrieved from http://search.proquest.com/docview/763160208
159 Crescente, Mary Louise; Lee, Doris (March 2011). "Critical issues of m-learning: design models, adoption processes, and future trends". Journal of the Chinese Institute of Industrial Engineers. 28 (2).
160 "What's Holding Back Mobile Phones for Education?". Stanford Social Innovation Review Blog. Stanford Social Innovation Review. February 11, 2013. Retrieved August 4, (2013). http://www.ssireview.org/blog/entry/whats_holding_back_mobile_phones_for_education
161 Masters, K.; Ng'ambi D. (2007). "After the broadcast: disrupting health sciences' students' lives with SMS". Proceedings of IADIS International Conference Mobile Learning. Lisbon, Portugal. pp. 171–175. ISBN 978-972-8924-36-2.
162 Crescente, Mary Louise; Lee, Doris (March 2011). "Critical issues of m-learning: design models, adoption processes, and future trends". Journal of the Chinese Institute of Industrial Engineers. 28 (2): 111–123. doi:10.1080/10170669.2010.548856.

4.2.2: Simulation

Technologies that can simulate reality, such as augmented reality (AR) or mixed reality (MR) and virtual reality (VR), are redefining the interface between educators, learners and machines[163]. They can be combined with situated and constructivist learning approaches[164]. AR, MR and VR are increasingly popular in the education sector and are particularly useful for some VET courses, for example in tourism, healthcare, engineering or architectural design[165].

Box 10: Augmented and mixed reality

Bühler, a Swiss technology company manufacturing advanced materials in the food processing sector, offers vocational training using augmented and mixed reality. The superimposition of three-dimensional models of machines and equipment through digital tools enables learning content to be deepened and better understood, as well as allowing for specific support for learners. For instance, with HoloLens, an untethered mixed reality headset, students are able to explore the company's own grinding machines together directly in the classroom, in 3D and in their original size. They can move freely around the 3D object, open the machine and disassemble it, thereby deepening their understanding of its functionality and inner workings. In addition, participants from remote locations can be integrated into lessons regardless of location. Thanks to ARKit, the AR framework for iOS, it is also possible for apprentices to access and study the 3D content on their usual devices at home or on-the-go on their iPads or iPhones.

Source: Bühler Group, 2017[166]

AR and VR have great potential to help students visualise abstract scientific concepts[167], such as the human anatomy or food chains, by rendering them as fully 3D models that can be overlaid over the real world. Students can interact, turn and study a model as much as they wish; teachers can then direct students to certain parts of the model, provide additional pointers or facts, and assign tasks based on the model – finding a human organ in relation to the position of the liver, for example. Through virtual headsets, students are also free to experiment with virtual chemicals[168] and see the results instantly. AR apps on mobile devices are also increasingly available, enabling learners to explore the solar system[169], understand geometry in 3D[170] and learn the life cycles of plants[171]. Teachers can also create their own AR applications, such as scavenger hunt adventures[172] that incorporate group work and problem solving activities.

Simulation technologies are especially beneficial for students with more visual or hands-on learning styles, or who might lack face-to-face access to certain resources due to their location or socioeconomic background.

163 See for example AugThat, which superimposes a computer generated image on the user's real view of the world for educational purposes. URL: http://augthat.com/ Fehling, Christian Dominic, Andreas Müller, and Mario Aehnelt. "Enhancing Vocational Training with Augmented Reality." Accessed (2016). https://www.researchgate.net/publication/309373052_Enhancing_Vocational_Training_with_Augmented_Reality.

164 Dunleavy, M. and Dede, C.: "Augmented reality teaching and learning." Handbook of research on educational communications and technology. Springer New York (2014): 735-745.

165 Virtual Reality and Augmented Reality in Europe. (2019)" Netherlands Enterprise Agency, Ministry of Foreign Affairs., 2, URL: https://www.cbi.eu/node/2665/pdf.

166 https://www.buhlergroup.com/content/buhlergroup/global/en/media/media-releases/buehler_celebratesthetenthanniversaryofinternationalmobilityinvo.html

167 https://educationblog.microsoft.com/en-us/2018/06/digital-learning-distraction-or-default-for-the-future/

168 https://www.schellgames.com/games/superchem-vr

169 http://amazingspacejourney.com/#explore

170 https://vrmath.co/

171 https://www.youtube.com/watch?v=TNQedwQiu8A

172 http://classtechtips.com/2017/10/27/metaverse-classroom-augmented-reality/

Box 11: Virtual reality applications in vocational education

In the Leading House DUAL-T research project funded by the Swiss State Secretariat for Education, Research and Innovation (SERI), digital pedagogies and platforms facilitating the coordination between places of learning are currently being examined. Highlighted approaches using VR to bridge the gap between school and workplace experiences include:

GardenVR, a 3D simulated environment where gardeners experiment with garden design and maintenance of a real garden space. In this approach, a drone captures the layout of the landscape and the blueprint is used to create a simulated environment that can be explored and developed through virtual reality glasses. The 3D environment allows the learners to acquire a unique impression of width, height and depth, in order to predict things such as potential shadowing from trees planted or seasonal changes without having to re-enter the physical garden space.

Similarly, InterTrain for nurses is a simulation allowing learners to step into the 'real-life' work situations of nurses. The tool helps learners prepare for difficult human interactions by presenting them with simulated patients.

BloomyPro is a tool that allows trainees to create digital bouquets for virtual customers. By using the tool, the apprentice can explore the design of different flower arrangements. The Swizz Leading House DUAL-T research project found that apprentices using the tool experimented with more varieties of flower arrangements than before which is likely to be attributed to the costs saved by using virtual flowers.

The teacher-led project VRhoogte represents another use of a VR application for learning. The project, funded by the Flemish government, has developed a high-quality VR training module for secondary VET students to learn how to work safely in high places, such as high-voltage pylons or wind turbines. Through the VR training module students can work and train a number of basic skills in a safe, interactive and challenging environment in preparation for the workplace. The module itself deals with scaffolding installations and construction. In addition to software and hardware, the project consortium is further developing a manual and training for schools and teachers so that they can transfer the module to their schools.

Sources: Leading House Technologies for Vocational Training Dual-T (2018),[173] VRhoogte, 2019[174]

173 EPLF, (2018). Leading House Technologies for Vocational Training Dual-T. https://dualt.epfl.ch/

174 VRhoogte - Veilig werken op virtual hoogte, (2019). https://www.imec-int.com/drupal/sites/default/files/inline-files/VR_HOOGTE_V4_0.pdf https://www.imec-int.com/drupal/sites/default/files/inline-files/VR_HOOGTE_V4_0.pdf

Artificial intelligence/learning analytics is finding increasing application in education and training and is a vital support to the types of changes described above.

Digital technologies offer the opportunity to collect and analyse relevant data on learners on a greater scale and more quickly than ever before.

It also offers the chance to collect new types of data. For example, in the virtual reality simulation of spray painting described in the box below, it is possible to collect data on the depth and spread of paint rather than relying on the experience of the tutor to judge the paint application, as has happened previously. The data collected and analysed is more consistent than hitherto and instantly available to trainers. The application of AI enables teaching and learning to be adjusted in line with the learner's individual progress.

Box 12: Simspray – virtual reality spray painting

Simspray is a virtual spray paint learning system that enables training organisations to be more efficient and more sustainable while reducing training costs for industrial and automotive painting. Simspray offers the trainees exercises that are adjusted to their level, from beginner to expert. It also contains two different training modes encompassing a lesson mode to guide the trainee through a series of projects concerning one procedure in which the trainee must reach a certain score to be able to progress to the next exercise and a free mode to learn how to paint in a more autonomous way.

The virtual spray painting training tool provides a general assessment of the success rate of the painting project as well as detailed information about the transfer, angle, distance and speed efficiency, quantity of paint used and wasted for the chosen layer, defects such as drips, orange peel or dry spray, thickness of the applied paint and the spray gun movements such as distance, advance speed or angles for each layer. In this way, the tool allows trainees to learn how to adjust the air pressure and paint flow, how to control coating thickness, how to master distance, speed and angles, how to work on flat or round surfaces, and how to work on complex surfaces. Simspray further enables the instructor to track and measure the performance of the trainee on a simulator and generate result reports.

Source: Mimbus, 2017[175]

175 Mimbus, (2017). The pedagogical follow up, Simspray. https://www.mimbus.com/en/portfolio/simspray-en/#the-pedagogical-follow-up

Artificial intelligence/learning analytics can be used to help learners improve learning and achieve a more personalised learning experience. Learning analytics are increasingly taken for granted in individual learning tools, but consideration also needs to be given to their wider use across learning programmes and VET systems as a whole.

Box 13: Lexplore, Sweden – artificial intelligence for reading assessments

Lexplore uses eye tracking and AI to determine a student's reading level. This unique evidence-based technology is based on an extensive 30-year research project carried out at the Karolinska Institute in Sweden. Lexplore's machine learning algorithms recognise correlations and patterns in eye movement data. This unique high-tech process provides teachers with real-time data for intervention that directly correlates to a student's reading capability.

Source: Lexplore, N/A[176]

The European Commission has reported that learning analytics is still in its early days, even if a number of countries in Europe (e.g. Denmark, Norway, the UK and the Netherlands) are developing national approaches and are putting in place new infrastructure or competence centres to support learning analytics. The European Commission has highlighted that policymakers have a significant role to play to support the development of learning analytics, including for example setting up a national or regional point of contact on educational data, ensuring that data collection is open and transparent and promoting quality assurance processes[177].

Box 14: Artificial intelligence challenge course, Poland - familiarising learners with AI

The Digital Poland Foundation has launched an AI challenge, using the course created by the National Information Processing Institute. The course, titled 'Fundamentals of Artificial Intelligence' has been available and offered for free since 7 October 2019 on the Navoica platform.

The course is designed for people interested in learning more about what artificial intelligence is, where it comes from and the various ways in which it can be applied. The issues discussed are described in simple language and illustrated with numerous examples to facilitate learning.

Source: Navoica, 2019[178]

176 Lexplore Sweden (n.a) How it works. www.lexplore.com/how-it-works/technology/
177 European Commission (n/a) Annex 1: Key messages from the PLAs, pp. 7-9.
178 AI Challenge, Navoica. http://navoica.edu.pl/aktualnosci/aichallenge-na-navoica

The strengths and weaknesses of VR, AR and AI are shown in the table below.

The apparent lack of weaknesses may reflect the newness of the technology, such that there has not yet been sufficient time to 'test' the technology in the real world.

Table 4.3: Strengths and weaknesses of virtual reality, augmented reality and artificial intelligence

Strengths	Weaknesses
• Cost-effective tool to study and replicate interactions in a controlled environment[179]. In this sense, VR/AR can simulate real workspaces for workplace occupational safety and health purposes, educational purposes and training purposes. It can be used to provide learners with a virtual environment where they can develop their skills without the real-world consequences of failing. • The positive effects of AR on the efficiency of instruction vis-à-vis increased attention, participation and motivation of users have been recognised in the literature, although Karasavvidis and Kollias call for more data and insights into students' perspectives regarding their experiences with digital transformation in education[180]. • With AR/VR the ability to access learning opportunities outside the classroom can also help students contextualise and apply their learning in the real world. • It can help students struggling to grasp abstract concepts by creating practical learning scenarios	• Prolonged use of VR/AR can lead to a number of health issues. As such, most virtual reality systems come with consumer warnings, including seizures; developmental issues in children; trip-and-fall and collision warnings; discomfort; repetitive stress injury; and interference with medical devices[181]. Some users may experience twitches, seizures or blackouts while using VR headsets, even if they do not have a history of epilepsy and have never had blackouts or seizures before. • It has been argued that AI can stimulate technology addiction[182]. • AI has been criticised for its lack of personal engagement[183].

179 Groom, Victoria; Bailenson, Jeremy N.; Nass, Clifford (2009-07-01). "The influence of racial embodiment on racial bias in immersive virtual environments". Social Influence. 4 (3): 231–248. doi:10.1080/15534510802643750. ISSN 1553-4510.

180 Kamarainen, A. M., Metcalf, S., Grotzer, T., Browne, A., Mazzuca, D., Tutwiler, M. S. and Dede, C.: "EcoMOBILE: Integrating augmented reality and probeware with environmental education field trips." Computers & Education 68 (2013): 545-556. Karasavvidis, I., & Kollias, V. (2017). Understanding Technology Integration Failures in Education: The Need for Zero-Order Barriers. In Reforms and Innovation in Education. (pp. 99-126). Springer.

181 "Oculus Rift Health and Safety Notice" (PDF). Retrieved 13 March 2017. https://static.oculus.com/documents/310-30023-01_Rift_HealthSafety_English.pdf

182 10 pros and cons of AI in education: https://medium.com/@oleksii_kh/10-pros-and-cons-of-ai-in-education-c7c1b69a89b2

183 Ibid

Strengths	Weaknesses
• The literature also shows that that the use of AR draws student interest and attention to lessons and increases motivation[184]. • An advantage of AI is that it can enhance the potential of digital assessments to capture finer analytical insight into students' performance by enabling more detailed, informative feedback. For example, the potential of AI in detecting reading difficulties in learners is currently being explored by a variety of education stakeholders[185]. • AI can also pave the way for digital tutors, reducing costs and making accessing tutoring (digitally) more possible.	

4.2.3: Digital assessment tools and credentials

Innovative learning and teaching extends to novel ways of enhancing the whole assessment process; from the design of assessment tools and processes, to the delivery of assessments and the evaluation and subsequent reporting of student performance. Within this context, digital assessments can provide innovative solutions for assessing students' skills in order to identify progress, challenges and needs[186], although anecdotal evidence suggests that their popularity amongst teachers varies[187]. The nature of summative assessments are changing with new and innovative (digitally enabled) approaches, e.g. allowing internet access for examinations in a given subject. ePortfolios, in which a student can gather a collection of documents representing their achievements (i.e. transcripts, video or audio recordings etc.), are increasingly being used for formative and summative assessments, and can be implemented through e-learning management systems such as Mahara and Moodle. The ETF reports that although few examples of ePortfolios are known in VET, Finland, with one of the highest performing education systems, is shifting away from traditional summative assessments toward more individualised forms of assessments that ePortfolios can support[188].

184 Delello, J. A. (2014). Insights from pre-service teachers using science-based augmentedreality. Journal of Computers in Education, 1(4), 295–311. Perez-Lopez, D., & Contero, M. (2013). Delivering educational multimedia contentsthrough an augmented reality application: A case study on its impact on knowl-edge acquisition and retention. Turkish Online Journal of Educational Technology- TOJET, 12(4), 19–28. Tomi, A. Bin, & Rambli, D. R. A. (2013). An interactive mobile augmented realitymagical playbook: Learning number with the thirsty crow. Procedia ComputerScience, 25, 123–130

185 E.g. Lexplore Sweden, n.a. How it works. www.lexplore.com/how-it-works/technology/.

186 European Commission (2018) Teaching, learning and digital change: Annex 1: Key messages from PLAs

187 Views expressed by VET Working Group members at the January 2020 meeting.

188 European Training Foundation (2018) Digital skills and competence, and digital and online learning, p 31, URL: https://www.etf.europa.eu/sites/default/files/2018-10/DSC%20and%20DOL_0.pdf ; Sahlberg, P. (2014) 'Finnish lessons 2.0: what can the world learn from educational change in Finland', New York: Teachers college press, URL: https://www.etf.europa.eu/sites/default/files/2018-10/DSC%20and%20DOL_0.pdf

Box 15: Czech Republic – DOVOS, digital online verification of skills

DOVOS is an Erasmus+ funded project aiming to establish a common ground for VET institutions to meet the needs of the media industry. Four education partners joined forces within this project to elaborate on the skills necessary for the graduates of institutions to be competitive and useful in the field of journalism and to look for ways of incorporating this skill training into already existing curricula of participating educational institutions. DOVOS also verifies and optimises the designed skillsets in practice with the participation of both academic and media institutions and develops ways of including the skillsets mentioned above into the digital systems of the institutions using open source software so that it could be easily modified by third party users to fit anyone's needs.

Source: Dovos, 2020[189]

More specifically, the 2016–2018 European Commission Working Group DELTA (Digital Education Learning, Teaching and Assessment) noted that digital assessments can allow for more creative problem solving by introducing new materials (e.g. audio/video files), while enabling reduced cost and greater time efficiency. The Working Group further noted that digital assessments present an opportunity to switch from a knowledge-focused curriculum to one that is competence-focused.

> ***Another advantage of digital assessment is the potential to capture finer analytical insight into students' performance by enabling more detailed, informative feedback.***

For example, the potential of AI to detect reading difficulties in learners is currently being explored by a variety of educational stakeholders.

Assessments embedded in mobile technologies, as in the TRIALOG app (see Section 6.4.3), make it possible to involve not just trainees and their trainers but also employers much more easily than before, and to provide feedback and take remedial action if necessary in a much more timely manner.

At the same time, a focus on digital assessment to improve efficiency, comparability and accountability could also lead to increased focus on tests that allow automated assessment, such as multiple-choice tests, which would in fact represent a step back from more innovative and learner-centred pedagogical approaches. As such, the DELTA Working Group has cautioned that the implementation of digital assessments needs to be carefully prepared and implemented in small steps.

Beyond assessments lie the processes of validation and certification, including through digital credentials, like open badges (as illustrated in the box below).

189 http://www.dovos.eu/

Box 16: Competitive skills – National Open Badge – constellation of problem solving in technology-rich environments in Finland

The aim of this European Social Fund project, coordinated by the Oulu University of Applied Sciences, is to develop a nationwide open badge constellation, which enables the verification of adults' problem-solving skills in technology-rich environments by identifying and recognising competences acquired outside the formal education system at different levels of education and in transition phases of the education structure. The open badges created by the project will be piloted within different target groups in VET and adult education, including preparatory training for VET, integration training for migrants, adult students developing basic skills and in upper secondary VET.

Source: TIEKE, 2020[190]

As part of the new Europass, the European Commission is developing free tools and services to support the issuance of authentic, tamper-proof digital credentials by education and training institutions to confirm the awarding of a qualification to a person. Graduates and learners will be able to receive their qualifications in digital form to share with employers and education and training institutions who can instantly verify that the qualification, or other learning credential, is authentic and issued by a recognised awarding body.

The tools and services will reduce administrative burdens for citizens, learning providers and businesses; decrease fraud and ensure that certificates from one Member State can be understood and correctly interpreted in any other.

Currently, 18 countries are engaged in piloting Europass credentials. As per the table below, there are a number of VET awarding bodies/institutions involved in the pilots and this will offer a key opportunity to digitalise and support the faster recognition and understanding of VET qualifications. It is expected that the first results from the piloting will be announced by April 2020. This action was also announced as part of the Digital Education Action Plan.

190 https://tieke.fi/en/projects/competitive-skills/

Table 4.4: Overview of countries engaged in piloting Europass credentials

	Europass credentials pilot country	Area of activity/types of credentials
1	Czechia	Higher education
2	Germany	Higher education; industry
3	Estonia	VET
4	Greece	VET
5	Spain	Higher education
6	France	Higher education
7	Croatia	Higher education; industry
8	Italy	Higher education; VET
9	Luxembourg	VET
10	Malta	Higher education
11	Netherlands	VET; higher education; open badges
12	Portugal	Higher education
13	Romania	Higher education
14	Slovenia	VET; higher education; industry
15	Slovakia	Higher education
16	Norway	Higher education; VET

Blockchain technology[191], notably being pioneered in Malta, can support the opening up of education and can replace current processes, such as re-issuing certificates, the management of intellectual property, payments and contracts and identity management.

191 See Glossary for a definition

Box 17: BlockCerts, Malta – blockchain in educational pilots

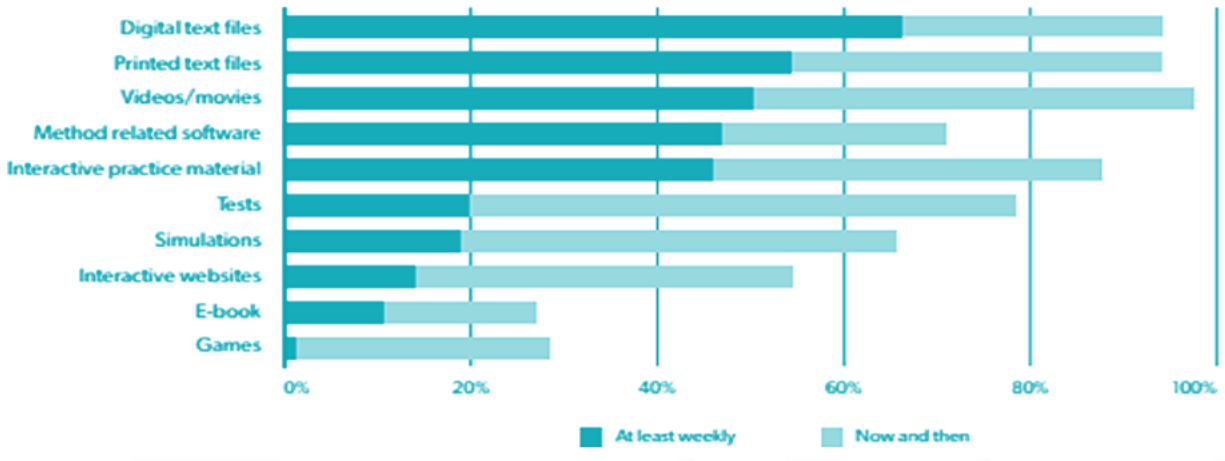
In Malta, the use of blockchain technology for encrypting qualifications represents an important innovation in education. More specifically, from the year 2020, Malta is predicted to be the first country in the world where education certificates and credentials of all students will be on blockchain. This step is made possible through BlockCerts technology that facilitates an open standard for creating, issuing, viewing and verifying blockchain-based certificates. As a result, through an online portal, learners can organise and store educational and professional certificates, enabling digital access to educational records accumulated over time to store and share. Benefits include increased autonomy over credentials for users and the ability to add certificates over time, as well as lowered administrative costs.

Source: Joint Research Centre (JRC), 2017[192]

4.3. Up-take of digital technologies in VET to date

What has been the up-take of digital technologies in learning so far? As noted above in Section 4.2.1, there has been a significant rise in people participating in online courses in recent years. However, systematic evidence on the question of what types of digital technologies are being used in education and training is in short supply, and one of the challenges in this field is that such data goes out of date rapidly because of the fast past of technological change and up-take. However, a Dutch survey published in 2015 provides some insights showing that whilst over one half of vocational education institutions were using most technologies at least some of the time, there was a more limited group being used regularly (at least once a week): digital text files, which includes websites, blogs or wikis; printed text files; videos and movies; method-related software; and interactive practice material. Much less commonly used were tests, simulations, interactive websites, e-books and (very rarely) games.

Figure 4.1: Digital learning in Dutch vocational education: % of surveyed institutions using various technologies



Source: Vier in balans monitor 2015, (Kennisnet, 2015), captions translated into English[193]

192 Joint Research Centre (JRC), (2017). Block chain in Education, Science for Policy report by the European Commission's science and knowledge service. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC108255/jrc108255_blockchain_in_education%281%29.pdf

193 Vier in balans-monitor (2015), Kennisnet. 59. URL: https://www.kennisnet.nl/fileadmin/kennisnet/publicatie/vierinbalans/Vier_in_balans_monitor_2015.pdf

This pattern of usage translates into a broader framework of first- and second-order innovations in vocational education[194]. First-order innovations are very widespread in many technology-rich learning environments and include blogs, wikis, social networking sites, virtual learning environments, laptops, notebooks, interactive whiteboards, web apps, digital cameras, and e-learning and digital portfolios. Second-order innovations include AR, simulations, digital games, console games, remote-response systems, mobile/handheld computing, programming applications, pico projectors and electronic books, all of which are still used at a less frequent rate in current learning environments.

Turning to potential future trends, De Witt (2013) found that mobile learning, game-based learning and learning through social networking sites (social learning) were identified as the most important trends as part of a survey of 76 experts conducted in Germany, Austria and Switzerland in 2011. In more detail:

- 59% of the survey respondents agreed that mobile learning/mobile apps/mobile devices was of greatest importance in the immediate future. According to the Institute for Media and Competence Research – Institut für Medien-und Kompetenzforschung (MMB) – Trend Monitor II/2011 mobile learning was becoming a fundamental pillar of digital learning for German companies. Mobile learning has the advantage of resulting in situation-based and contextualised learning, involving informal learning processes for people who could not participate and micro-learning (on small, structured units)[195].
- 41% of respondents agreed that social learning/social media and communities were of the greatest importance in the immediate future. Social learning can help to bring together students and/or employees who are in diverse geographical locations and support the formation of a collaborative environment, as well as transparency in work procedures. Social learning acts to help reflection, recall and structuring[196].

27% of respondents agreed that game-based learning/serious games and simulations were of the greatest importance in the immediate future. Gaming and simulations help learners to develop the skills necessary for collaborative work in competitive environments which leads to implicit learning, where the learners repeat a certain behaviour and explicit learning, when the learners need to solve certain situations[197]. These three types of digital technologies also had the highest growth and the strongest demand in the VET sector[198].

194 Groff, J. (2013) Technology rich learning environments, URL: http://www.oecd.org/education/ceri/Technology-Rich%20Innovative%20Learning%20Environments%20by%20Jennifer%20Groff.pdf

195 De Witt (2013) New forms of learning for vocational education: mobile learning – social learning – game-based learning, BiBB, BwP special edition, p. 28.

196 Lohman, S. (2010) Social tagging in e-learning (Einblick, Uberbuck Ausblick), in Breitner, M. eds (2010) E-learning, Berlin: Heidelberg. De Witt, C. (2013) New forms of learning for vocational education: mobile learning, social learning, game-based learning, p. 30, URL: https://www.bibb.de/veroeffentlichungen/de/publication/download/7056 Lohmann, S. (2010) Social Tagging im E-Learning: insight, overview, outlook (Einblick, Überblick, Ausblick), in: Breitner, M. H. (ed.): E-Learning 2010. Berlin, Heidelberg 2010, pp. 199–214

197 Bonfadelli, H. (2004) New perspectives: media use as social action (Neue Perspektiven: Medienzuwendung als soziales Handeln). Media Impact (Medienwirkungsforschung) Grundlagen. Konstanz (2004), pp. 167–207, URL: www.mediaculture-online.de/fileadmin/bibliothek/bonfadelli_medienzuwendung/bonfadelli_medienzuwendung.pdf

198 De Witt, C. (2013) New forms of learning for vocational education: mobile learning, social learning, game-based learning, URL: https://www.bibb.de/veroeffentlichungen/de/publication/download/7056

Box 18: IT Academy of Vocational Education, Estonia

As a pioneer in e-governance, the ICT sector in Estonia is constantly growing and according to the 'Vision 2020 for ICT Sector' strategy of the Estonian Association of Information Technology and Telecommunications (ITL), it is important to double the ICT sector's entire workforce. As such, the aim of the IT Academy of Vocational Education programme is to make IT-related vocational training more responsive to the needs of the labour market and more attractive to potential students. In order to achieve these goals, a pilot for renewing curricula was launched under the programme in the autumn of 2018 with the aim of being ready for fall 2019. In addition to developing a novel four-year curriculum in information technology with options to specialise in one of the two curricula of the ICT curriculum group: 'Database and Network Design and Administration' or 'Software and Applications Development and Analysis', the programme also places greater emphasis on preparing graduates for higher education, by increasing the focus on Estonian, mathematics and English while engaging higher education institutions in substantive cooperation.

Three schools were picked to participate in the programme based on the comparability of the curriculum groups, namely Tallinn Polytechnic School, Tartu Vocational Education Center and Ida-Virumaa Vocational Education Center. The programme is executed under the guidance of the Education Technology Foundation, with the support of the Estonian Ministry of Education and Research, higher education institutions, IT companies and other relevant stakeholders. In parallel with updating the curricula the programme has three major strands, namely to:

1. Develop the competences of and motivate teaching and organising staff, taking into consideration factors such as the aging teaching staff, the use of ICT digital technologies and the importance of quality coaching in traineeships. To this end, the pilot programme involves a number of training courses and master classes for teachers, including traineeships in businesses.
2. Developing learning resources in parallel with updating the curricula. The programme evaluates which materials can be used, which materials can be covered with English-language learning resources, and which materials are missing but need to be available in Estonian (e.g. teachers' books, systematic study materials for learners, theoretical and practical tasks created in collaboration with businesses, simulations and learning games).
3. Curriculum marketing activities considering messages aimed at both students and parents in order to encourage promising basic school graduates to take the step into vocation education. This is envisioned through highlighting different advantageous aspects of pursuing vocational education, including the possibility to specialise, exciting employment prospects, strong cooperation with businesses and other educational institutions and an updated curricula which lays solid groundwork for continuing into applied higher education or undergraduate studies.

The curriculum updating process in the schools, in collaboration with businesses, was set in motion in 2018.

Source: Cedefop, 2019[199]

199 Cedefop, (2019). Ruul, K and Mikk, K. Policy strategies, initiatives and practices to prepare VET systems for digitalisation and future of work Technologies, Estonia.

4.4. Making better use of pedagogical innovations and digital learning technologies in VET

Having examined innovations in pedagogy and digital learning technologies somewhat separately above, the question arises as to the relationship between the two in VET and in particular how digital technologies can be used to make innovations that improve the quality of teaching and learning.

This is a challenging topic: as was shown in Section 3.1.4, for all their potential advantages, digital learning technologies can have unintended negative consequences. In short, we need to be aware of the strengths and weaknesses of digital learning technologies. In VET a particular issue is how to ensure an optimum balance between virtual learning and practical experience. The table below summarises the benefits and challenges of digital learning technologies in VET.

Table 4.5: Summary of benefits and challenges of digital learning technologies in VET

Benefits	Challenges
• Supports pedagogical innovation • Offers learners new, different experiences (multi-media); visualises abstract content (especially AR, VR, AI) • Decouples learning from time, place (especially online/remote/mobile) • Supports personalisation • Supports social learning in communities • Content creation by teachers, learners • Faster, more tailored feedback to learners • Enables informal and self-learning (social media, video-sharing) • Cost of use can be low • Simulations are cheaper than the real thing (once developed), reduce preparation/clean-up time, enable more practice and are safer	• Huge range of options: how do we know what is 'good'? • Access is unequal across learners (digital divide); language (English dominates); types of company (by sector, size); occupations • How much tech is actually changing/ improving how people learn in formal VET? • Simulations are still only simulations: can they fully replace real experiential learning? • Are there risks that self-learning and non-formal learning replace formal CVET? And how should they be validated? • Completion rates in MOOCs can be low • Development costs can be high especially in AR/VR • Health issues in VR, AR, AI • Intellectual property rights issues

It is also important to be aware that different digital technologies vary in the depth of their effect on learning. Whilst much depends on how teachers use technologies, technologies are inherently variable in the degree of impact they are likely to have. Some may actually have little effect on teaching and learning processes but might, for instance, enhance the resources available to learners or increase the efficiency of learning processes that essentially remain unchanged, e.g. making it easier for learners to grasp concepts more quickly. Others, such as VR and AR and online social platforms have the potential for learners to do new things not possible before or to expand the range of possibilities such as through social or collaborative learning. In short, digital technologies vary in terms of their capacity to bring about pedagogical innovation. The evidence presented above regarding the diffusion of different types of technology shows that so far less disruptive technologies (e.g. digital text files, interactive whiteboards and digital cameras) have been more popular than those with the potential for more radical change (e.g. simulations, games) and suggests that

more needs to be done to move beyond technologies like text files and movies, to more advanced applications of technology and pedagogical innovations.

Different technologies may also have different impacts on different forms of VET – IVET, CVET and VET at higher levels. It is hard to generalise what such impacts might be. However, employers are increasingly requiring their workforce to be upskilled or reskilled and are demanding skills at higher levels (see Section 1). These trends suggest the need to develop the capacity of both CVET and higher VET. Digital technologies have the potential to support these developments. For CVET, ICT enables learning to be delivered in new ways directly into the workplace and decouples learning from fixed learning times and places, providing the basis for learning expansion. At higher levels, digital learning has already been widely embraced in general (academic) higher education (witness the use of MOOCs for example) suggesting that learning at this level is highly amenable to digitalisation (dealing with older, more experienced learners with better developed (self-)learning skills than in IVET for example.)

Regarding the relationship between digital learning and pedagogy, it has been observed that:

'… using technology well for pedagogical purposes is no easy task. ICT itself does not enhance learning nor does the sophistication of the technology applied. One of the pitfalls of ICT integration is when teachers adopt traditional pedagogical strategies. Another risk is that teachers become more concerned about how they use ICT, than about the benefits of technology for their students'[200].

If anything, in the last decade the relationship between technology and pedagogy in VET has become more complex. Teachers and trainers now face a range of pedagogical and technological possibilities (see Table 4.6) and there is no straightforward one-to-one relationship between them. Indeed, teachers and trainers will typically deploy a number of pedagogies and technologies across their teaching and training depending on a wide range of factors including who their learners are and what they are teaching/training.

200 OECD, (2018), Teachers as Designers of Learning Environments, p. 24

Table 4.6: The innovation-digitalisation nexus

Teaching and learning methods	Digital learning technologies
Embodied	Online resources
Experiential	Online courses
Blended	Online tools and mobile learning
Game-based	Virtual reality, augmented reality
Social/collaborative	Artificial intelligence and learning analytics
Others…	Future technologies…

Nonetheless, it is helpful to consider how digital technologies might be applied in support of innovative pedagogies most relevant to VET. This is shown in Table 4.7, which also highlights where the most likely opportunities for pedagogical innovation might lie and where VET systems might most productively prioritise developments. It also provides an indication of likely challenges and obstacles.

Table 4.7: Pedagogical innovation and digital technologies in VET: prospects and challenges

Type of pedagogy/ learning environment/ assessment process	How digital technologies might be applied in VET
Experiential learning	VET is inherently experiential to the extent that it involves work-based learning or apprenticeships. There is enormous potential for digital technologies to enhance the type and scale of experiential learning in VET. Digital technologies bring benefits when they enhance learners' experiences, offer new and different experiences or offer the same quality of experience at a reduced cost. For example, immersive simulations like VR/ AR are expensive to develop but offer cost reductions and new learning opportunities or ways of assessing learners. Given that VET learners split their time between classrooms and workplaces, mobile learning devices might offer particular advantages in accessing online tools and resources[201].
Blended learning	There is probably a lot of scope to increase the share of learning undertaken through digital tools and resources. Most of the literature on blended learning deals with classroom situations so an important issue for VET is whether and how blended learning might fit into learning in workplaces. Blending may also mean rethinking the timing and location of delivery of some parts of the curriculum between schools/teachers and companies/trainers. Teachers and trainers will need support to be able to blend latest digital technologies effectively into their pedagogies.

201 https://augmentit.ch/new-horizons-vocational-education-training-buhler/

Type of pedagogy/ learning environment/ assessment process	How digital technologies might be applied in VET
Game-based learning	Digital gaming is already a relatively popular tool in training and extracurricular learning and has been successful at engaging people with negative experiences of 'traditional' pedagogies. It therefore has a potentially good general fit with VET, although it seems relatively under-utilised so far. Gaming has proven useful in developing key competences. VET's engagement with these competences to date in terms of programme/qualification design has been highly variable and gaming may offer cost-effective ways of improving their incorporation into curricula – games aimed at developing certain key competences could be 'sector-neutral' and hence used across most VET programmes. In respect to technical/occupation-specific skills, the development costs of gaming (to replicate the types of immersive experiences that are likely to engage young learners especially) might restrict their application to certain skill sets in certain sectors of industry and commerce.
Assessment using digital technologies	Digital assessment offers clear benefits in VET where the key parties (learners, school-based teachers and company-based trainers or mentors) are not always (or usually) in the same place at the same time. There are few apparent barriers to the digitalisation of assessment.

Key issues highlighted in Chapter 4

Digital technologies have the potential to enhance the type and scale of a variety of new or under-exploited types of learning in VET. They can, in particular, support and strengthen experiential, project-based, blended and game-based learning, as well as social/collaborative learning. Yet such developments raise challenges for VET, with its mix of school and workplace settings. For example, blended learning may mean rethinking the timing and location of delivery of some parts of the curriculum between schools/teachers and companies/trainers. And the COVID-19 pandemic has highlighted the difficulties of using remote/online learning and simulations to replace work-based learning.

There is also the broader question of the need to see digital learning and innovation in pedagogies as part of a broader whole, as integrated with other dimensions of teaching and learning, notably, quality management within schools and the creation of communities of practice.

Typically, VET provision is likely to consist of a mix of 'old' and new digital technologies that are being used by teachers and trainers in various ways: all have their place. But equally more needs to be done to use more advanced applications of technology and pedagogical innovations. In the last 10–15 years there has been a major increase in the potential to decouple teaching and learning from time and place and a massive increase in the ability to offer learners new and different experiences and provide faster, more tailored feedback. It is important VET does not 'miss the boat'.

Digital technologies also have the potential to support the development of CVET and VET at higher levels. Employers are increasingly requiring their workforce to be upskilled or reskilled and demanding skills at higher levels. Yet in many countries, there is a lack of capacity – in the form of well-developed CVET and higher VET provision – to meet these growing needs.

EXPERT CONTRIBUTION

'Vocational education and training is at the heart of innovation'

Stéphan Vincent-Lancrin
OECD, Directorate for Education and Skills

Innovation is often associated with advanced technologies, engineering education and PhD graduates working in the R&D departments of large companies. Well, this is indeed part of the picture, and probably the most visible one. What one tends to forget is that in a R&D department, in fact in research functions more generally, only 50% of the staff are researchers: the other half are mainly technicians with a vocational education degree.

Innovation is also about deploying and using the technologies that have been designed in those labs. Typically, this is the work of VET graduates, who thus play a very hands-on role in the innovation process. Within an economy, the largest share of innovation does not correspond to 'radical' or 'disruptive' innovation, but to incremental improvements to existing solutions in goods or business processes. The most innovative companies are those that can be described as 'learning organisations'. There are at least two reasons for this. The first is that organisations that innovate and push their employees to learn to deploy these innovations: innovation is a source of learning. But another important reason is that learning organisations have organisational routines that take advantage of the feedback and suggestions from all of their workers, including those in the production process.

The feedback and learning of all its members, including those that received VET, make them most innovative. In a study analysing the factors associated with learning organisations (Innovative Workplaces, OECD 2010), it appeared that countries that provided the most training to employees at firm level or at employee level were also those with the most learning organisations the most innovation. Opportunities to learn usually also come with vocational training indeed. There are strong reasons to support and invest in VET, including those innovation-related reasons that are often overlooked by policymakers.

In the education sphere, the drive towards equipping students with skills for innovation (the ability to both contribute to innovation and to adapt to it) leads to an interesting convergence between academic and vocational education tracks. Most education policymakers realise that both vocational and general education should include, but cannot be limited to, learning technical skills. Social and behavioural skills (communication, collaboration, etc.) are increasingly recognised as learning outcomes per se – and this is also true for higher order skills such as creativity and critical thinking, which are rated among the most important for the future by employers, and are now almost universally included within education curricula in Europe and beyond.

The real question is how to really take them seriously and foster them in the formal educational process. Working with networks of schools across 11 countries to articulate a language around creativity and critical thinking, and to explore practical approaches to fostering and assessing them across the curriculum, the OECD showed that rubrics helping teachers to be intentional about their development could be effective (Fostering Creativity and Critical Thinking: What it means in schools, OECD 2019). Those rubrics are organised around four dimensions: inquiring, imagining, doing and reflecting. In the case of academic subjects, 'doing' is difficult for teachers who may be used to assessing the acquisition of content and procedural knowledge though tests and exams. This is one of the strengths of vocational education: doing and producing tangible artefacts is at the core of the learning process, and in this respect could not only inspire general education, but also easily integrate all the other dimensions of these higher order thinking skills.

5.0

Cooperation and partnerships

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Cooperation and partnerships

As noted in Section 1.4, there are some areas where VET can only fully achieve its goals by interacting with stakeholders in its wider 'external' environment through cooperation and partnerships. This section of the report examines: the development of VET curricula that are more responsive to the labour market; the development of VET systems that are proactive and flexible in supporting wider innovations for social and environmental sustainability objectives; the growing importance of public-private partnerships; the need for intermediary bodies that can help VET policymakers and practitioners understand and make more informed choices about digital learning tools; and mobility and internationalisation. VET also has a vital role to play in wider innovation systems such as through Centres of Vocational Excellence, which is examined in chapters 6 and 7.

5.1. Adapting curricula to labour market needs

Across Europe, steps are being taken to make VET curricula better tuned to the needs of the labour market. These steps involve a variety of measures including the development of more effective mechanisms for anticipating skill needs, bringing employers and other stakeholders more closely into the processes for developing qualifications and curricula and the use of learning outcomes in qualifications.

The introduction of apprenticeships also signals a closer relationship with labour market needs. Such measures help to ensure that curricula are better adapted to the full range of skills and knowledge required in workplaces, whether such skills and knowledge are technical and related to specific occupations or more general ones that apply across occupations, which are variously termed transversal or key competences. Cooperation and partnerships with relevant stakeholders are crucial to these measures.

Box 19: Samsung Digi Pass, Estonia

The Samsung Digi Pass programme is designed to provide a solution to the problem of youth unemployment in Estonia. In the Samsung Digi Pass programme, a four-month training programme is offered to vocational school students every year. The programme is intended for 14–20 year old students in vocational training and every year 30 students are invited to participate. Three-member teams are eligible to apply and an application must describe the digital competences of each participant and propose an initial problem that will be addressed in the course of the training programme. 10 teams of vocational students will be picked out by the programme's panel.

The training programme has been developed by Samsung Electronics Baltics in cooperation with Tallinn University and the Estonian National Youth Council. The training provides the participants with the necessary skills for taking the first steps towards their career path in anything from an IT company, beauty salon, forestry, business, or entertainment-related position. In the course of the programme, each team of participants, along with a mentor, will work on a project (prototype) proposed by the team members themselves with the purpose of helping the students prepare for their future job. At the end of the training, the participants will receive special digital passports which can be used to prove the skills and experience acquired to their future employer.

The winner of the Samsung Digi Pass programme is awarded a three-week internship in one of the leading Estonian businesses in their field and prizes for all participants are provided by Samsung. The Samsung Digi Pass project started in 2016 and a total of nearly 100 students from 9 vocational schools have participated in the project..

Source: Samsung Digi Pass, 2016[202]

Key competences are seen as playing an important role in helping individuals and businesses respond through innovation to the fast-changing environments in which they must now operate (as mentioned in Section 1.1) Key competences include skills such as critical thinking, problem solving, teamwork, communication and negotiation skills, analytical skills, creativity and intercultural skills. The importance of such competences should not be underestimated: it has been argued that people need to foster a range of competences alongside digital skills like coding if they are to be in the labour market, including complex problem solving, critical thinking, creativity, group work and curiosity[203].

Key competences are seen as overlapping and interlocking in a way where aspects essential to one domain will support competence in another.

Currently, there is not much systematic evidence regarding the extent, or the ways in which, key competences are integrated into curricula in VET. Broadly, it has been found that VET curricula are becoming more oriented towards delivering transversal skills[204]. However, the way in which key competences are expressed within VET qualifications varies substantially across countries, sometimes being expressed separately from technical skills, sometimes integrated with them and sometimes a mixture of the two[205].

202 Samsung Digi Pass, (2016). http://www.samsungdigipass.ee/ee.

203 Presentation by Ádám Horváth, Head of Division, Centre of Digital Pedagogy and Methodology, Hungary at the VET Working Group PLA, Budapest, 5 December 2019

204 Cedefop (2018). The changing nature and role of vocational education and training in Europe. Volume 3: the responsiveness of European VET systems to external change (1995-2015). Luxembourg: Publications Office. Cedefop research paper; No 67. http://data.europa.eu/doi/10.2801/621137 https://www.cedefop.europa.eu/files/5567_en.pdf

205 Cedefop project to develop a methodology to compare qualifications: Exploring, gathering and analysing national qualifications data - Comparing VET qualifications (WA 2 Draft Final report October 2019) https://www.cedefop.europa.eu/en/events-and-projects/events/workshop-comparing-vet-qualifications

In general, key competences are poorly specified in qualifications and hence in programmes compared to technical skills. In some countries, however, such as the Netherlands, the balance between providing technical, occupation-specific skills and more transversal, generic skills within individual qualifications has shifted, which will feed through into curricula. Another notable trend has been the tendency for the number of qualifications to be reduced[206], which inevitably broadens both qualifications and curricula, and which is sometimes accompanied by more emphasis on transversal skills.

A Cedefop study[207] is dedicated to examining key competences in VET. In particular, it examines how three key competences – literacy, languages and digital – are integrated and promoted in policy and curricula.

Competences related to new technologies are especially significant to consider since, along with entrepreneurial, social and civic competences, they are identified in the Council Recommendation as being of increasing significance. It has been found that within VET programmes transversal skills increasingly encompass digital skills in an effort to prepare people for a fast-changing technological environment[208]. For example, in the Netherlands, the introduction of 21st century skills into the VET curriculum includes entrepreneurial and digital skills.

Box 20: Berufenet, German Public Employment Services (PES) – online career advice portal

Career guidance represents an additional bridge between VET programmes and the world of work, considering the student as an active agent in the relationship. In order to ensure that student demand is well informed and adjusted to the needs of the labour market, it needs to be supported by high quality information.

For this purpose, Berufenet is a service of the German PES that functions as an online career advice portal containing information on future trends in several individual occupations. The goal of the portal is to inform people in the labour market about career choice opportunities. It helps all interested parties (PES employees, journalists, politicians, company representatives, people in tertiary education and people who want to choose their career) to process information on the local, regional and national labour market. Berufenet lists all occupations and corresponding education and training profiles. When a new occupational profile is created with a demand, it is officially listed in the PES database. Recent 'newer' dual VET profiles with digital components include 'technical operating assistants for surgical interventions' (using IT and robotics), 'programmers for robotics' (notably for increasing automation) and 'e-commerce apprenticeships'. The portal is updated regularly with some areas adjusted daily, some monthly, some annually and some as a result of certain events..

Source: Bundesagentur für Arbeit, 2019[209]

206 This trend is not true in all countries. In the UK-England, placing employers centre stage in developing occupational standards for apprenticeships may be leading to a narrowing of the scope of some programmes.

207 https://www.cedefop.europa.eu/bg/events-and-projects/projects/key-competences-vocational-education-and-training

208 Cedefop (2018). The changing nature and role of vocational education and training in Europe. Volume 3: the responsiveness of European VET systems to external change (1995-2015). Luxembourg: Publications Office. Cedefop research paper; No 67. http://data.europa.eu/doi/10.2801/621137 https://www.cedefop.europa.eu/files/5567_en.pdf

209 https://berufenet.arbeitsagentur.de/berufenet/faces/index?_adf.ctrl-state=w7as6fayr_1&_afrLoop=2179029721932934

EXPERT CONTRIBUTION

'How can we be better than robots?'

Adam Horvath
Head of division, Centre for Digital Pedagogy and Methodology, Hungary

As everyone in the world who is younger than 22 has not lived a day without Google, our approach to information is slowly changing. The value of information accessibility is decreasing together with the value of simple decisions. It doesn't add worth to a human's salary anymore to remember basic information, to perform basic mathematical operations or to make decisions if something is red or green, or if an egg is broken or not. Those vocations and professions which are built around these competences, like bank tellers from the '70s, or cashiers, or ticket vendors are slowly evaporating. Even in the complex concept of using signals: reading and writing, which helped humanity to differentiate itself from animals, algorithms are catching up faster and faster. Google can process written or verbal text better than the human majority. Jobs based purely on simple writing or reading will also disappear.

Digitalisation is responsible for the extinction of our parents' jobs and this process has hardly started yet. According to PwC there will be waves of different levels of digitalisation affecting different areas of the economy. The algorithm, the augmentation and the autonomy waves will eradicate 20–30% of jobs in the next decade. Depending on the characteristics of different countries, job loss can vary from 15% to as much as 70%, according to William Gibson: The future is already here – it's just not evenly distributed!

Computers, machines, and robots will take over the disappearing jobs, which is what we were learning, innovating, planning, manufacturing and working for. The COVID-19 virus has accelerated this process by cutting down all processes based on direct human interactions.

Instead of the loss, we should focus on the new opportunities which will be made available by these changes. However, to utilise these opportunities we have to rethink and redefine our education and training systems, which systems are still producing human robots: creating people to be able to repeatedly perform tasks applying a given set of rules.

In applying rules, repeating routine tasks and remembering information, we humans will not be able to be faster or stronger than robots which we have built with the intention to be faster, stronger, and more durable than us.

Vocational education and adult training are the key to reach a critical amount of people and help them to update their existing competences to meet the requirements of a more and more digitised labour market. Professions are changing by extending to digital areas. Hungary for example is setting up a legal framework, based on DigComp for recognising and supporting digital competence development and has aligned the vocational and adult training laws accordingly to provide everyone with general and profession-related digital competences.

The chance for success relies on our capability to adapt to the change we started, starting with reshaping our schools and training systems with the aim to develop complex problem solving, critical thinking, creativity, groupwork and curiosity, the core human values.

Humans can be better than robots if they become better humans.

5.2. The proactive role of VET in supporting innovation for sustainability and social goals

5.2.1: The potential of VET in the social and green arenas

As well as taking place internally within VET, innovation occurs 'externally' in wider society and economy, and to support sustainability. An important issue is how VET can effectively engage with and support innovations in this wider environment. In this section, we examine VET's role in supporting innovation for sustainability and societal goals through cooperation and partnerships.

VET has considerable potential to support innovations in the social arena given its client base, which includes people with lower skill levels, and its function in many countries of helping to retain potential early school leavers in the education system or re-engaging those who have already left. At the same time, we need to be wary of digital solutions in relation to the needs of people in poverty or with low incomes – an issue which was highlighted during the COVID-19 crisis[210]. Digital tools have been associated with a digital skills gap, with people from poorer income households less likely to have access to ICT. The same households are least likely to access and have successful engagements with education. Combining these two factors brings a risk that the increasing spread of digital learning might unintentionally widen the digital and learning gaps. Fortunately, VET is well placed to counter such risks and, more than that, to use innovations and digitalisation to enhance the engagement of learners from disadvantaged backgrounds.

Digital learning offers scope to tailor learning to the needs of disadvantaged learners to an unprecedented degree

and to deploy tools best suited to such learners, such as game-based learning (which has great potential in VET, as noted in Section 4.2.3) or making physical adaptations to hardware to meet the needs of people with special educational needs.

Box 21: Portugal's INCoDe – promoting social inclusion through training units on digital literacy

Portugal's INCoDe.2030 national digital competences initiative is an integrated programme for Portugal, bringing together and encouraging collaboration between people with different experience and knowledge as well as multiple public and private organisations. It aims to ensure digital literacy and inclusion for the exercise of citizenship; to encourage specialisation in digital technologies and applications for job qualifications and a higher added-value economy; and to produce new knowledge in international cooperation. This initiative has five major priorities (1) inclusion; (2) education; (3) qualification; (4) specialisation; and (5) research.

Within the programme, several actions are taking place in the area of initial VET and lifelong learning, such as the integration of training units on digital literacy in the National Catalogue of Qualifications with the intention of promoting the acquisition of competences for the qualification of effective digital citizenship. These training units target people over 18 years old, employed or unemployed, but with a particular focus on those with the lowest levels of digital literacy.

Source: INCoDe, 2020[211]

210 McCoshan, A. (2020) COVID-19: How can VET respond? https://ec.europa.eu/social/vocational-skills-week/covid-19-how-can-vet-respond_en

211 https://www.incode2030.gov.pt/

VET also has potential to contribute to achieving important gender goals in respect to the economic and social position of women. Women's under-representation in certain occupations and senior positions is pervasive in Europe and particularly acute in some countries. VET has the potential to innovate in these areas such as by actively supporting the recruitment and training of women to tackle these imbalances in IVET and seeking to develop programmes specifically to address the low proportion of senior jobs occupied by women (e.g. management courses as part of CVET).

VET also has a significant role to play in supporting innovations for environmental sustainability. The role of VET in the green economy is particularly relevant here. VET has a key role to play in the supply of people with the skills for new green jobs, such as in new occupations in solar or wind power generation, and in retraining workers and upgrading skills for occupations that are being 'greened' such as in the transition to electric vehicles in automotive manufacturing[212]. At the same time, VET should always consider digital learning in terms of its environmental costs and benefits. No technology is likely to be 'environmentally neutral'. Indeed, AI was recently found to have a very poor carbon footprint[213]. More widely, VET should reflect on skills from a sustainability perspective, in terms of skill 'wastage': many skills are never used or lie dormant in individuals and may warrant 'reactivation'.

Box 22: VET, sustainability and the circular economy in Belgium

Permafungi is a Brussels-based social cooperative that recycles urban waste coffee grounds to produce oyster mushrooms. The Belgian cooperative was started to provide stable and lasting employment to young people in the city, while ensuring that recycled coffee grounds from a number of Brussels stores were not simply thrown away. From these coffee grounds collected by bicycle, Permafungi produces 1 tonne of fresh oyster mushrooms and 10 tonnes of natural fertilizer each month while recycling 5 tonnes of coffee grounds. It offers training in its cultivation methods as well as advice regarding starting similar profitable activities so young people can follow in its footsteps.

The Belgian federation Ressources represents social enterprises from the circular economy sector in Wallonia and Brussels aimed at reducing waste and creating local sustainable jobs. Accordingly, the association has created a new recognised job profile as recycling or waste management coordinator ('valoriste'). The training targets in particular unemployed persons who are encouraged to obtain a job certificate as recycling coordinator. As a next step, the federation Ressources is developing further training to link competences to the job certificate.

Source: Permafungi, 2020[214], Ressources, 2020[215]

212 International Labour Organisation and Cedefop (2011) idem: p. xvii-xviii; and Cedefop (2015) Green skills and innovation for inclusive growth, Luxembourg: Publications Office of the European Union, pp. 33-51 URL: http://www.cedefop.europa.eu/files/3069_en.pdf

213 Hao, K. (2019) Training a single AI model can emit as much carbon as five cars in their lifetimes, MIT Review, 6 June 2019, accessed 09.04.20 https://www.technologyreview.com/2019/06/06/239031/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/

214 https://www.permafungi.be/

215 https://www.res-sources.be/fr/valoriste/

Box 23: Germany – Federal initiative for sustainability in VET

Since 2004 the Federal Institute for Vocational Education and Training (BIBB) has directed funds from the Federal Ministry of Education and Research (BMBF) to fund joint projects aiming to anchor sustainable development in VET under the pilot project funding priority 'VET for Sustainable Development (ESD-VET; BBNE)'.

The corresponding research and development activities include elaborating schemes for sustainable competence development of apprentices and teaching/training staff, such as in commercial and nutrition sectors and in craft industries, as well as an initiative on the sustainable design of learning venues in companies and schools. In addition, it encompasses the development of competence schemes for company owners and managers, especially in SMEs. As a result, the federal initiative ESD-VET provides research-based didactic concepts which come with recommendations for sustainability in VET at the level of regulations, learning processes and teaching practices. Currently a call for projects focuses on the transfer of the results to further training for teaching and training staff in apprenticeships in the context of digitalisation.

Running from 2015–2019 (extended until 2021) the projects mentioned above for sustainability in VET are allocated €12 million by the German Federal Budget.

Furthermore, €2.4 million will be spent on projects that run from 2020 until 2022 and focus on the transfer of the results of elaborated concepts for sustainable competence development. By 2019, 19 projects had been selected and a total of 50 training methods and modules have been developed, implemented in practice and evaluated.

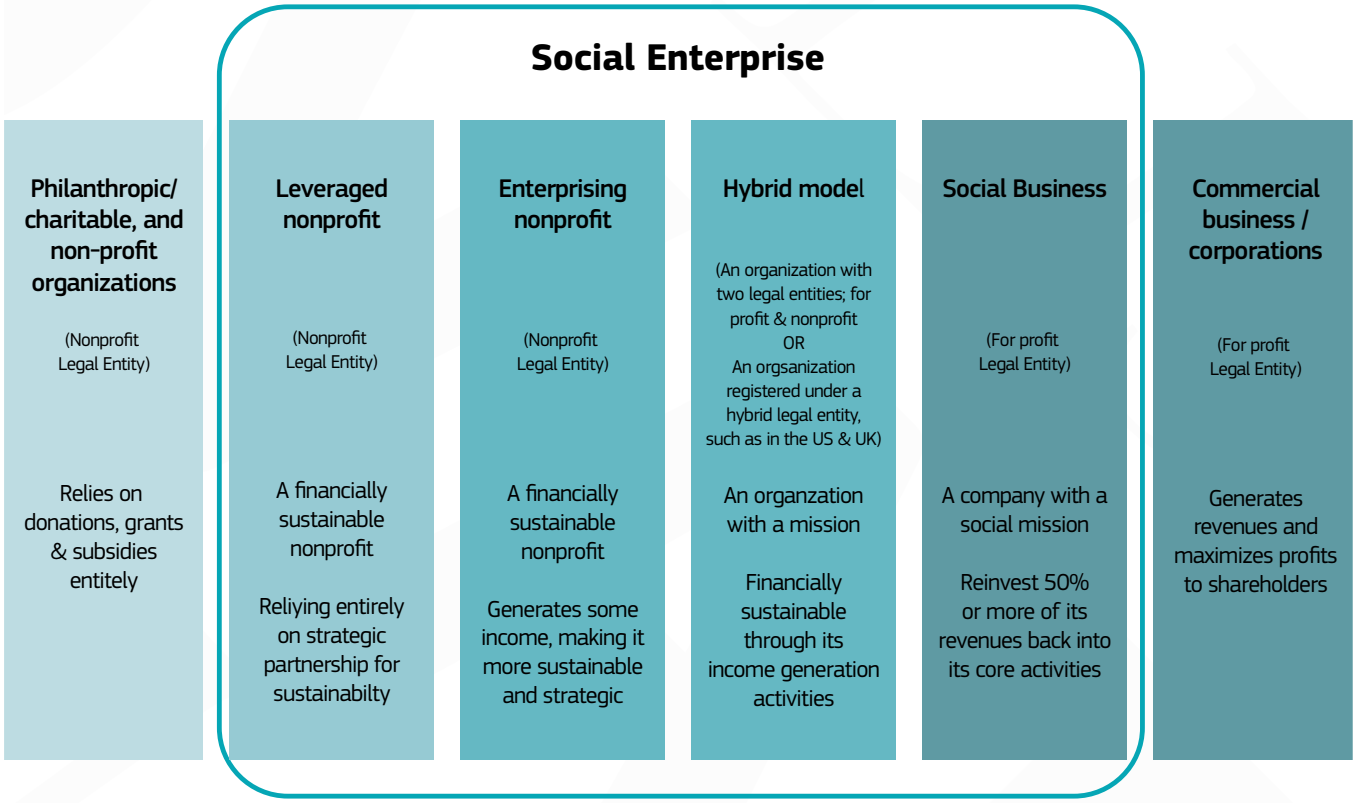
Source: Vocational Training for Sustainable Development (BBNE), 2020[216]

5.2.2: VET and social enterprises

VET's traditional engagement with employers, combined with its ability to tackle social issues, makes it well positioned to play a role in respect to social enterprises. Such enterprises frequently seek innovative ways to fill market gaps or tackle areas of social and environmental concern. Although social enterprises can be for-profit, they ultimately seek to reinvest a portion of their income from sales back into their mission, for instance by providing income generation for the unemployed, empowering socially marginalised groups and/or operating in a particularly sustainable manner. In doing so, social enterprises can take more than a few forms, as the figure below demonstrates.

216 https://www.bmbf.de/upload_filestore/pub/Berufsbildungsbericht_2020.pdf

Figure 5.1: The spectrum of social enterprises (arranged by legal form and revenue source)



Source: adapted from So VET Needs Analysis Report, 2017[217]

By embracing business models that aim to solve social challenges while simultaneously providing goods or services, social enterprises are increasingly becoming drivers of social innovations at local and regional level. A window into what such innovative activities may look like in practice is further outlined in the examples below from the Irish context.

217 https://ied.eu/entre_files/outcomes/Social_Entrepreneurship_as_an_alternative_for_Young_Unemployed.pdf

Box 24: The social enterprise – inspiring practices from Ireland

Based in Dublin, the Walkinstown Green Social Enterprises Limited (WGSEL) aims to fulfil green needs in the community while creating employment opportunities for people with intellectual disabilities. To this end, the enterprise has launched a number of targeted activities, including a structured learning programme aimed at supporting young people with intellectual disabilities to successfully transition into the world of work. To sustain its activities, WGSEL's Multi-Functional Community Resources Facility runs a community coffee shop (The Green Kitchen). It also extends a number of other services to the local community, including a community garden centre (The Green Garden), a men's shed workshop, meeting rooms for use by other community groups and a training centre.

Bounce Back Recycling (BBR) is a recycling company that aims to divert as much furniture away from the landfill as possible. Accordingly, BBR provides services for companies, councils and householders to recycle their unwanted waste rather than send it to the landfill. The recycling company already works with a number of local authorities across the country and many retail outlets to improve the recycling rates across the west of Ireland. BBR further employs a social enterprise employment model by providing employment opportunities and job training for people with high barriers to employment. BBR is working towards making the social enterprise financially self-sufficient through their services, with current income used to pay standard operating expenses associated with the business and wages to employees.

Siel Bleu, Ireland, is a not-for-profit organisation providing life enhancing exercise programmes to older adults and patient groups, particularly patients suffering from chronic decease. It is the first specific effort to promote exercise among older adults and patient groups in Ireland, with the aim of improving overall wellbeing. In 2018, 91% of its overall revenue came from the delivery of services, with the rest coming from grant funding from corporate partners and private foundations.

Source: Walkinstown Green[218], Bounce Back Recycling[219], Siel Bleu Ireland[220]

With a practice-oriented curriculum and close connections with the marketplace, VET is in an ideal position to foster social entrepreneurship, for instance by endorsing innovative entrepreneurial training. VET institutions are also ideal focal points, providing a space where interested stakeholders (teachers, employers, entrepreneurs, students, local authorities, community organisations) can come together in a process of knowledge-sharing and cooperation. With many successful entrepreneurs having struggled in school, it is also evident that the skills that successful entrepreneurs possess do not always translate well into traditional classroom settings. As such, VET is particularly well placed to go beyond the thinking of social entrepreneurship as a theoretical subject, by closely aligning activities with local social enterprises through apprenticeship schemes and other actions that enable the insights and experiences of social entrepreneurs themselves to be drawn upon.

218 https://www.walk.ie/what-we-do/employment.php
219 https://bouncebackrecycling.ie/about-us/
220 http://www.sielbleu.ie/

Box 25: VET and social entrepreneurship

INNOVENTER – Innovative vocational social entrepreneurial training

The Interreg-funded project INNOVENTER aims to create a VET learning framework to promote social entrepreneurs' competences and skills. The core idea is to establish VET-oriented social entrepreneurship training for SME entrepreneurs so that they innovate themselves, while engaging disadvantaged people as employees at the same time. The main project outputs include ECVET-compliant training courses on social entrepreneurship tailored to the relevant national contexts, including curricula, learning modules and handbooks. The project also aims to produce online and mobile training platforms with interactive tools for SMEs. The project brings together three EU Member States (Bulgaria, Cyprus and Greece) and two candidate countries, Albania and the Republic of North Macedonia, across the Balkan-Mediterranean regions.

SO VET – upgrading vocational training systems for better social entrepreneurship courses

SO VET consists of a project team of seven organisations from the UK, North Macedonia, Greece, Turkey, Italy and Sweden, collaborating to enhance the development of social entrepreneurship to combat youth unemployment. The main objective of the SO VET programme is to upgrade vocational training systems in order to provide effective courses in the subject of social entrepreneurship, through developing a number of outputs, including:

- A needs analysis report in each country to determine the existing situation with regards to VET and the existing courses on social entrepreneurship.
- 'Curriculum for Young Entrepreneurs' reflecting the knowledge and skills youth are expected to learn including the learning standards or learning objectives they are expected to meet, the units and lessons that teachers teach and the assignments given to students, related resources (e.g. the books, materials, videos, presentations and readings used in a course) and the tests, assessments and other methods used to evaluate student learning.
- Pilot implementation of the Curriculum for Young Entrepreneurs to young persons without formal qualifications and/or work experience. Each workshop aims to involve at least 5–8 participants.
- An e-learning platform where the young unemployed will be able to attend the pilot online courses.

Source: INNOVENTER, 2017[221], SO VET[222]

It deserves mention, however, that strengthening the link between VET and social entrepreneurship – for instance by creating learning frameworks to promote social entrepreneurs' competences and skills – would necessarily also have implications for teacher training, by requiring greater investment in the continued professional development of teachers and trainers. Investing in VET teachers' understanding and experience of social entrepreneurship in their training, and throughout their careers, would be essential in order to implement deep learning experiences, ultimately affecting the overall understanding of, and experience with, social entrepreneurship for VET students.

221 http://www.interreg-balkanmed.eu/approved-project/41/
222 https://sovet-project.eu/en/project/

5.3. Private-public partnerships for the EdTech market

An important feature of the growth of e-learning has been the appearance of private sector actors. These actors include specialised firms, including start-ups and small and medium-sized companies that invent, design and commercialise educational tools in what is sometimes referred to as the educational technology (or 'EdTech') market. It also encompasses private VET providers (when regulations allow) and IT firms that offer training in digital skills (often linked to their products) and certification such as Microsoft, IBM and SAP.

The global 'EdTech' market is already significant and continues to grow. It has been estimated to be around US $250 billion, and to be most significant in the USA with rapid growth now occurring in Asia[223]. In the USA, 'innovation ecosystems' are emerging in places where there are clusters of EdTech companies, investors and proactive schools and school districts and sometimes universities[224]. In comparison, the European 'EdTech' market is relatively small and fragmented.

Examples include:

- EdTech France[225] constitutes an association of French companies that aim to federate and structure the ecosystem of French EdTech in order to maximise the impact of innovation and technology in education and professional training. To this end, EdTech operates with a mandate to make private sector solutions visible and legible and to facilitate exchanges and meetings with the various providers and seekers of EdTech solutions. To promote innovation among those involved in VET, EdTech France is also partnering with Center Inffo[226], an association under the supervision of the French Ministry of Labour with a public service mission to provide stakeholders in vocational training and apprenticeships with guidance (e.g. through legal expertise, training and specialised information). In this context, the role of EdTech France includes participation directly or through its members in the Center Inffo working and reflection groups and advancing actions and projects likely to promote the use of innovative solutions in vocational training[227].
- Similarly, the city of Pori in Finland runs a public-private partnership on 'AI & Robotics ecosystem' that brings talent, jobs, start-ups and growth to the region. Among other initiatives, it has been running a successful project of robotics in schools to better link industry with the education system[228].

A notable example of how significant the private sector can be is Cisco Systems, which develops, manufactures and sells networking hardware and telecommunications equipment. It not only has established standards for digital skills through training and certification that are widely accepted within the industry, but also accredits schools as 'Cisco academies'.

223 https://www.uktech.news/news/report-edtech-spend-will-reach-252bn-2020-20160526
224 Vander Ark, T. (2016) Inspiration, Incubation, Intermediation: Keys to Next-Gen Learning at Scale https://www.gettingsmart.com/2016/02/inspiration-incubation-intermediation-keys-to-next-gen-learning-at-scale/
225 https://edtechfrance.fr/
226 https://www.centre-inffo.fr/site-centre-inffo/qui-sommes-nous/qui-sommes-nous-2
227 https://www.centre-inffo.fr/site-centre-inffo/actualites-centre-inffo/le-quotidien-de-la-formation/articles-2019/edtech-france-et-centre-inffo-partenaires-pour-valoriser-linnovation-chez-les-acteurs-de-la-formation
228 http://www.satakunta.fi/en/coast-robots

In Albania, IT teachers from a group of schools underwent a three-month blended training to receive a Cisco standard industrial certificate and their schools subsequently became Cisco academies offering IT training to young and adult learners[229].

It is difficult to estimate the size of the private sector but its relevance in education and training is increasing (as shown in Section 6.3.3).[230] The emergence of these new actors, combined with the increasing accessibility of educational content outside educational institutions through open access sources, challenges the traditional boundaries and position of educational institutions, which have to adapt to survive[231]. A further challenge is posed by the dynamism and instability in the private 'EdTech' market which makes for a constantly shifting array of (potential) partners for the public sector. Competitive market conditions and appropriate funding are important for these companies to thrive and thus encourage the development of innovative education technologies.

VET systems need clear responses to such complex 'operating environments' of actors and innovations.

It is crucial to ensure that educational institutions do not simply become recipients of innovations and digital tools – 'responding and adapting' – but taking control of the wide range of innovation and digitalisation available in a strategic way (e.g. through quality assessments of digital tools, their effects and intended purpose in the classroom). It is also important for governments to attempt to ensure fairness in distribution and access, to mitigate risks, and to maximise benefits through proactive labour market governance.

5.4. The need for intermediation

As is evident from Chapter 4 especially, the digital world is providing a bewildering and ever-increasing array of opportunities to enhance learning. And, on the side of teaching and learning, the choices can be confusing. Furthermore, as noted in Section 4.4 there are no easy one-to-one relationships between pedagogies and digital learning technologies, not all innovations in teaching and learning need digital technologies; and not all digital learning tools lead to innovations in teaching and learning. Policymakers, school management teams, teachers and trainers may need support and leadership in the pedagogical innovations they make and the digital tools they select, especially if such efforts are to be directed towards wider strategies for innovation and regional development.

An important concept in information and communication technology is 'intermediation' – how users interact with the digital world: what, or who, sits between users and the technology to make it accessible and easy and rewarding to use. VET stakeholders are likely to benefit a lot from bodies that can 'intermediate' in this way, between them and the digital world.

229 https://www.etf.europa.eu/sites/default/files/2019-02/digital-factsheet_albania.pdf
230 OECD. (2016). Innovating education and educating for innovation, OECD: Paris, pp. 115 and 134
231 See glossary for a definition

One of the constraints on the penetration of digital technologies in education and training is reported to be that the system's gatekeepers have to make decisions on their own or with minimal help from knowledgeable others. It has been estimated that the speed of digitisation in education is up to five times slower than in other sectors[232]. This is likely to be because of poorly distributed knowledge and weak connectivity amongst teachers, school managers, governing bodies and policymakers. Intermediary bodies can help to address this problem and develop the expertise needed to address the need for effective assessments of the costs and benefits of digital learning technologies (Chapter 3).

Indeed, intermediary bodies can also help to address the full range of system-level challenges that can be synthesised from the evidence presented in this report and summarised in the table below.

Table 5.2: System-level challenges of innovation and digitalisation in VET

Challenges
1. Opening up of learning landscape, widening of opportunities
2. Opening up of new pedagogical opportunities – especially in experiential, blended, game-based learning
3. Blurring of boundaries between types of learning, i.e. formal, non-formal and informal learning
4. Growth of the role of the private sector ('EdTech' developers and ICT companies providing training) and VET providers
5. Issues of quality, efficiency and effectiveness
6. Changing role of teachers and trainers

There are already inspiring examples of intermediary bodies in Europe, such as, in Spain, the Basque Country's Tknika[233] and Aragón's regional Centre for Innovation for Vocational Training (CIFPA)[234]. But more such structures are needed to provide investment, inspiration and innovation and to enable stakeholders to make faster and better pedagogical and technological choices. In the USA, 'innovation intermediaries' play a key role in creating the 'innovation ecosystems' that characterise local and regional 'EdTech hotspots'[235]. The US situation is distinctive, but there are lessons here for Europe.

232 https://www.uktech.news/news/report-edtech-spend-will-reach-252bn-2020-20160526
233 https://tknika.eus/en/
234 https://cifpa.aragon.es/en/
235 Vander Ark, T. (2016) Inspiration, Incubation, Intermediation: Keys to Next-Gen Learning at Scale https://www.gettingsmart.com/2016/02/inspiration-incubation-intermediation-keys-to-next-gen-learning-at-scale/

5.5. Mobility

5.5.1: Support for learner mobility

Learning mobility[236], regardless of social or cultural background, as well as cooperation and innovative policy development in education and training, including VET, is key to building inclusive societies and sustaining the competitiveness of the European Union. It also contributes to strengthening European identity, principles and values, as well promoting a more democratic EU.

Mobility particularly supports skill improvement, including both key competences and technical skills, which in turn enhances innovation (e.g. in terms of generating fresh ideas). Mobility, however, is not only a labour market and innovation value, but also benefits the whole society by supporting the acquisition of qualities needed to navigate a progressively diverse European and global society more generally. Besides the European dimension, learning mobility can take place in a local, regional or national context.

Digitalisation can strongly enhance learning mobility, which can take different forms, be it physical learning mobility, or virtual learning (i.e. acquisition of knowledge, skills and competences through the use of information and communication tools). Learning mobility may be accompanied by measures such as language support and training and/or be complemented by online learning and virtual cooperation for the purpose of providing a meaningful transnational or international learning experience. Virtual formats can entail virtual cooperation, blended and virtual mobility, which can play an important role to reach more participants, in particular those with fewer opportunities and those for whom moving to a country other than their country of residence would be an obstacle.

Nonetheless, European mobility in VET is lagging behind compared to other sectors, such as higher education. Moreover, EU support in the area of VET has so far been limited to Europe, and not included the international dimension.

Increasing the use of virtual cooperation activities could boost international exchanges in VET,

such as through more systematic and coherent use of online platforms such as eTwinning, and others in the area of VET. In addition, in the COVID-19 context where physical mobility has been halted or severely curtailed, exchanges through online and virtual learning between countries have become even more significant. Whilst digital technologies can never replace all of the benefits of physical mobility, online platforms have scope to play an enhanced role in the preparation for and follow-up of physical mobility, especially now that the COVID-19 experience has increased people's familiarity with them.

236 As defined in the 2018 Commission proposal on a new Erasmus regulation, 'learning mobility' means moving physically to a country other than the country of residence, in order to undertake study, training or non-formal or informal learning; It may be accompanied by measures such as language support and training and/or be complemented by online learning and virtual cooperation. In some specific cases, it may take the form of learning through the use of information technology and communications tools.

Establishing some common VET content across countries has the potential to facilitate mobility of learners and workers, as well as the automatic recognition of qualifications. An initiative in this area are the Erasmus+ projects under Key Action 3 on supporting the setup of joint VET qualifications, including at higher level, or the improving such existing qualifications (2018–2020). These transnational qualifications should comprise strong work-based learning and a mobility component, address learning outcomes, quality assurance and proper recognition while making use of relevant European tools and instruments. Moreover, the Commission, together with Member States and relevant stakeholders, intends to explore the potential of developing European vocational core profiles as part of the Europass platform, complemented, where possible, by vocational digital content developed within the framework of European transparency tools[237].

The European Union has a role in creating the framework conditions to allow for more and better learning mobility, and this is why a number of policy and funding initiatives support mobility and transnational cooperation in education and training.

The European Commission's proposal for the next Erasmus+ programme (2021–2027) foresees tripling the number of VET learners and staff, including HR staff in companies guiding and implementing training. This potentially translates into VET mobility opportunities abroad for around 2 million people, compared to the 650,000 in the current programme (2014–2020). In addition, the proposal envisages opening up the international dimension to VET mobility of learners and staff for the very first time.

As reaffirmed in a communication by the European Commission on 30 September 2020, the European Education Area (EEA) will be established by 2025[238]. This recent communication sets out the pathway for achieving the EEA. Among the six dimensions of the EEA are quality, inclusion and gender equality, green and digital transitions, teachers, higher education and advocating a stronger Europe in the world. Beyond helping 'to overcome unjustified obstacles that make it more difficult to learn, train or work in another country with the aim of realising the "free movement of learners" and creating a genuine European learning space', its objectives include 'supporting Member States in improving the inclusive, lifelong learning-based and innovation-driven nature of their education and training systems[239].'

237 See European Commission proposal for an EU Council Recommendation on VET https://ec.europa.eu/education/policies/eu-policy-in-the-field-of-vocational-education-and-training-vet_en

238 https://ec.europa.eu/education/education-in-the-eu/european-education-area_en

239 As clarified by the European Commission in its Communication of 22 May 2018 on Building a stronger Europe: the role of youth, education and culture policies.

In April 2019, the eTwinning platform[240] aimed at improving collaboration among teachers, students, schools, parents and local authorities, was updated and improved to increase and recognise the work of VET schools across Europe participating in the platform. In practical terms, teachers registering in eTwinning are able to indicate whether their school is a VET school. As a result, they will find it easier to create projects with likeminded professionals, bringing forward the importance and innovation of VET.

Box 26: Boosting VET cross-border mobility between Luxembourg, Germany and France

Cross-border cooperation has been strengthened to ensure apprenticeship places in occupations, which includes the use of digital materials and development of e-books. In March 2018, Luxembourg signed a bilateral agreement with the German Land of Rhineland-Palatinate that was modelled on the 2017 agreement with the Lorraine region in France. Both are based on a 2014 framework agreement aimed at boosting cross-border mobility in VET and thereby strengthening the labour market in the Grande Région (i.e. Luxembourg and the bordering regions of Belgium, France and Germany). The aim of the agreements is to give young people new perspectives and contribute to the flow of labour force, contributing to fighting skill shortages and securing a sufficient supply of skilled employees on both sides of the border. In September 2018, a total of 150 VET students were involved in apprenticeship mobility across the Grande Région.

Source: Cedefop, 2018[241]

240 https://www.etwinning.net/en/pub/newsroom/highlights/a-new-chapter-in-etwinning_voc.htm

241 Cedefop, 2018. For more information, please see: https://www.cedefop.europa.eu/de/news-and-press/news/luxembourg-vet-goes-cross-border

To maximise the benefits of transnational mobility in VET for learners, as well as teachers and trainers, the presence of internationalisation strategies is crucial. European internationalisation in VET entails supporting learning in other European countries by embedding high quality mobility activities into curricula, as well as developing international approaches throughout VET institutions, for example by networking with bodies in other countries, promoting the learning of foreign languages and looking beyond national VET approaches. At an institutional level, the internationalisation process should result in improved capacity to organise mobility for learners and staff, whilst at the same time rewarding, promoting and further developing the quality of learning mobility[242].

By extension,

> ***having a clear and well-anchored strategy on internationalisation is crucial to support and provide direction for international activities, and ultimately to have an impact on and add value for the VET providers, its students, the employees, the surrounding region and the world of work.***

For this purpose, a practical guide on strategic internationalisation in VET has been prepared for the European Commission.[243] The guide aims to provide practical guidance and advice for the strategic planning of international cooperation to VET training providers. It caters to both small and large institutions, to countries and to VET systems at different stages of internationalisation. In practice, while developing such strategies and fully embedding internationalisation into institutional policy and practice on all levels is often considered a challenge, various innovative efforts to improve the culture of learning mobility in VET are currently being implemented, as the below examples show.

242 CALL - EAC/A04/2018 Erasmus+ Vocational Education and Training Mobility Charter. https://ec.europa.eu/programmes/erasmus-plus/sites/erasmusplus2/files/specifications_of_the_vet_mobility_charter_0.pdf
243 https://ec.europa.eu/programmes/erasmus-plus/sites/erasmusplus2/files/eac-a06-go-international_en.pdf

Box 27: Initiatives to strengthen international VET mobility

Intervet – Internationalisation of VET systems in the Western Balkans

Intervet is a project focusing on the internationalisation of VET systems in the Western Balkans. The project aims to improve the culture of learning mobility in the field of VET by better informing VET teachers and headmasters about resources and opportunities in learning mobility – thereby increasing their competences in planning and managing mobility projects. The project will implement activities at two levels: mobility of VET learners and competence building of VET staff from January 2020.

The Education Worldwide programme, Germany

The Education Worldwide programme (AusbildungWeltweit) of the Federal Ministry of Education and Research (BMBF) has been promoting international experience in vocational training beyond Europe since 2017. It supports stays abroad for trainees and company trainers in countries that are not covered by the EU's Erasmus+ programme. Since 2017, more than 1,000 stays in over 40 countries have been approved. The USA, China, Switzerland and Australia are frequently chosen destinations. The stays abroad must be operational or practice-oriented. The new funding guidelines for the period until 2024 significantly expand the spectrum of training worldwide. For example, in addition to training companies and chambers, vocational schools can now also apply for funding.

Internationalisation strategy development, the case of Ogre TVS, Latvia

At the Ogre Technical Vocational School (Ogre TVS) in Latvia, high quality practical work placements and work-based learning is increasingly offered internationally, with an increasing number of incoming foreign students. Accordingly, the school's internationalisation strategy is being developed and implemented through the cooperation of and consultation with a number of different stakeholders. The main actor in advancing the internationalisation strategy is a school advisory body – the convention – incorporating representatives from the branch ministry, local government, employers and other relevant stakeholders.

Source: EfVET, 2019[244], Education Worldwide, 2017[245], Ogre Technical Vocational School, 2020[246]

244 EfVET, 2019. Project description. https://www.efvet.org/portfolio-items/intervet-internationalisation-of-vet-systems-in-western-balkans/
245 https://ausbildung-weltweit.de
246 www.ovt.lv

EXPERT CONTRIBUTION

'In the future everyone will be a circular economy professional'

Nani Pajunen
Leading specialist, D.Sc. (Tech.), Carbon-neutral Circular Economy

The Finnish Innovation Fund Sitra, Finland

Our present economy is based on overusing the natural resources of our planet. There are limits to growth, as we only have one globe with finite resources. The impacts of human behaviour, the industrial boom and accelerating urbanisation are changing the conditions for life in some parts of this planet. Many areas already suffer from a dire lack of water. Climate change and biodiversity loss is already a reality.

In a world ravaged by the climate crisis, diminishing natural resources and biodiversity loss, growth of the economy and wellbeing can no longer be based on the wasteful use of natural resources and on buying and owning more and more new goods. We need smarter economic models that will not stop consumption but transform it, making it more sustainable. We need a circular economy.

Education also needs to react to these global crises. We need to include carbon-neutral circular economy in all education, including VET, on all levels and disciplines.

Circular economy skills and knowledge are needed in different areas of society, both in public and private sectors: in chemistry, legislation, business activities, behavioural sciences, construction and food production, and so forth. The list is limitless as it covers all areas of human activity. Here, education will be key in converting the world's economic model to a circular economy.

For around 30 years, we have had titles such as 'environmental manager' and 'sustainability managers', and environmental issues have been mostly just their responsibility. This is not enough. We need all employees and employers to understand their role in the transition towards the circular economy. This is a pure necessity and vital for the future. Increased understanding of the present situation and the know-how via circular economy education are key to change. There is a need for circular economy education – on all levels of the education system and in lifelong learning.

As society moves towards a circular economy, we will constantly be confronted with greater challenges that education will need to address. It is not enough for teachers and trainers to reach today's school pupils, vocational and university students as well as adults. We need to engage the whole working population in the educational sphere. Lifelong learning should support the goal of making us all circular economy professionals. And this is why we also need to use information channels outside the educational field.

'I believe, in the future everyone will be a circular economy professional, capable of applying carbon-neutral circular economy solutions at work and in their everyday lives. I want to encourage everyone to learn the skills to be part of the transition. We all have a right to be part of a sustainable future.'

5.5.2: Support for teacher and trainer mobility

While often insufficiently explored, stimulating VET teacher and trainer mobility is a crucial aspect of promoting high quality VET mobility for various reasons. Firstly, it is valuable for the professional development of the individual teacher or trainer, be it through participation in conferences, training, study or company visits. Secondly, staff mobility supports the sending VET institution, through the establishment of working relationships with faculties or departments in other countries, which could ultimately lead to sharing of experiences and innovative practices, as well as project cooperation. At the same time, staff mobility can also help VET institutions align themselves with wider regional or national strategic objectives relating to internationalisation.

Staff mobility is also key to advancing and supporting student mobility in several ways. For one, the mobility of teachers and trainers is one of the most important multipliers of learner mobility. This is because staff who have good relations and networks with institutions abroad, either through training, teaching or research, know the added value of being mobile and are more likely to support learners in becoming mobile themselves. Moreover, digital technologies have the potential to enable teachers to be virtually present while the learners are abroad, by leveraging ICT tools in order to communicate with learners and monitor their progress. As such,

> ***the physical mobility of learners should, where possible, be accompanied by the virtual mobility of sender-institution teachers and trainers.***

Lastly, staff mobility it is an essential way in which to offer international experiences to learners that are unable to participate in student exchanges themselves. This is due to the fact that teachers and trainers with an international outlook who are mobile in their work are likely to add an international dimension into their classroom and thus foster an international outlook among learners, some of which, for various reasons, may be unable to physically relocate.

Key issues highlighted in Chapter 5

The challenges in VET's external environment are expanding and getting more complex. VET will need to address them through cooperation and partnership with others.

VET has considerable potential to support innovations in support of environmental sustainability, and social and gender equality. Innovation and digitalisation can enhance the engagement of learners from disadvantaged backgrounds but without explicit and conscious action have an inherent risk of digital exclusion – and hence exclusion from new learning opportunities, as shown by the COVID-19 pandemic. Similarly, active efforts will be required to support the recruitment and training of women to tackle gender imbalances in IVET, and to develop programmes specifically to address the low proportion of senior jobs occupied by women. Regarding the environment, VET has a key role to play in reskilling and upskilling people as well as supporting skills for new green jobs. Yet, critically, success will depend on how effectively it works with employers and other partners.

VET is also experiencing increasing complexity in its 'operating environment' of actors and innovations. The growth of educational content outside educational institutions challenges the traditional boundaries and position of VET institutions, whilst also raising the prospect that they become mere recipients of innovations and digital tools – 'responding and adapting'. It is important that VET can manage the innovation and digitalisation available in a strategic way. This means forging partnerships in the 'EdTech' market and putting in place structures for 'intermediating' between VET and the digital world.

Globalisation continues to increase the need for mobility to develop international mindsets in learners, trainers and teachers. Whilst digitalisation can strongly enhance learning mobility, the benefits of physical mobility can never be replaced by digital technologies, and the challenge is to be clear as to their optimum role, e.g. there is evidently scope for online platforms to play an enhanced role in the preparation for and follow-up of physical mobility.

6.0

Policy, funding and governance for a new age

Policy, funding and governance for a new age
Policy, funding and governance for a new age
Policy, funding and governance for a new age
Policy, funding and governance for a new age
Policy, funding and governance for a new age

'Governments can help to open up systems to innovation. They can create an innovation-friendly climate [...] help strengthen professional autonomy and a collaborative culture where great ideas are shared and refined [...] help to make great ideas real by providing access to funding and non-financial support to lift those ideas into action [...] build incentives and signals that strengthen the visibility and demand for what demonstrably works.

But governments [...] cannot innovate in classrooms. If there has been one lesson about innovating education, it is that teachers, schools and local administrators should not just be involved in the implementation of educational change but they should have a central role in its design. They need robust frameworks and sound knowledge about what works if they are to be effective innovators and game changers[247].'

Innovation requires broad governance of VET systems involving multiple actors – those most immediately involved, teachers, trainers and learners, but also wider stakeholders, employers, trade unions, universities, regional innovation authorities etc. Innovation also needs effective frameworks to support these stakeholders. This section looks at these governance arrangements and frameworks and examines how they can be put in place to support innovation and digitalisation not just within VET but also beyond, in the wider economy and society.

The section begins by looking at policies, strategies and funding mechanisms related to innovation and digitalisation at national, regional and European level and highlights the key role VET can play in regional innovation and smart specialisation strategies. It then considers developments in the wider context for VET – key trends including decentralisation, and the increasing involvement of companies. This provides the context to then examine innovations in VET organisation and leadership at school level[248]. The chapter ends by considering the vital underpinning topic of the role of teacher and trainer training without which effective innovation and digitalisation in VET will be difficult or impossible.

247 OECD (2017) The OECD Handbook for Innovative Learning Environments, p. 3

248 The development of VET at higher levels is considered in chapter 7.

6.1. National/regional-level policies and initiatives to support innovation and digitalisation

6.1.1: National/regional-level strategies and initiatives

At national level, one of the main ways to support innovation includes the development of national strategy and legislation[249]. In higher education, the European Commission has found that countries with clear objectives and priorities as part of their national frameworks have tended to have more effective policy mixes that could address the challenges and opportunities of digitalisation[250]. In 2015, Cedefop found that there were signs that VET was increasingly integrated in national innovation strategies. However, modernising VET by stimulating creativity and innovation had been less prominent in shaping national policies than the other Bruges strategic objectives[251]. Nonetheless, almost all Member States had included VET in their innovation strategy by 2014[252]. The way VET had been included in innovation varied, as the box below illustrates.

Governance arrangements vary across Member States but typically involve a form of decentralised governance, which divides responsibilities between ministries/agencies and central and local/regional administrations, with different levels of autonomy[253]. In relation to innovation, this decentralised form of governance has advantages and disadvantages[254]. On the one hand, decentralisation can lead to diversity and innovation, and by extension would provide the flexibility needed to play a role in local and regional development/innovation strategies. On the other hand, this form of governance might be confusing to employers, create duplication of tasks[255] and lead to so much variation in provision that it inhibits benefits like the development of flexible learning pathways[256].

249 Cedefop (2015) Idem: 71.
250 European Commission (n/a) Annex 1: key messages from the PLAs.
251 The Bruges Communiqué set strategic objectives to enhance European Cooperation in Vocational Education and Training for the period 2011-2020, following the Copenhagen communiqué of 2002, URL: http://www.cedefop.europa.eu/files/bruges_en.pdf
252 Cedefop (2015) Idem: 71.
253 McCann, P. and Ortega-Argiles, R/ (2014) Smart specialisation in European regions: issues of strategy, institutions and implementation', in European Journal of Innovation Management, 17(4): 409-27, URL: https://doi.org/10.1108/EIJM-05-2014-0052; Kis, V. and Windisch, C. (2018), Making skills transparent. Recognising vocational skills acquired through work-based learning, Paris: OECD, p. 60, URL: https://doi.org/10/1787/5390c400-en
254 Hazelkorn, E. (2018) VET and smart specialisation: a policy brief, 10 December, p. 23
255 OECD (2014) OECD reviews of vocational education and training. A skills beyond school synthesis report, Paris: OECD, p. 46, URL: https://doi.org/10.1177/009922813482515
256 Hazelkorn, E. (2018) VET and smart specialisation: a policy brief, 10 December, p. 23.

Box 28: Examples of national strategies including innovation in VET

In **Sweden**, the prime minister has called for a national innovation council with members of the government, academia and other important sectors with the aim of finding innovative solutions for a competitive and sustainable Sweden. Skill supply – e.g. through HVET and higher education – is an important theme for the innovation council to address.

Similarly, inaugurated in 2018, the **Hungarian** VET Innovation Council operates as a national debating and advisory body. In cooperation with the country's main VET advocacy bodies, it is expected to support demand-driven transformation of the VET system. Its mandate includes formulating proposals for policy decision-making and supporting implementation of initiatives in VET and adult learning.

Belgium concentrated on new VET programmes for green jobs in the construction sector in its national strategy; and strategies for smart specialisation referred to the potential of VET in Cyprus and Slovakia. The report also found some variation in the level of VET. Romania's research and innovation strategy focused on VET at tertiary level, while the Swedish innovation system strategy saw VET at all levels as a driving force for innovation.

In **Bulgaria**, the country's Innovative Strategy for Smart Specialization (2014–2020) focuses on activities that improve human capital, including reforming vocational training and qualifications.

Amendments to the **Latvian** VET modernisation strategy aimed to update training infrastructure by increasing funding from the ERDF for modernisation projects while rationalising the number of VET schools[257].

The **Swiss** report 'Research and Innovation in Switzerland 2016' prepared under the leadership of the State Secretariat for Education, Research and Innovation (SERI), aimed to map the framework conditions needed for innovation to thrive, including the role of VET institutions and universities of applied sciences in the Swiss innovation system.

Regarding digitalisation, all Member States have a form of national policy for ICT in education, either as a standalone policy or as part of a wider national ICT strategy[258]. In fact, two out of three Member States had a nationwide strategy to ensure that VET providers used state-of-the-art technology before 2010; and half of the Member States had revised these strategies by 2010[259].

257 Cedefop (2015) Idem: 72
258 European Commission (2011) Key Data on Learning and Innovation through ICT at School in Europe 2011. Brussels: European Commission.
259 Cedefop (2015) idem: 74

Box 29: Digitalisation in national VET legislation and strategies

In **Germany's** federal Digital Agenda, several initiatives have been launched under the umbrella of 'VET 4.0'; e.g. in the area of digitalisation in inter-company vocational training centres and competence centres.

Italy's Growth 2.0 decree covers ICT policies for schools, including the mandatory adoption of eBooks or books in mixed formats as textbooks and the creation of 'digital school centres' in isolated villages.

Similarly, **Bulgaria's** new LLL strategy 2014–2020 envisages using more modern technologies in VET and LLL such as e-textbooks, up-to-date equipment and ICT.

In parallel to the **Dutch** Digitization Strategy 2018–2021, The Dutch Ministry of Education, Culture and Science has funded a four-year programme (known as Wikiwijs) to encourage the use, creation and sharing of Digital learning material (DLMs) by teachers.

Amendments to the **Latvian** VET modernisation strategy aim to update training infrastructure by increasing funding from the ERDF for modernisation projects while rationalising the number of VET schools.

Digital skills are integrated into curricula in **Sweden** as a nationwide learning outcome for primary and secondary school with a view to strengthening digital competence, media and information literacy and abilities to be source-critical. Similarly, the provision of basic digital competences is outlined in Ireland's VET strategy.

In accordance with the roadmap for the implementation of the Digital Agenda in **Spain**, the Ministry of Education is currently mapping new occupational standards to respond to the increasing digital skills and professional profiles requested by the labour market.

The **Turkish** Ministry of Education's strategic plan for 2010–2014 includes strategies for the use of technology in VET.

Similarly, **Ireland's** Further Education and Training (FET) Strategy 2020–2024 identifies digital transformation as a key enabling theme underpinning three FET priorities: building skills, creating pathways and fostering inclusion.

Denmark has introduced a digital platform to help VET teachers and trainers bring innovation in the classroom. As part of the 'teacher agenda', the Netherlands introduced a specialisation for VET teachers in 2013 and plans to expand learning opportunities in enterprises for teachers. Belgium (Fl) has an action plan for teacher in-service training aimed at implementing e-learning.

In **Belgium**, **the Flemish** government supports teachers who want to tackle concrete challenges in their educational practice by using educational technology in collaboration with the digital research centre IMEC. As such, the selected innovative projects under the government-funded Smart Education @ Schools initiative all respond to specific needs or challenges in the classroom identified by teachers themselves. The projects are developed and implemented in cooperation with the schools.

In **Latvia**, education development guidelines for 2014–2020 highlight VET IT teacher training in cooperation with employers.

Bulgaria's strategy for effective implementation of ICT in education and science (2014–2020) provides a framework for integrating ICT in education in a meaningful way. Similarly, the country's Lifelong Learning Strategy 2014–2020 supported the use of technologies in VET and lifelong learning such as e-textbooks, up-to-date equipment and ICT. In this context, digital pedagogic specialists also provide access to training to help VET teachers use state-of-the-art technology.

In **Estonia**, a digital focus in lifelong learning is also one of five strategic goals in the Lifelong Learning Strategy (2014–2020). In order to implement this digital focus, the Ministry of Education and Research (MoER), in cooperation with its partners, has created a digital focus programme. Its objective is to devise a comprehensive approach to the development of digital competences and to contribute to the more expedient and effective use of modern digital technology in learning and teaching processes.

Similarly, the **Greek** 'Enhancing Digital Skills & Jobs in Greece-National Action Plan 2017–2020', depicts digital penetration in Greece and the actions that will be undertaken by the members of National Coalition on Digital Skills consisting of ministries, councils and social partners. Digital skills in education ranks as one of five key priorities in the action plan.

In the **Czech Republic**, the Digital Education Strategy 2020 proposes a set of interventions in pre-school education, elementary (primary and lower secondary) education, (upper) secondary education and teacher training. Priority objectives include opening Czech education to new methods and ways of learning through digital technologies, to improve students' competences in working with information and digital technologies and to develop students' computational thinking.

At the same time, there is increasing evidence that the digitisation of TVET and skill systems encompass multiple policies and actions at all levels of government, and that often these do not form a coherent unified strategy[260]. This is likely because a considerable amount of innovation in digital TVET is institutionally driven or in the hands of individual teachers and teacher communities (as we saw in Section 2.1).

At the same time, a number of Member States have not changed or introduced explicit strategies on innovation and digitalisation, but their arrangements achieve the same results. For example, extensive communication between social partners in VET councils and authorities helps to uncover the need for changes in VET programmes in Norway.

Slovenia combined VET schools into VET centres to ensure cost-effective use of equipment. Along the same lines, Croatia appointed 25 regional centres of competence in VET to serve as hubs of excellence in 2018. The regional centres aim to introduce innovative learning opportunities, state-of-the-art facilities and intensive cooperation with local enterprises and other VET stakeholders[261].

A further issue to consider is the balance between 'top-down' plans and strategies and activities undertaken at local level. As noted above in Section 2.1, the extent and nature of innovation and digitalisation rely, to a significant degree, on micro-decisions taken by schools and teachers. In this context, care needs to be taken that strategies and plans are not too 'top-down' and do not stifle local initiative and enthusiasm: sufficient autonomy needs to be available at local level, as discussed further in

260 ILO & UNESCO (forthcoming) Digitalisation of TVET and Skills Systems

261 Cedefop, 2018. Croatia: establishing a network of regional centres of competence. https://www.cedefop.europa.eu/da/news-and-press/news/croatia-establishing-network-regional-centres-competence

Section 6.4. This is a question of providing the optimal frameworks to encourage and enable the up-take of digital technologies opportunities.

Another important aspect of national/regional strategy and action involves how best to support teachers and trainers in innovation and digitalisation. Indeed, as noted in Chapter 3, the key to effective deployment of digital learning is how teachers use it. Significantly, a study using 2013 TALIS[262] data from Spain found that whilst the availability of educational software or school infrastructure was a determinant of teachers' use of ICT in the classroom, it was less important than teacher training in ICT, teachers' collaboration with other teachers, and teachers' perceived self-efficacy and beliefs about teaching[263]. Training for teachers and trainers can also play an important role in stimulating the demand for digitalisation (see Section 2.2) since it should not be assumed that demand is automatic given the inherent risks of innovation and digitalisation. Training also equips teachers with the knowledge and skills to make choices from the wide range of – often confusing – digital options available.

Box 30: Lithuania – Interactive e-learning tool to support teachers and trainers (IMP)

In order to provide support to teachers and trainers in the development of learners' key competences and basic skills, the Ministry of Education, Science and Sports of the Republic of Lithuania has set a strategic goal to further incorporate the use of interactive electronic learning tools. An interactive e-learning tool (IMP) was consequently created by the Lithuanian Qualifications and Vocational Education and Training Development Centre to support vocational training and non-formal adult education providers and teachers to develop learners' key competences. 56 vocational education institutions are currently connected to the e-learning tool.

The content of the IMP is tailored to 180 vocational training programmes covering 16 sectors. Content can be conditionally divided into 3 main parts: theory, practice and self-assessment. An appropriate general module is available for the development of each key competence. The general module provides full-scale content that is intended for use in both the education of students in vocational education programmes and in the context of non-formal adult education programmes. In order for the teachers and trainers to be able to adapt the content of their lessons easily and quickly, the learning tool is divided into conditional lessons. The content of the general module is designed in such a way that teachers and trainers can apply the content of the IMP in lessons without following the order of the lessons, but by choosing topics, subtopics or only individual practical tasks that are of relevance to them.

Source: IMP, 2020[264]

The 2016–2018 VET Working Group determined that one of the main factors to facilitate innovation and digitalisation was to 'help teachers and trainers to obtain the competences they need'[265].

Teachers need training in three dimensions: technological, pedagogical and content knowledge (TPACK) in order to create and implement deep learning experiences; and the most efficient type of training is peer-to-peer or collegiate[266].

262 TALIS is the OECD's Teaching and Learning International Survey http://www.oecd.org/education/talis/

263 Gil-Flores, J., J. Rodríguez-Santero and J. Torres-Gordillo (2017), "Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure", Computers in Human Behavior, Vol. 68, pp. 441-449, http://dx.doi.org/10.1016/J.CHB.2016.11.057

264 https://bendriejigebejimai.lt/

265 European Commission (2018) Teachers and trainers matter: how to support them in high performance apprenticeships and work-based learning. 12 policy pointers. Luxembourg: Publications office of the European Union. URL: https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8131&furtherPubs=yes

266 European Commission (n/a) Annex 1: Key messages from the PLAs.

It is important to note that teacher and trainer training on its own will not necessarily lead to innovation. Two additional conditions are required. First, teachers need time in order to incorporate innovation and digital technologies into their educational practices, and to make innovations relevant for deep learning and for digital pedagogy. Digital technologies are too often used for tasks rather than incorporated into teaching practices, and as a result have a limited effect[267]. Second, training teachers is pointless if teachers do not have a clear sense of purpose that drives their use of innovation. A clear institutional vision, which comes from the institution's leadership, is necessary to guide teachers into innovating (see Section 6.4.3)[268].

Recent innovations to support teachers and trainers in innovation and digitalisation include the use of i-coaches in VET schools and the introduction of 'hybrid' professionals; and teaching alongside collaborative robots (cobots) is already on the horizon. I-coaches support teachers to build a bridge between ICT and education, fostering the improvement of digital skills and the creation of a learning community (see box below). The other recent development, the emergence of 'hybrid' professionals, involves teachers and trainers combining roles in both VET institutions and companies, for example by having two part-time contracts. Helping to bridge the gap between VET institutions and companies, hybrid professional examples include Brainport Eindhoven in the Netherlands[269]. The concept has also been the subject of an Erasmus+ call for proposals under Key Action 3 on initiatives for policy innovation (EACEA/38/2019)[270].

Box 31: I-coaches, the success factors

Kennisnet and saMBO-ICT have reviewed i-coaches in 12 secondary vocational institutions in the Netherlands (MBOs).

They show that i-coaches assume a wide range of roles. Some were given a lot of room for innovation but few resources by their boards and hence acted as enthusiastic drivers of ICT. Others helped institutions' departments ensure ICT standards when designing courses and deciding on the necessary infrastructure. Some focused on implementing an institutional policy.

In general, Kennisnet and saMBO-ICT concluded that, to be successful, an i-coach should:

- have a role that is clearly linked to educational goals and that is transparent;
- have a structural position that connects them to operational, tactical and strategic levels;
- participate in central knowledge sharing;
- be sufficiently resourced and have enough time to carry out their role..

Source: Kennisnet and saMBO-ICT, 2018[271]

267 Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Gebhardt, E. (2014). Teaching with and about information and communication technologies. In: Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Gebhardt, E. (eds.), Preparing for life in a digital age, Springer, pp. 195–228. See also: European Commission (n/a) Annex 1: key messages from the PLAs, p. 9, and European Commission (2018) Draft key messages from the Working Group on Digital skills and competences 2016-2018, p. 6.

268 European Commission (n/a) Discussion document for the kick-off of the ET2020 Working Group Digital education: learning, teaching and assessment. See also November, A. (2013). Why schools must move beyond one-to-one computing. November Learning, 1-2.

269 https://brainporteindhoven.com/en/for-you/entrepreneurship/what-exactly-are-hybrid-learning-environments-and-hybrid-teachers#c1975

270 https://op.europa.eu/en/publication-detail/-/publication/88780c83-6b64-11e7-b2f2-01aa75ed71a1/language-en; https://eacea.ec.europa.eu/sites/eacea-site/files/guidelines_eacea_38-2019.pdf

271 Kennisnet and saMBO-ICT (2018) Build bridges. The success factors for i-coaches in MBO, Zoetemeer: Kennisnet.

6.1.2: VET's role in regional innovation and smart specialisation strategies

VET has an important role to play at local and regional levels in supporting innovation in the wider economy and society. The communication from the European Commission on Strengthening Innovation in Europe's Regions: Towards resilient, inclusive and sustainable growth at territorial level (2017) identified VET as relevant to supporting innovation with respect to: technological and process innovations; skills and work organisation practices; and innovation in low-tech sectors, which account for a large share of employment in Europe.

On this basis, policymakers were urged to 'integrate the VET offer into comprehensive skills and knowledge-based economic development strategies, particularly at regional and local level…to attract investments to clusters, innovation, smart specialisation strategies and sustainable growth strategies'.[272]

It is important to stress that VET should be integrated into regional strategies: it is not simply a 'bolt-on' but should influence the strategies themselves. Indeed, VET can add value in a number of ways to local and regional innovation activities as a consequence of some of its distinctive features, as shown in the table below.

Table 6.1: How VET could help address weaknesses in regional innovation strategies

Emphases of regional innovation strategies	Deficiencies in regional innovation strategies	VET added value
Knowledge creation	Knowledge diffusion & exploitation	Wide-ranging and strong links to business based on the practical needs of businesses; ideally placed to assist knowledge diffusion & exploitation
Supply side	Demand side	Well-tuned to the demand side through links to businesses looking for practical application of innovations into new products and services
Economy	Skills and training	VET attuned to (changing) skills needs of local business sectors

272 European Commission (2017) Strengthening innovation in Europe's regions: strategies for resilient, inclusive and sustainable growth, 18 July, URL: https://ec.europa.eu/regional_policy/sources/docoffic/2014/com_2017_376_2_en.pdf The EC provided various incentives to encourage regions to set up smart specialisation strategies. The EC requires a smart specialisation strategy as a precondition to access the cohesion funds and recently launched two pilot actions to provide material support to its Smart Specialisation Strategy: Pilot action 1 aims to boost innovation capacity in industrial transition regions and Pilot action 2 aims to fund interregional partnerships for innovative projects in at least four countries; each of these actions being for a value of 1 million euros each. Finally, the European Commission also set up the S3 platform, which provides advice to EU countries and regions for the design and implementation of their smart specialisation strategy. The project Stairway to Excellence (S2E) aims to support EU member states and their regions in gaining access to relevant funding by exploiting the synergies between European Structural and Investment Funds (ESIF), Horizon2020 (H2020) and other EU funding programmes. European Commission (n/a) Smart Specialisation: Strengthening innovation in Europe's regions, https://ec.europa.eu/regional_policy/sources/docgener/guides/smart_spec/strength_innov_regions_en.pdf

Emphases of regional innovation strategies	Deficiencies in regional innovation strategies	VET added value
	Society	VET well placed to address innovation in social issues
STI model (Science, Technology & Innovation)	DUI model (learning by doing, using, interacting)	DUI model inherent to VET
High-tech industries and large companies	Traditional industries, service sector and SMEs	Supports all sectors of industry, as well as applied sciences and the services sector
Investment and financial markets	Labour force and labour market	Provision is tuned to needs of the labour market
Researchers, PhDs, managers, engineers…	Intermediate and technical qualifications	Focus of IVET on intermediate and technical qualifications; higher VET developing, covering higher qualifications
Regions	Multi-level & local systems	VET often well embedded in local economies and communities

Source: Adapted from Navarro[273], plus authors' analysis of how VET can help tackle the weaknesses (third column)

273 Navarro, M. (2018) Presentation to Pilot Workshop on VET and Adult Learning for Smart Specialisation, 20 September 2018

Furthermore, it is important to be clear as to how VET might contribute to innovation: much of VET has potential to contribute to innovation that involves lots of small-scale, incremental and experiential or 'learning-by-doing' changes through technology diffusion[274]; in contrast, participation in innovation related to the application of radical science-based research is most likely to be an activity of higher VET institutions. In addition, VET is positioned to make a unique contribution to regional innovation through research into VET pedagogies linked to regional environmental, social and economic needs; again this is likely to be a role fulfilled by higher VET by virtue of its having in-house research capacity.

The Joint Research Centre of the European Commission (JRC) has analysed the integration of VET in smart specialisation strategies through its S3 platform[275]. JRC's experience and analysis shows that smart specialisation has helped to build institutional capacity in Europe's less developed regions, but that the impact of these investments could be much higher if the region's education and training institutions were involved more closely in the design and implementation of the strategies. This is because most innovation requires skills to co-create and put new ideas into practice, especially non-technological forms that are in fact the most common. VET in particular is essential to match skill supply with demand in emerging innovative sectors of the economy. Furthermore, VET institutions can be part of cooperative regional ecosystems where students and staff are directly involved in innovation[276].

While the picture varies enormously across Europe, for many regions smart specialisation has been a new and difficult task. This is partially explained by the fact that those responsible for smart specialisation are likely to be from a different part of the regional authority than those working with VET and some may not have the administrative competence to bring the two together, with responsibilities split between national and regional levels. Other potential barriers include the lack of incentives for VET institutions to engage with regional stakeholders and the separation of funding programmes[277]. To respond to these obstacles, recent JRC and DG Employment cooperation aims to bring together the different policy communities responsible for VET and smart specialisation[278]. Such collaboration aims to showcase good practice examples (e.g. the Basque Country) and raise awareness of new opportunities for support, including the Erasmus-funded Centres of Vocational Excellence initiative as well as the ESF+ and ERDF post 2020, which proposes a new objective on 'skills for smart specialisation and industrial transition'. Centres of Vocational Excellence are discussed further in Section 7.2.

274 Curtain, R. (2004) Vocational education and training, innovation and globalization, Adelaide: National Centre for Vocational Education Research, p. 41, URL: https://www.ncver.edu.au/research-and-statistics/publications/all-publications/vocational-education-and-training,-innovation-and-globalisation

275 A networking body for S3 managers. For more information please see: https://s3platform.jrc.ec.europa.eu/

276 Hazelkorn, E and Edwards, J (2019) Skills and Smart Specialisation: The role of Vocational Education and Training in Smart Specialisation Strategies, Luxembourg: Publications Office of the European Union.

277 Ibid

278 Paiva, T, Redford, D and Edwards, J, Workshop Report on Vocational Excellence and Smart Specialisation, European Commission: Seville, 2020.

EXPERT CONTRIBUTION

'Smart Specialisation and Vocational Education and Training'

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Smart specialisation has become an important policy approach to support innovation in Europe's regions, which underpins more than €60 billion of EU funding from the European Regional Development Fund (ERDF). Seven years ago, in preparation for the current funding period, national and regional policymakers developed smart specialisation strategies (S3) in all parts of the European Union. Such was the extent of this exercise that other countries have watched with interest and even adopted the approach, from the Western Balkans to Australia, Latin America and Africa. The logic is indeed appealing – policymakers alone cannot know which areas of innovation have the most potential, so entrepreneurs and knowledge actors must help to discover how a region can become competitive in specific parts of global value chains or address our big societal challenges such as ageing and climate change.

The Joint Research Centre of the European Commission hosts the S3 platform, a networking body for S3 managers who receive advice from a dedicated team in its Seville office. Our experience and analysis shows that investment in research and innovation from the ERDF is indeed today more concentrated on regions' innovation priorities. More significantly, evidence shows that smart specialisation has helped to build institutional capacity in Europe's less developed regions. However, the impact of these investments could be much higher if the region's education and training institutions were involved more closely in the design and implementation of the strategies. This is because most innovation requires skills to co-create and put into practice new ideas, especially non-technological forms that are in fact the most common. VET in particular is essential to match skill supply with demand in emerging innovative sectors of the economy. Furthermore, VET institutions can be part of cooperative regional ecosystems where students and staff are directly involved in innovation.

Why has this not happened so far? We cannot ignore cases of where VET institutions are indeed contributing enormously to the local economy including innovation. However, there are few cases where we see alignment of VET policies with S3. While the picture varies enormously across Europe, for many regions S3 has been a new and difficult task. Those responsible for S3 are likely to be from a different part of the regional authority than those working with VET and some may not have the administrative competence to bring the two together, with responsibilities split between national and regional levels. There are other explanations too, such as the lack of incentives for VET institutions to engage with regional stakeholders or the separation of funding programmes.

What can we do? A new project at the JRC together with DG Employment is trying to bring together the different policy communities responsible for VET and S3. Showing good practice examples, such as from the Basque Country can help. We also need to raise awareness of new opportunities for support, including the Erasmus-funded Centres of Vocational Excellence initiative as well as the ESF+ and the ERDF post 2020, which proposes a new objective on 'skills for smart specialisation and industrial transition'.

'At the JRC we invite you to share your experiences and ideas so we can show how VET is a powerful instrument to spread innovation across all Europe's regions'.

6.2. European policies and initiatives

6.2.1: Innovation and digitalisation

Innovation and digitalisation are key themes in EU policymaking. The Updated Skills Agenda[279] focuses on the need for reinforced lifelong learning opportunities, stronger cooperation between public and private organisations and improved digital skills. It sets ambitious objectives to be achieved by 2025, including for 70% of adults to have at least basic digital skills (current level: 56% in 2019). It also sets a policy framework for 12 concrete actions, such as developing European standards for micro-credentials, a new Europass platform and skills to support the twin transitions.

Furthermore, the Innovation Union is one of the seven flagship initiatives of the Europe 2020 strategy for smart, sustainable and inclusive growth; and the Education and Training Strategy ET2020 launched various efforts to promote innovation in education. Before that, a series of communiqués held in Maastricht, Helsinki and Bordeaux supported quality, innovation and excellence in VET. The 2010 Bruges communiqué connected the need for vocational excellence to innovation, creativity, entrepreneurship, smart and sustainable growth and ICT, and encouraged the collaboration of VET providers with local enterprises and stakeholders, including higher education in the formation of 'knowledge partnerships'. In 2020, the Osnabrück Declaration to be adopted in November will propose a concrete set of actions, including on innovation and digitalisation in VET, at both national and European level for the period 2021–2025.

In terms of the post 2020 setting, the communication on the European Education Area[280] proposes a framework for cooperation with Member States and engagement with education stakeholders, including a reporting and analysis structure with agreed education targets up to 2030, to encourage and track reforms. In the first instance, the Commission will establish an enabling framework (2020–2025) on how to deliver the six dimensions of the EEA, and then as a second step, put forward a proposal for setting up a more permanent governance structure (post 2025–2030).

The European institutions have also been very active in terms of digitalisation. In 2012, the European Commission linked the need for a world class VET system to opportunities offered by ICT in its 2012 communication called Rethinking Education[281]. In 2013, the European Commission's communication Opening up Education: innovative teaching and learning for all through new technologies and open educational resources identified technology and open educational resources as opportunities not only to support education, but to reshape it. In 2017, the European Council called for education and training systems to be 'fit for the digital age'; and in 2018, the Commission launched the Digital Education Action Plan[282]. The action plan supports the use of innovation and digital technology and relevant digital competences, and has a special focus on schools, VET and higher education. This action plan was announced in the communication 'Strengthening European Identity through Education and Culture'[283] and followed a range of commitments from the European Council and communications from the European Commission. In September 2020, the Commission adopted an updated Digital Education Action Plan (2021–2027)[284], reflecting lessons learned from the coronavirus crisis and devising

279 European Commission (2020) Communication on an Updated European Skills Agenda, https://ec.europa.eu/social/main.jsp?catId=1223&langId=en

280 European Commission (2020) Communication on a European Education Area https://ec.europa.eu/education/sites/education/files/document-library-docs/eea-communication-sept2020_en.pdf

281 European Commission (2012) Rethinking education: investing in skills for better socio-economic outcomes, COM/2012/0669 final, 20 November, URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2012:0669:FIN

282 European Commission (2018) The Digital education action plan , Communication, 17 January, COM(2018)22 final, URL: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0022&from=EN

283 European Commission (2017) Strengthening European Identity through Education and Culture, Communication, COM(2017)673 final, 17 November, URL: https://ec.europa.eu/commission/sites/beta-political/files/communication-strengthening-european-identity-education-culture_en.pdf

284 European Commission (2020) Communication on the Digital Education Action Plan (2021-2027) https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en

a plan for a high-performing digital education ecosystem with enhanced digital competences for the digital transformation.

The European Commission Working Group DELTA (Digital Education Learning, Teaching and Assessment 2018–2020) started in September 2018 to support the implementation of the Digital Education Action Plan. In addition, the Digital Skills and Jobs Coalition was launched in 2016 by the European Commission to develop a large digital talent pool and ensure that individuals and the labour force in Europe are equipped with adequate digital skills. 23 national coalitions have been created to bring together Member States and stakeholders, including social partners, to develop and upgrade digital skills across the whole economy and all sectors and for all citizens. In this context, Member States were also invited to develop comprehensive national digital skills strategies.

Tools to support innovation and digitalisation have also been developed at European level. The European Commission has developed a self-assessment tool, called Self-Reflection on Effective Learning by Fostering the Use of Innovative Educational Technologies tool (known as the SELFIE tool)[285]. The SELFIE tool can help educational institutions to further embed technology for teaching and learning by reflecting on their digital policies and practices and developing organisation-wide strategies and improvement plans.

In order to explore to what extent, and with what scope, the SELFIE tool could also be meaningfully used in the context of work-based learning systems in VET, including apprenticeships or dual VET, a feasibility study has been conducted. The study found that there is a need for the SELFIE tool in the work-based learning context, especially to bring VET institutions and companies closer together, and to discuss how they jointly embed digital technology in the education and training provided. It further concluded that it is feasible to adjust SELFIE to work-based learning in VET, firstly accommodating, with minimal changes, the majority of work-based learning settings in formal VET and secondly exploring more fundamental changes to cater for settings that are less widespread but are quintessentially apprenticeships[286]. Since early 2020, the European Commission has been working on extending the SELFIE tool to work-based learning. In this context, the European Forum of Technical and Vocational Education and Training (EfVET), together with the JRC, is undertaking pilots in France, Germany, Hungary and Poland on the implementation of SELFIE for work-based learning. In cooperation with the European Training Foundation (ETF), four additional countries have been added to the pilot phase: Montenegro, Serbia, Turkey and most recently Georgia. Following the results of the pilots, it is expected that SELFIE for work-based learning should be made widely available in all EU languages in 2021.

The European Commission has also taken a keen interest in AI, with the publication of a communication in April 2018. This communication emphasised that artificial intelligence was not science fiction but already reality in Europe. It argued in favour of a European initiative on AI, with the following objectives:

a) Boost investment in research and innovation, and promote better access to data in order to boost the EU's technological and industrial capacity and AI uptake across the economy;

b) Prepare for socio-economic changes brought about by AI by encouraging the modernisation of education and training systems, and changes to the labour market and social protection systems;

c) Ensure an appropriate ethical and legal framework, based on the European Union's values and in line with the EU Charter of Fundamental Rights, including for example guidance on product liability rules[287].

285 For more information on the SELFIE tool, see URL: https://ec.europa.eu/education/schools-go-digital_en

286 https://publications.jrc.ec.europa.eu/repository/bitstream/JRC119707/200211_selfie_wbl_jrc_tech_report.pdf

287 European Commission (2018) Artificial Intelligence in Europe, 25 April, URL: https://ec.europa.eu/digital-single-market/en/news/communication-artificial-intelligence-europe

A European Commission document on the coordinated plan on artificial intelligence followed. This plan recommends that digital skills, which facilitate the development of AI, should be included in all education and training curricula. The coordinated plan also encourages Member States to include the skill dimensions in national AI strategies, to investigate how AI could be incorporated into vocational training, and to explore avenues to support the inclusion of AI modules in multi-disciplinary adult learning programmes[288].

According to the European Commission's report The Future of Work, Work of the Future[289], a flaw in Europe's educational ecosystem today is its relative lack of interplay and collaboration between general and technical educational pathways (with some notable exceptions). By contrast, a more synergetic educational framework would allow the creation of individualised learning pathways, which could enable students to learn what they need and to benefit from the right learning approach for them. In turn, this would allow them to better adapt to a labour market shaped by AI and automation. Flexibility is thus an important aspect of framework conditions to support digitalisation and innovation.

At a joint meeting of the ET 2020 Working Groups (VET, Adult Learning, Digital Education: Learning, Teaching and Assessment), VET providers and the Cedefop community of practitioners in October 2019 in Helsinki, a first discussion was held on the impact of AI on VET and adult learning. Participants in the meeting recognised in particular the role of AI in improving learning processes, but it was concluded that further reflections are needed on the topic.

6.2.2: Identifying and anticipating new skill needs

Digitalisation and innovation affect the competences required by the labour market. This means that it is important for governments and educational institutions to be able to accurately anticipate what these competences should be. For this reason, Cedefop launched an initiative in 2016 aiming to help Member States develop, improve and further refine the governance of their skill anticipation and matching systems in order to adapt their curricula/training programmes appropriately[290]. In conjunction with the International Labour Organisation (ILO), the Organisation for Economic Cooperation and Development (OECD) and the European Training Foundation (ETF), Cedefop conducted a joint survey on governance mechanisms and institutional frameworks that steers the relevance of training provision to labour market needs in over 60 countries. This survey found that many countries used a form of forward-looking skill anticipation methods, but that there was quite a wide variation in national practices to assess skills[291]. Cedefop also published country-based skills forecasts. Most recently, given the impact that digitalisation has on skills requirements on the labour market, Cedefop has launched a project on digitalisation and the future of work, which aims to analyse skill requirements and new forms of digital labour, in order to inform policy on the role of VET[292].

Since January 2014, Cedefop has also led the development of the Skills Panorama, in cooperation with the European Commission's Directorate-General for Employment, Social Affairs and Inclusion (DG EMPL). The Skills Panorama is an online central access point for data, information and intelligence on skill needs in countries, occupations and sectors across EU Member States.

288 European Commission Coordinated plan on Artificial Intelligence, COM(2018) 795 final, p. 12-13, URL: https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence

289 European Commission (2019) Future of Work? The work of the future! On how AI, robotics and automation are transforming jobs and the economy in Europe (Author: Michel Servoz). For further information, see URL: https://ec.europa.eu/digital-single-market/en/news/future-work-work-future

290 Cedefop (2019) Skills anticipation methods and practices, URL: http://www.cedefop.europa.eu/en/events-and-projects/events/skills-anticipation-methods-and-practices

291 Cedefop 2017) Skills needs anticipation: systems and approaches, pp. XV-XVI, URL: http://www.cedefop.europa.eu/en/publications-and-resources/publications/2223

292 Cedefop (2019) 'Digitalisation and the future of work', URL: http://www.cedefop.europa.eu/en/events-and-projects/projects/digitalisation-and-future-work

It is an initiative of the European Commission aiming at improving the EU's capacity to assess and anticipate skill needs, helping education and training systems to be more responsive to labour market needs, and better match skill supply and demand across the EU. While offering an EU perspective on trends in skill supply and demand and possible skill mismatches, it also provides access to national data and sources[293].

Similarly, the European Skills Index (ESI) is Cedefop's composite indicator measuring the performance of EU skills systems. The objective of a skills system is not only to continually develop the skills of the population, but also to activate and effectively match these skills to the needs of employers in the labour market. As such, ESI monitors EU Member States' performance over time and identifies areas calling for improvement. The index is comprised of three pillars, namely skill development, skill activation and skill matching. These pillars are used to organise and aggregate 15 individual indicators into a single summary measure. For example, the pillar on skill activation includes indicators of the transition from education to work, together with labour market activity rates for different groups of the population in order to identify those who have a greater or lesser representation in the labour market.

Box 32: Cedefop – online job vacancies (OJV)

Online job vacancies (OJV) form an easily accessible source of data on skill demand by employers, thanks to technological advances. As outlined by Cedefop (2019), various techniques can be used:

- Scraping is employed to extract structured data from websites. Using web scraping means that data are already structured on the web page and can be extracted precisely by knowing the exact position of each field on the web page. As specific web scrapers must be programmed for each website, this is ideal for sites that contain many vacancies;
- Crawling employs a programmed robot to browse web portals systematically and download their pages. Crawling is much more general compared to scraping and is easier to develop. However, crawlers collect much more irrelevant content and additional effort is needed to clean the data before further processing;
- Direct access via application programming interface (API) facilitates the download of vacancy content directly from OJV portal databases. This direct access demands a formal agreement from the website operator and is subject to maintenance and agreement costs. Data collected in this way have the highest quality among the various methods and can be downloaded much more quickly..

Source: Cedefop, 2019[294]

293 https://skillspanorama.cedefop.europa.eu/en

294 Cedefop (2019). Online job vacancies and skills analysis: a Cedefop pan-European approach. Luxembourg: Publications Office. http://data.europa.eu/doi/10.2801/097022

The European Commission also published a set of recommendations to improve digital competences in 2018, covering concepts such as coding, cybersecurity and cyberbullying[295]. These recommendations introduce the concept of digital citizenship, the vulnerability of personal data and cybersecurity threats, media literacy, cyberbullying and radicalisation and the need to mitigate actions[296].

As part of delivering the 2016 Skills Agenda for Europe, the Commission proposed a revised European Reference Framework of Key Competences for Lifelong Learning that sets out the knowledge, skills and attitudes people need for life, including digital competence.

In addition, the European Commission Working Groups on Digital and Online Learning (2014–2015) and on Digital Skills and Competence (2016–2018) have supported the development of European reference frameworks for:

- Citizens (DigiComp): Digicomp defines 21 competences clustered in 5 competence areas: information and data literacy, communication and collaboration, digital content creation, safety and problem solving. In addition, many VET learners also benefit from the European Computer Driving License (ECDL), a well-known computer skill certification[297].
- Teachers (DigiCompEdu): DigiCompEdu defines 23 competences across 6 clusters related to professional engagement, digital resources, digital pedagogy, digital assessment, empowering learners and facilitating learners' digital competence. A survey of the use of ICT in European schools reported that Europe's teachers have high aspirations to improve their own understanding of ICT, that the majority of European teachers engage in personal learning related to ICT, and that teachers are more confident about making use of ICT in teaching and learning even in poorly equipped schools[298]. The Education Training Foundation reported similar trends in a survey on continuing professional development in VET in the Western Balkans and Turkey, where ICT skills for teaching was reported as one of the most common professional development activities[299].
- Educational organisations (DigiCompOrg): DigiCompOrg further summarises the framework for educational organisations.

295 European Commission (2017) Developing key competences for all throughout life, Factsheet, URL: https://ec.europa.eu/education/sites/education/files/document-library-docs/factsheet-key-competences-lifelong-learning_en.pdf

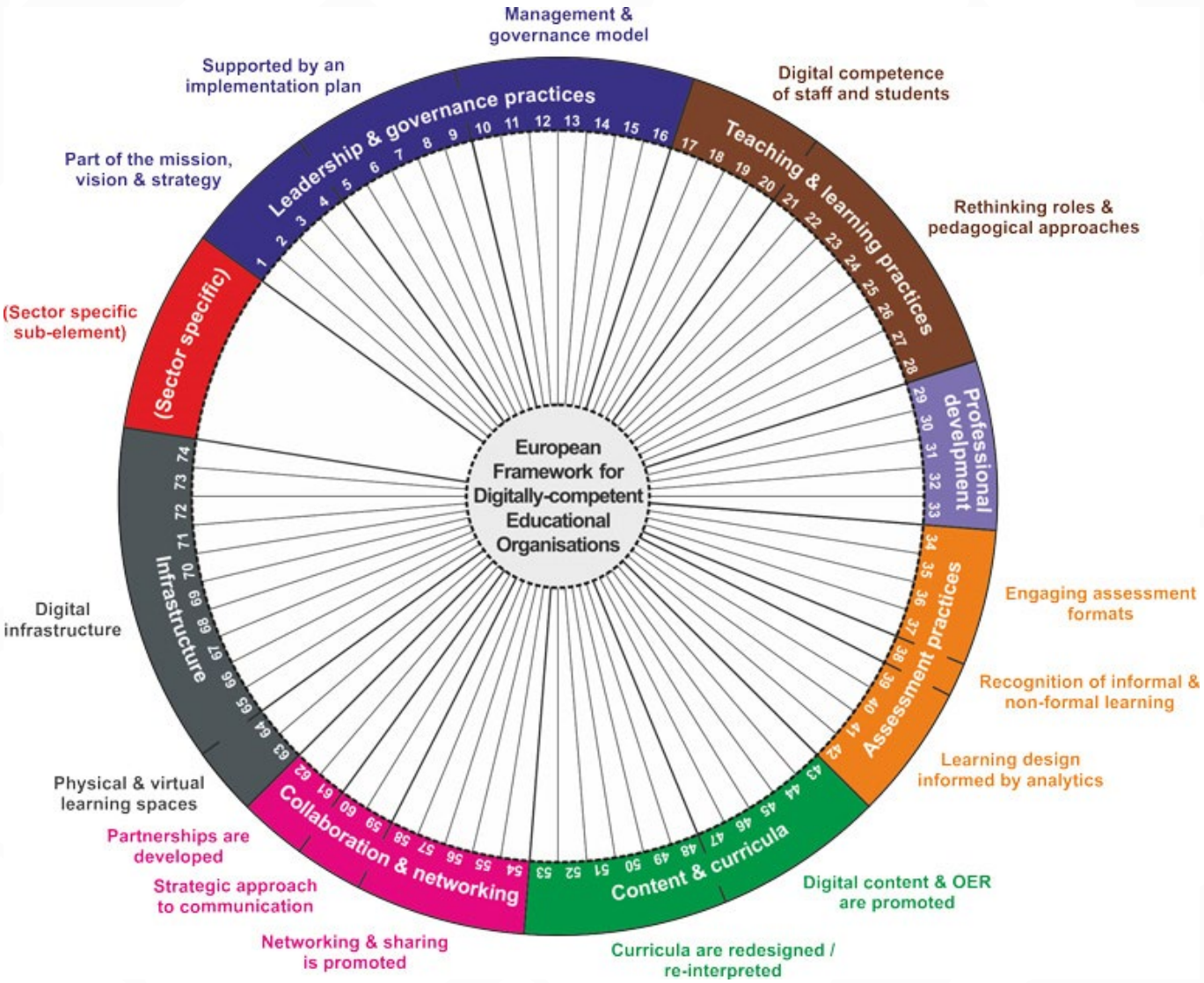
296 European Training Foundation (2018) Digital skills and competence and digital and online e learning, Turin: European Training Foundation, p. 19, URL: https://www.etf.europa.eu/sites/default/files/2018-10/DSC%20and%20DOL_0.pdf

297 ECDL education (2019) ECDL education, URL: http://ecdl.org/ecdl-education

298 European Schoolnet (2013) Survey of schools: ICT in education. Benchmarking access, use and attitudes to technology in Europe's schools. Executive summary, 2013. URL: www.eun.org/c/document_library/get_file?uuid=9be81a75-c868-4558-a777-862ecc8162a4&groupId=43887

299 ETF (2018) Digital skills and competence, and digital and online learning, Turin: ETF, p. 31, URL: https://www.etf.europa.eu/sites/default/files/2018-10/DSC%20and%20DOL_0.pdf

Figure 6.1: European framework for digitally competent educational organisations



Source: https://ec.europa.eu/jrc/en/digcomporg/framework

DigiCompOrg defines 16 competences across 8 clusters which relate to: leadership and governance practices, teaching and learning practices, professional development, assessment practices, content and curricula, collaboration and networking, infrastructure, or sector specific elements.

6.3. Funding for innovation and digitalisation

6.3.1: National investment in innovation and digitalisation

For the majority of public VET providers, government agencies are the main source of funding and in many countries such funding is being reduced in real terms. Other sources of funding include grants, aid agencies, donors, charitable organisations, public-private partnerships and revenues earned from entrepreneurial activities[300]. An important question is what type of specific provisions may have been made to support innovation and digitalisation in this context. Innovation carries the risk of failure, which in turn risks deploying funds up front on activities that may not bear fruit.

Box 33: National initiatives funding innovation and digitalisation for VET excellence, Germany

INNOVET

With an initial budget of €80 million, a new federal initiative called INNOVET 'Shaping the future Innovation Clusters for VET Excellence' was launched in Germany to support the development and testing of innovative VET approaches. Excellence is indirectly defined as responding to labour market and company needs, prompting interested youth entering VET and ensuring equivalence (Gleichwertigkeit) between dual and academic/school-based education. Quality in the initiative should be ensured by involving state or federal-level decision-makers and other stakeholders in the projects.

The selection criteria include:

a. increasing the attractiveness, quality and equivalence of VET;

b. supporting enterprises, in particular small and medium-sized enterprises in recruiting and training future professionals, managers and business successors;

c. developing VET into an innovative, permeable and high-quality system;

d. developing innovative VET offers at further qualification level (in particular level 5 of the German Qualification Framework), which are geared to the needs of companies and provide incentives for young people to enter vocational training;

e. creating innovative, high quality cooperation between learning venues, for example for the transfer of knowledge and new developments from universities and research institutions via VET into company practice, especially in SMEs, and;

f. the early adoption of new developments in VET, such as AI and the development of corresponding qualification concepts for VET.

In July 2019, two examples of projects of the Länder that passed the first selection round were: a) study-integrated apprenticeships such as SiA (Northrhine-Westfalia) and b) quality assurance of hybrid training opportunities (Hamburg). Both projects link VET with academic training.

300 European Training Foundation, (2019). Governance arrangements for vocational education and training in ETF partner countries Analytical overview 2012–17. https://www.etf.europa.eu/sites/default/files/2019-02/VET%20governance%20in%20ETF%20partner%20countries%202012-17.pdf

Digitalpakt Schule – programme for financing digitalisation in schools

In 2019, the German federal and local governments signed the national contract Digitalpakt Schule aimed at providing German schools with the hardware and software they need in order to be able to meet the current and future digital requirements. This investment is shared by the federal government (90%) and the Länder (10%). North Rhine-Westphalia has established a guideline that focuses basic on IT structures, digital devices, mobile devices and regional measures. This guideline also offers references for schools on how to apply for financial support using the programme Digitalpakt Schule.

Source: INNOVET, 2019[301], Digitalpakt Schule[302]

The literature cautions us that digital tools are not necessarily cheaper than traditional forms of instruction. ICT-based learning can be resource- and labour-demanding for both staff and students, which needs to be taken into account if its advantages are to be economic and sustainable as well as pedagogical and sociocultural[303]. In addition, the literature has flagged issues around the sustainability of innovation, including digital innovations such as MOOCs, which for a long time were experimenting with different funding models[304].

Box 34: SOLAS, Ireland – innovation through collaboration fund

SOLAS, the Further Education and Training Authority, launched an innovation through collaboration call in 2019 for FET providers to form new and imaginative bridges with enterprise to achieve a major step-up in innovation in employee development across Ireland. This funding is specifically intended to provide an innovation space in which FET providers can experiment, forming collaborative relationships outside of the FET sector. This fund directly addresses the considerable innovation expected from the sector in meeting the challenges of the Supporting Working Lives and Enterprise Growth in Ireland: 2018–2021 Further Education and Training Policy Frameworks for Skill Development of People in Employment. The priority innovation categories under the 2019 call were recognition of prior learning (RPL), information and outreach, delivery and design of programmes, regional and sectoral approaches, and enterprise engagement. Ten projects were awarded funding across the advanced manufacturing, aquaculture, haulage, near zero emission building (NZEB), hospitality, SME management, food processing and care sectors.

Source: SOLAS, 2019[305]

301 InnoVET initiative Wettbewerb InnoVET: Zukunft gestalten – Innovationen für eine exzellente berufliche Bildung: https://www.bmbf.de/de/innovet.html (in German)

302 https://www.digitalpaktschule.de/

303 Latchem, C (2017). Using ICTs and Blended Learning in Transforming Technical and Vocational Education and Training, Colin Latchem. UNESCO and Commonwealth of learning, 212.

304 Jordan, K. (2013). Emerging and potential learning analytics from MOOCS. Available at: http://www.academia.edu/3264990/Emerging_and_potential_learning_analytics_from_MOOCs Yuan, L. (2013). MOOCs and Open Education: Implications for Higher Education. URL: http://publications.cetis.ac.uk/wp-content/uploads/2013/03/MOOCs-and-Open-Education.pdf Kedem, K. (2012). Shifting Ground: Technology Begins to Alter Centuries Old Business Model for Universities. URL: http://www.etsu.edu/125/taskforces/Programs_and_Opportunities/documents/MOOC.PDF.

305 SOLAS, Skills to Advance – Innovation. http://www.solas.ie/SkillsToAdvance/Pages/Innovation.aspx

Box 35: Learning Centres, Sweden – bridging the digital divide

In Sweden, the government proposed an increase from a grant of SEK 50 million to 90 million directed towards local and regional learning centres for 2021. Learning centres are centres for adult learning that municipalities can set up in order to offer increased opportunities for adult education, higher vocational education (HVE) and higher education in more places around the country as well as wider access to digital tools and resources. To further increase educational opportunities, an investment of SEK 15 million is proposed next year for increased quality in distance education and strengthened support for inexperienced people studying from a distance. Another SEK 15 million is proposed to strengthen the opportunities for work-based distance education.

Source: Regeringskansliet, 2020[306]

6.3.2: European-level investment in innovation and digitalisation

During the last decade, innovation and digitalisation in education have gained ground in the EU agenda. It is increasingly acknowledged that investing in modernising education in light of rapid technological advancements is crucial in order to ensure a sufficiently skilled labour force in the future, while enhancing wider economic and societal goals.

Erasmus+ and other EU-level funding has been used by EU Member States to support innovation and digitalisation in VET, as the example below illustrates.

Box 36: INNOVET

INNOVET – 'Shaping the future – innovations for excellent vocational education and training'

INNOVET is an Erasmus+ project involving three European partners, the Technological Educational Institute (TEI) of Eastern Macedonia and Thrace, Greece, Forschungsinstitut Betriebliche Bildung GmbH from Germany and the Association for Education and Sustainable Development in Romania as well as education and business representatives. INNOVET aims to design, implement and adopt an innovative modular VET IT tool. This modular VET IT tool includes modelling and simulations of business processes and real enterprises in the training programmes of VET schools.

Source: INNOVET, n/a[307]

Moreover, as a part of the European Commission's response to COVID-19, two extraordinary Erasmus+ calls to support digital education readiness and creative skills were launched in August 2020. Each call provided €100 million to respond to the educational challenges resulting from the COVID-19 pandemic. More specifically, the call for digital education readiness was launched in order to support projects in school education, VET and higher education. The call aims to enhance online, distance and blended learning – including supporting teachers and trainers, as well as safeguarding the inclusive nature of digital learning opportunities.

306 https://www.regeringen.se/pressmeddelanden/2020/09/satsningar-pa-larcentrum-och-distansutbildning-for-okade-mojligheter-till-utbildning-i-hela-landet/

307 For further information, see URL: https://innovet.teiemt.gr/

A second call for 'partnerships for creativity' will support projects in the fields of youth, school education and adult education. The call aims to develop skills and competences that encourage creativity and boost the quality, innovation and recognition of youth work. Both calls will help link education, training and youth organisations with those in the cultural and creative sectors. However, at present, the principal funding sources for innovation and digitalisation at EU level are Horizon 2020 and the European Structural and Investment Funds. In fact, Horizon 2020 has been the largest EU research and innovation programme for the current programming period (2013–2020) with EU contributions of €80 billion over a seven-year period. This EU investment seeks to attract additional private investments which, when combined, aim to deliver breakthrough products, ideas and services and support their transfer from laboratories to the market.

Objectives under Horizon 2020 to address social challenges through research and innovation have been particularly useful as avenues for boosting education and training outcomes. Raising the attractiveness of science education and science, technology, engineering and mathematics (STEM) fields has also been one of the priorities under Horizon 2020. In this context, the programme's aims have included enhancing citizens' science knowledge through the promotion of innovative teaching methods, increasing the number of students in science, particularly the number of girls, and removing potential obstacles that young people encounter when starting their careers in science, technology, engineering and innovation. Unfortunately, Horizon 2020 lacks specific lines of aid or calls for grant applications addressing VET or vocational skills, action which is therefore scattered across a broad range of socioeconomic and cultural areas. As a result, it has been argued that 'supranational research on VET is not attractively funded to enable researchers to seek the most promising avenues of scientific advancement at European level'[308].

Increased resources to education generally, and explicit addresses to VET, could instead emerge under Horizon Europe, the research and innovation programme to succeed Horizon 2020 for the period 2021–2027. The framework programme was proposed in June 2018 by the European Commission. Although its budget is still under construction at the time of this report (summer/autumn 2020), the proposed €100 billion budget represents a significant increase from the previous programme. Based on the Commission's ambitious proposal, the main objectives under Horizon Europe have been defined as follows[309]:

I. Strengthening the EU's scientific and technological foundations and European Research Area (ERA);

II. Increasing innovation capacity, competitiveness and the number of jobs in Europe, and;

III. Fulfilling citizens' priorities and maintaining socioeconomic model and values.

To date, funding for education under Horizon 2020 has primarily been channelled through the European Institute of Innovation and Technology (EIT), which funds education, training, and public-private partnerships known as knowledge and innovation communities (KICs)[310]. Other Horizon instruments deal only sporadically with education, in part through social research.

EIT is currently funded by approximately €2.4 billion under Horizon 2020 and would acquire €3 billion from Horizon Europe under the Commission's proposal for the next EU budget. In line with the planning process for the next research programme, the proposal for EIT's strategic innovation agenda for 2021–2027 also includes enhancing its mandate in higher education, promoting innovation policy initiatives at institutions of higher education through coaching, expertise and financial support focusing particularly on regions

308 Moso-D.ez, M. (2019). EU research and innovation policy and VET: Concepts, development and challenges. In B. E. Stalder & C. N.gele (Eds.), Trends in vocational education and training research, Vol. II. Proceedings of the European Conference on Educational Research (ECER), Vocational Education and Training Network (VETNET) (pp. 330–337). https://doi.org/10.5281/zenodo.3371559

309 https://ec.europa.eu/info/sites/info/files/research_and_innovation/ec_rtd_he-presentation_062019_en.pdf

310 https://eit.europa.eu/our-communities/eit-innovation-communities

with lower capacity for innovation. In doing so, the EIT aims to build on successful policy initiatives such as HEInnovate[311], a free self-assessment tool for all types of higher education institutions and the Regional Innovation Impact Assessment Framework[312], which allows universities to assess how they are fostering innovation in the regions they are based in.

Box 37: EIT Digital Academy

The EIT Digital Academy offers online 'blended' innovation and entrepreneurship education to raise quality, increase diversity and availability of the top-level content provided by EIT partner universities, institutes and companies. Through their master, doctoral, professional and summer schools, the Digital Academy aims to deliver a blend of technical excellence and entrepreneurial skills to digital engineers and entrepreneurs at all stages of their careers. Programmes at all levels offer double degrees, which combine technical competence with skills in innovation and entrepreneurship. Programmes are offered through EIT's collaboration with 17 technical universities around Europe.

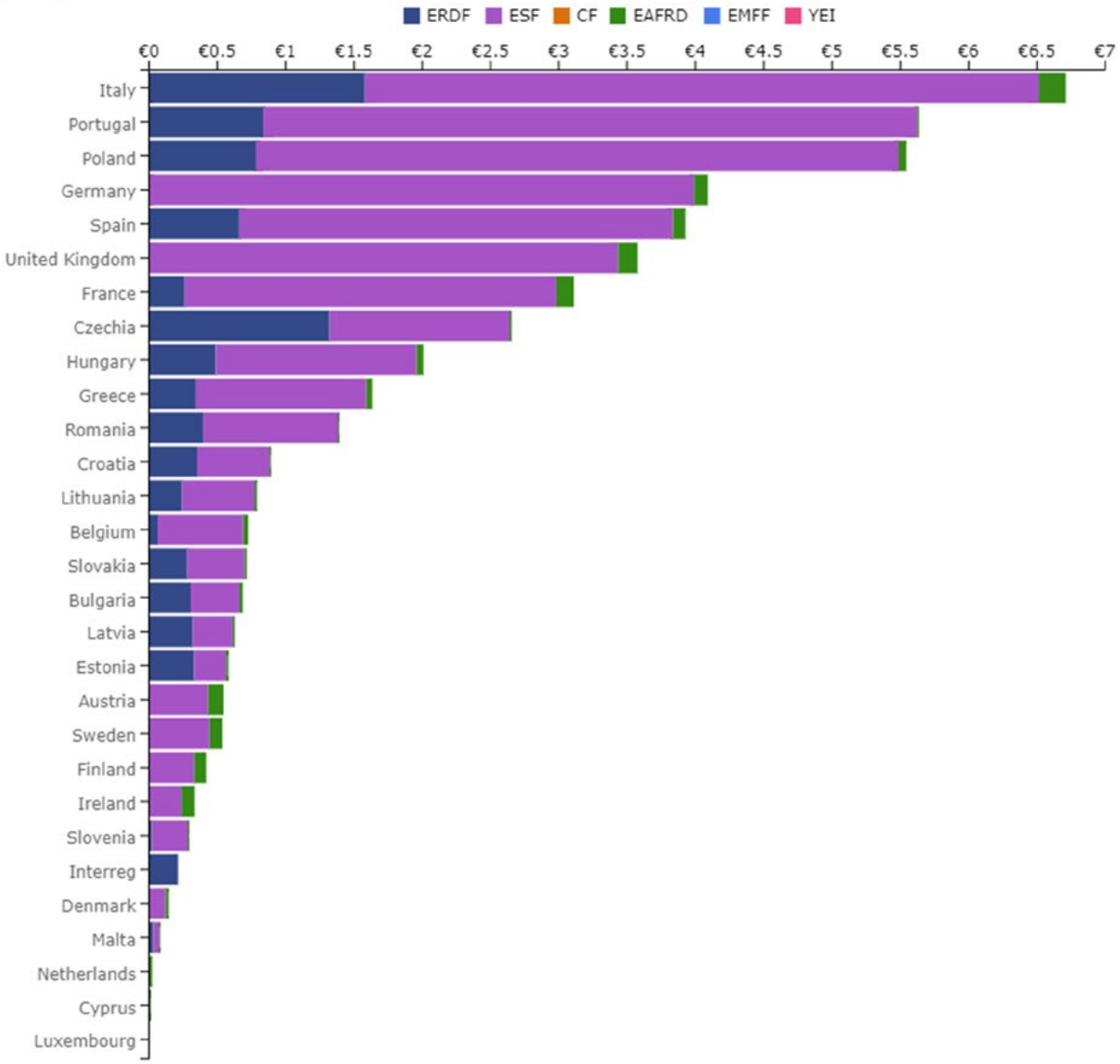
Source: EIT Digital Academy, 2020[313]

In parallel, education and training has been one of the eleven priorities under the European Structural and Investment Funds (ESIF) for the period 2014–2020 by way of thematic objective 10 (henceforward 'TO10'). Under ESIF, the European Social Fund (ESF) and the European Regional Development Fund (ERDF) have been the two main funds supporting activities which help to:

- modernise education and training systems, including investments in educational infrastructure;
- reduce early school leaving;
- promote better access to good quality education for all, from the primary to tertiary level;
- enhance access to lifelong learning, and;
- strengthen VET systems.

311 https://heinnovate.eu/en
312 https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/regional-innovation-impact-assessment-framework-universities
313 https://www.eitdigital.eu/eit-digital-academy/

Figure 6.2: Total budget by country (EUR billion) for education and vocational training under the different ESI funds (2014–2020)



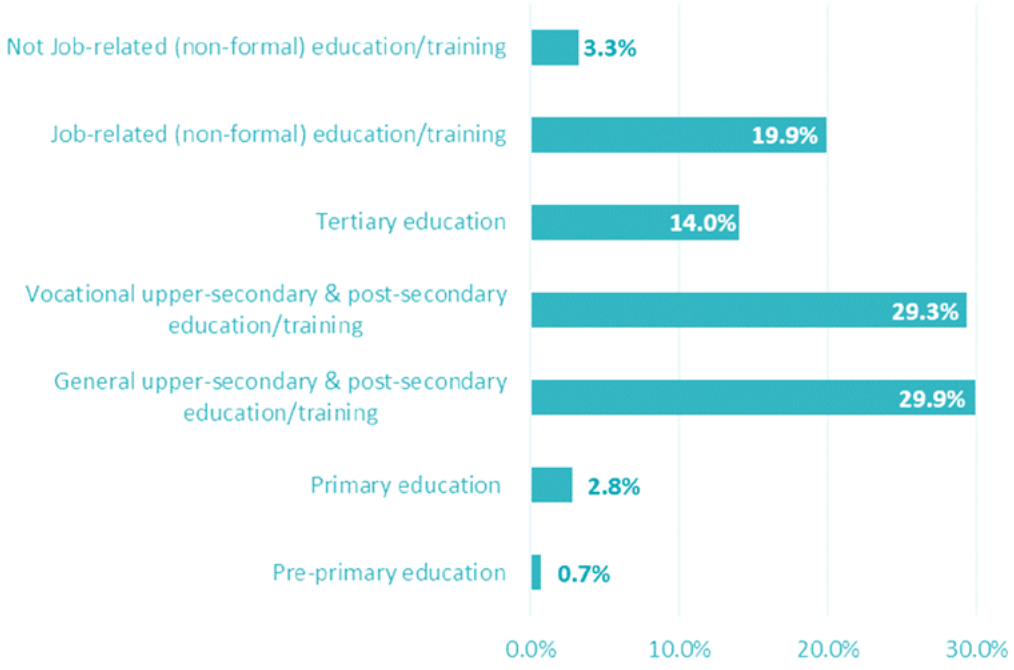
Source: European Structural and Investment Funds data, 2020[314]

314 https://cohesiondata.ec.europa.eu/themes/10. Refresh Date: 7/4/2020.

The figure above displays the total financing for education and vocational training by country under the different ESI funds, encompassing both EU financing and national co-financing for the period 2014–2020. With the exception of the Czech Republic, where investments from ERDF and ESF funds are more or less equivalent, ESF is shown to constitute the main source of ESI funding for education and vocational training, with particularly significant investments in Italy, Poland, Portugal and Germany.

Though TO10 is not VET specific, the share of ESF projects allocated to VET was explored in a recent ESF interim report[315], as shown in the graph below. Noticeably, vocational upper secondary and post-secondary education and training obtains a share of 29.3% of the total. Another 19.9% is allocated to job-related education and training.

Figure 6.3: Distribution of TO10 eligible costs by area of intervention in the EU*



Source: ESF interim report, 2019[316]

Within this context, the report observed a focus on ESF investment in general upper-secondary and post-secondary education and training in Bulgaria (62.3% of total allocations to selected projects), Estonia (50.4% of total), Italy (48.5%), Latvia (54.7%), Romania (71.7%), Slovenia (43%) and Spain (50%), while a majority of funds were allocated to vocational upper-secondary and post-secondary education and training in Austria (63.7% of total allocations to selected projects), Cyprus (55.2%) and Portugal (59%)[317].

315 103,767 ESF supported education and training operations were considered in the analysis.

316 https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=pi_com:Ares(2018)6620755, p. 121. *Countries included in the calculation: AT, BE, BG, CY, DK, EE, FI, HR, IE, IT, LU, LV, MT, PT, RO, SI, UK.

317 https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=pi_com:Ares(2018)6620755, p.121.

Box 38: ESF funding for digitalisation in VET, Luxembourg

In 2020, the Training Institute for the Construction Sector in Luxembourg started a two-year ESF project called New Tech Build (NTB). The project responds to the skill shortages of skilled construction workers, crane and caterpillar operators due to digitalisation, and foresees training for 800 workers. The training will be oriented towards practice and situational training so as to make the trainee able to work directly on construction sites. The training sessions will integrate digital elements to facilitate their use in real site conditions.

The DigiCoach (digital coaching) Luxembourg Gare project is led by the Digital Inclusion association, in collaboration with the Ministry of Labour and the ESF. The project is aimed at digital inclusion and professional integration of 400 people who are unemployed, including migrants, particularly those low qualified. The classes cover subjects designed to develop digital literacy, language skills and an understanding of how to access the job market in Luxembourg. Classes to develop these skills are also taught in foreign languages including Arabic, Tigrinya and Persian. The project has a budget of €519,700 for the period 2019–2020.

Source: New Tech Build, 2020[318]. DigiCoach, 2020[319]

Another key part of funding education generally, and innovation in VET more specifically, is the Erasmus+ programme. Erasmus+ offers the opportunity for organisations to send VET learners abroad to benefit from education and training, and for staff to give or receive training including through transnational mobility. However, Erasmus+ also offers specific avenues for funding specifically to VET institutions seeking to engage in innovative activities. For example, the Sector Skills Alliances (SSAs) are transnational projects in VET designed to tackle skills, aligning VET systems with labour market needs funded under Erasmus+. The aim is to fund opportunities for cooperation and the exchange of innovative practices in VET in order to support the modernisation of VET systems. As such, priority is given to projects which address one of the following specific objectives:

- improving skills and competence levels;
- fostering quality, innovation and internationalisation;
- promoting the development and modernisation of education;
- enhancing the international dimension of education and training, and;
- improving language learning and teaching.

As of late 2019, an Erasmus+ call for proposals on Centres of Vocational Excellence (CoVEs) was launched[320]. The call aims to support the establishment and development of transnational cooperation platforms of CoVEs, to connect CoVEs operating in a local context at European level. In its definition of vocational excellence, the call targets vocational training that goes beyond simple provision of 'traditional' VET to better meet business needs through innovative pedagogies and curricula, innovation hubs, business incubators, and so on. Through this initiative, Erasmus+ hence emerges as a key player investing in supporting innovation in VET at European level.

Moreover, the cornerstone of the Investment Plan for Europe, The European Fund for Strategic Investment (EFSI), has supported investment in education infrastructure[321] (including through public-private partnerships), research and development activities,

318 http://www.fonds-europeens.public.lu/fr/projets-cofinances/fse/2014-2020/1098/index.html
319 http://digital-inclusion.lu/digicoach-project-info/
320 https://eacea.ec.europa.eu/erasmus-plus/actions/centres-of-vocational-excellence_en
321 e.g. modernizing school infrastructure, installing broadband Internet and highly-equipped classrooms

as well as business cooperation and vocational training programmes throughout the programming period 2014–2020.

EFSI aims to increase investment in the education sector by using public funding, including funding from the EU budget, to mobilise private investment for a wide range projects carried out in the EU. Education and training directly benefit from the plan in two ways[322]:

I. through the development of investment projects in education and training that can obtain economic returns and thus attract private capital (infrastructure and innovation window);

II. ensuring that start-ups, for example on digital education and training, benefit from funding (SME window).

Under the 2014–2020 EFSI programme, the Skills and Education EFSI Guarantee Pilot is an EU financial instrument launched in 2019 aimed at supporting the access of EU students and workforce to education, training and skills development. The instrument aims to stimulate stronger private sector investment in skills and skill management, through easier access to financing to the benefit of firms, in order to strengthen workforce skills, as well as supporting innovative providers of education, training and related services, to grow and innovate[323].

Building on the EFSI approach to mobilising public and private investment to increase funds in the education sector, the InvestEU Fund (2021–2027), will include a social investment and skills window, financing projects in skills, education and training, while its research, innovation and digitisation window will aim to finance projects in research and innovation at large[324].

As regards the EU budget for the future, an ambitious and innovative EU budget for European recovery has also been set out by the European Commission. The plan aims to kick-start the European economy, boost the green and digital transitions, and make the economy fairer, more resilient and more sustainable for future generations. These proposals are based on an emergency European Recovery Instrument ('Next Generation EU') amounting to €750 billion[325], as well as a reinforced multiannual financial framework for 2021–2027. The importance of a digital Europe is reflected throughout the Commission's proposals, noting the importance of investing in digital infrastructure and skills to boost competitiveness and technological sovereignty. In particular, in the context of the Recovery and Resilience Facility[326], the Commission encourages Member States to invest in reforms with regard to reskilling and upskilling, that is to adapt education systems to support digital skills and VET for all ages.

Moreover, taking account of the additional health care needs spurred by the COVID-19 crisis, estimates of additional investment needs in the area of social infrastructure have been increased to €192 billion per year. These estimates cover investment needs for affordable housing, health and long-term care, education and lifelong training. An annual €15 billion is foreseen for education and lifelong learning.

6.3.3: Private sector funding

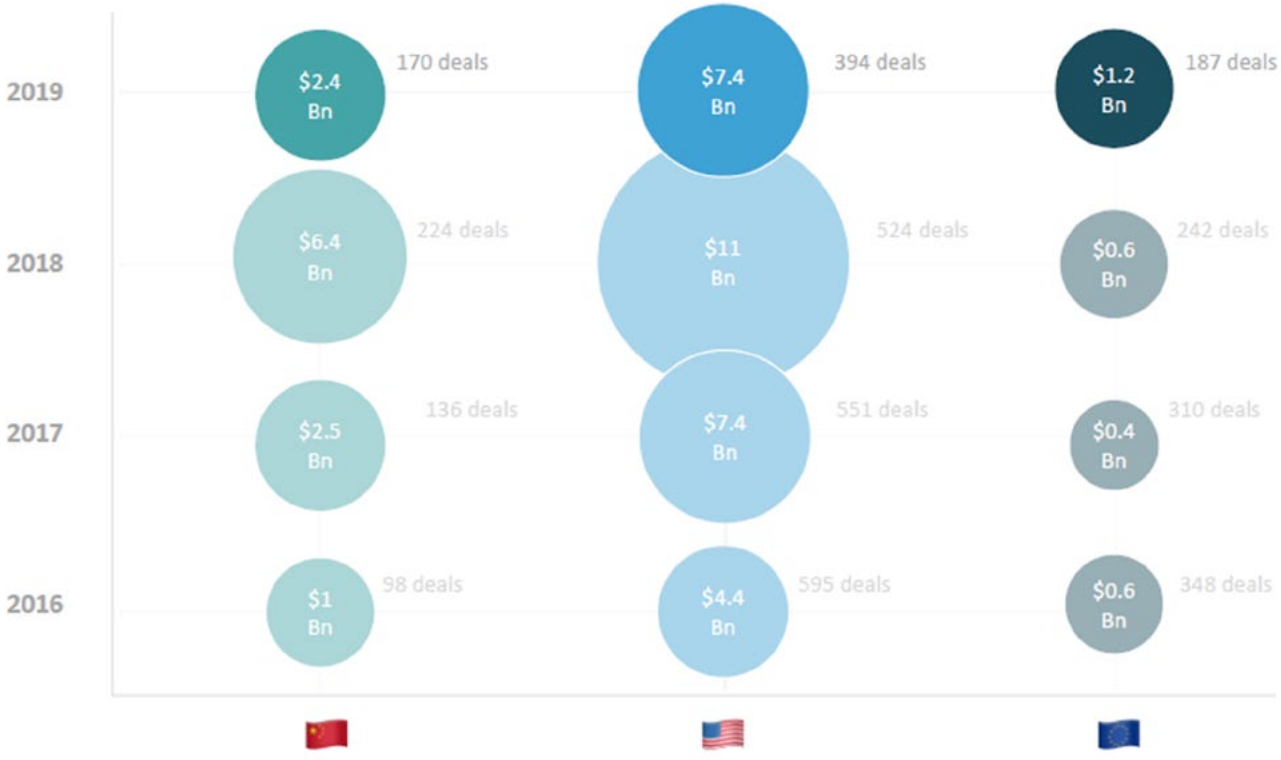
As seen in the above section, the private sector can play an important role in mobilising additional resources for education and improving the management of education infrastructure. Through venture capital, private equity and grants, a variety of private sector actors can invest in specialised firms that invent, design and commercialise educational tools in the EdTech market. Indeed, the EdTech market is an increasingly important part of the e-learning landscape, growing in line with the increasing adoption of augmented and

322 https://www.consilium.europa.eu/en/policies/investment-plan/strategic-investments-fund/
323 https://www.fi-compass.eu/publication/event-material/skills-and-education-efsi-guarantee-pilot-paving-way-investeu
324 https://ec.europa.eu/commission/sites/beta-political/files/investment-plan-sector-specific-factsheet-eac-online_en.pdf
325 As proposed by the Commission in May 2020: https://ec.europa.eu/info/strategy/eu-budget/long-term-eu-budget/eu-budget-2021-2027_en. Unless indicated otherwise, amounts are expressed in constant 2018 prices.
326 https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_1659

virtual reality, robotics, adaptive learning, alongside blended and online modalities for learning purposes (see Chapter 4).

Despite its increasing maturity, the sector is still in its early stages and as a result, challenges are presented when seeking to get a holistic projection of EdTech investments globally and across Europe more specifically, with competing sources of information using different tools and definitions. Correspondingly, it is difficult to determine to what extent the private equity and venture capital finance mentioned in this section can be attributed entirely to the private sector since public sector funding could also play a role in risk sharing arrangements underlying the data. Nonetheless, in attempting to lay out a general overview, consolidated data is presented in the table below.

Figure 6.4: General overview: 2016–2019 development of EdTech investments in key markets per annum[327]



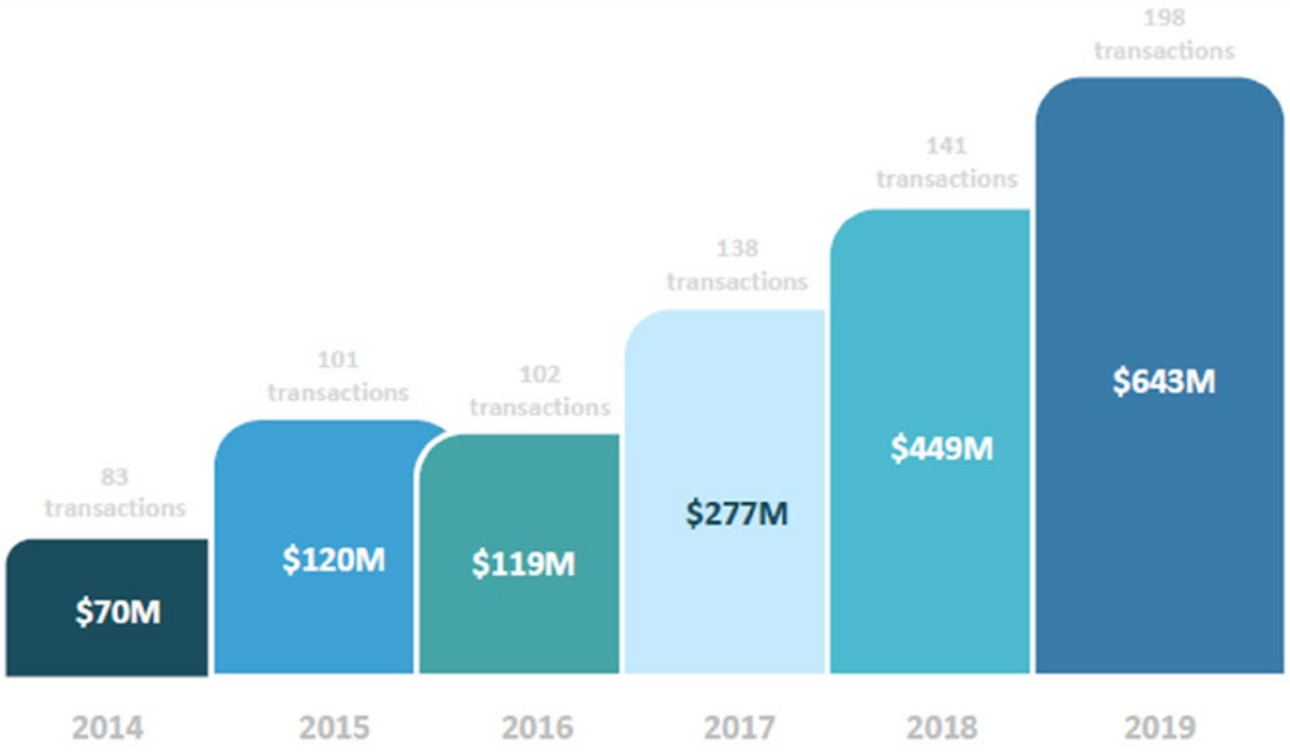
Source: Adapted from the European EdTech Funding Report 2020, Brighteye Ventures[328]

327 Figures include all types of financing rounds: early & later stage venture capital, growth, private equity, grants, LBO, M&A, debt financing deals.

328 https://www.brighteyevc.com/post/european-edtech-funding-report-2020

As observed in the above table, despite its lower volume of EdTech investments compared to China and the US, EdTech investments in the EU continue to grow, and have done so steadily in the last few years. Substantiating this observation, the EU market passed the symbolic $1 billion mark in money invested in EdTech in 2019. Key 2019 transactions on the EU market included TES Global ($360 million)[329], Ilerna Online ($100 million)[330], FutureLearn ($58 million)[331], Graduway ($60 million)[332] and Amboss ($30 million)[333]. In 2018, key investments encompassed initiatives such as OpenClassrooms ($60 million)[334] and Klaxoon ($50 million)[335].

Figure 6.5: EdTech venture capital investment in Europe 2014–2019[336]



Source: Adapted from the European EdTech Funding Report 2020, Brighteye Ventures[337]

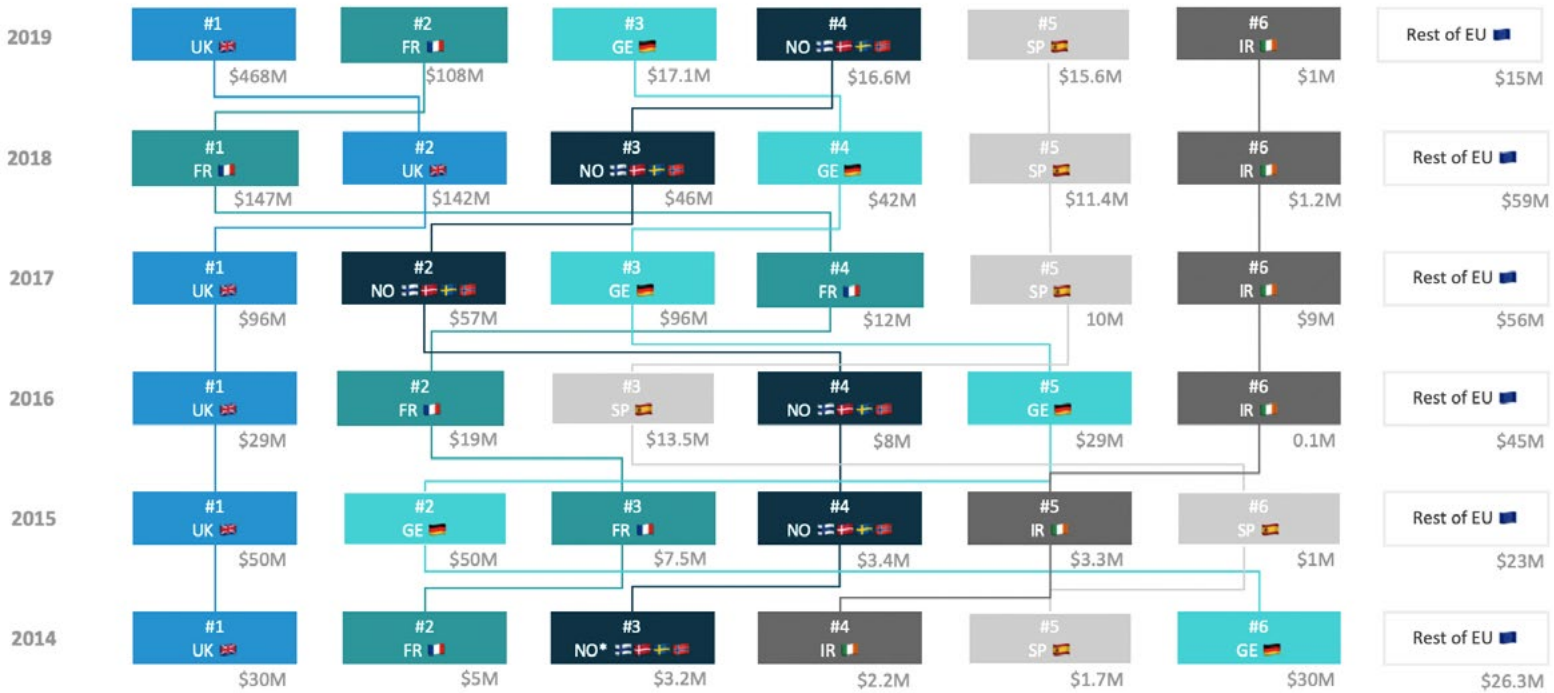
329 https://www.tes.com/tesglobal
330 https://www.ilerna.es/
331 https://www.futurelearn.com/
332 https://graduway.com/
333 https://www.amboss.com/us
334 https://openclassrooms.com/en/
335 https://klaxoon.com/
336 Figures exclude growth, private equity, grants and debt financing deals.
337 https://www.brighteyevc.com/post/european-edtech-funding-report-2020

Consumer and corporate-facing EdTech companies continue to dominate EU funding activity, accounting for about 75% of total investments in 2019, with total EU investment in school-facing and university-facing companies over the same period remaining significantly lower. Consumer-facing EdTech companies include those companies serving general markets (e.g. platforms designed to help people acquire a second language in their own time), while corporate-facing companies are primarily EdTech companies that deliver training solutions to businesses.

This disparity in private sector funding may be explained by investors remaining reluctant to invest in companies serving schools and universities because sales cycles can be lengthy and digital penetration in schools is still perceived to be limited, which may be related to the poorly distributed knowledge and weak connectivity amongst the gatekeepers mentioned in Section 5.4

It is also worth noting that the EU private sector funding outlined above still includes the UK, which accounts for the highest share in EdTech investment by country in 2019. As such, the overview below allows for a further break down of the data between the EU27 and the UK in the context of Brexit.

Figure 6.6: Development of European EdTech venture capital investment from 2014–2019

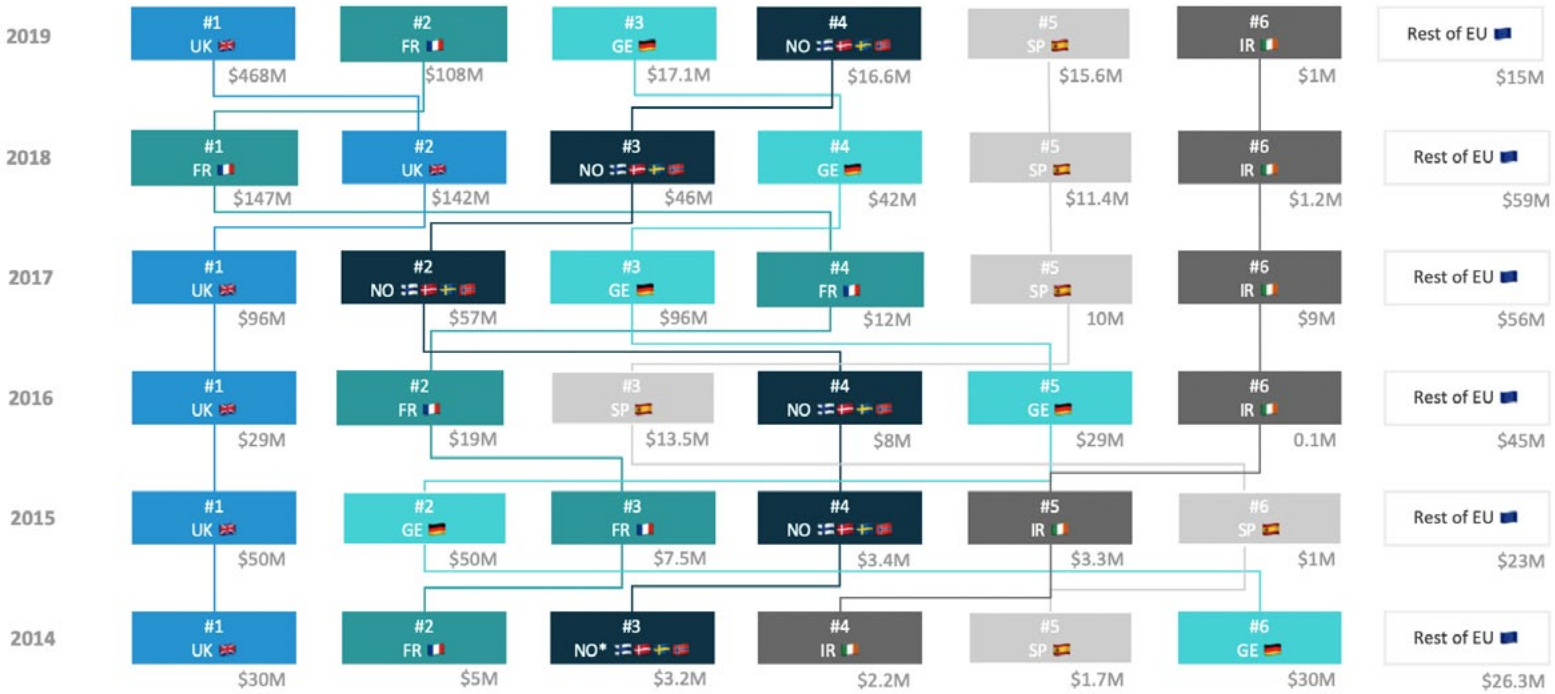


Source: Adapted from the European EdTech Funding Report 2020, Brighteye Ventures[338]

338 https://www.brighteyevc.com/post/european-edtech-funding-report-2020

The overview above shows that the UK received 72% of total EdTech venture capital investments in 2019, with investment from 2018 increasing by 3.2 times, followed by France. While Germany shows the third highest investment in the European context, its EdTech investments have decreased considerably compared to 2018. This is also the case for the Nordic countries[339]. The overview above further suggests a significant volatility in terms of overall European EdTech venture capital investments from year to year. The following figures of investments across the four years, however, provide a more balanced picture of overall investment. This overview suggests that there is a considerable investment gap between the UK and the rest of Europe.

Figure 6.7: **Total European EdTech Venture Capital investment by country, 2014–2019**



Source: Adapted from the European EdTech Funding Report 2020, Brighteye Ventures[340]

339 Ibid.

340 https://www.brighteyevc.com/post/european-edtech-funding-report-2020

This distinct divide between the UK and the EU27 also reproduces itself in 'voctech' funding. As a component of EdTech, voctech funding specifically supports new digital solutions in vocational education. While still in its infancy in the EU27 context, voctech funding support has advanced in the UK in the last few years. Examples include the Ufi VocTech Trust,[341] a grant-funding body focused on delivering an increase in the scale of digital vocational learning in the UK. Accordingly, the trust provides funding for digital solutions including digital learning for the workplace, digital learning collaborations, understanding the learning journey and seeding the market. Project applicants may work in collaboration with employers, other learning providers and workforce representatives to make sure that the idea is grounded and deliverable in this market. Moreover, as a response to the COVID-19 pandemic, the Ufi VocTech Trust has announced an immediate VocTech Now funding call, offering up to £25,000 to support vocational education providers in the UK with the digital shift. This funding call aims to support vocational training providers who need to move to digital delivery methods in order to keep their learners engaged[342].

6.4. VET organisation, governance and leadership

In this section developments in VET organisation and leadership are considered. It begins by briefly outlining key trends, including the devolution of responsibilities within VET and the blurring of boundaries between types of VET, before highlighting the importance of company involvement and the development of multi-stakeholder governance for high quality VET. It then looks at the indispensable role played by schools in innovation, and in particular the crucial issue of leadership and the changing nature of relationships between teachers and learners. Another key organisational/institutional development currently underway is the development of VET at higher levels, which is discussed in Chapter 7.

341 https://www.ufi.co.uk/
342 https://www.ufi.co.uk/voctech-now-guidelines

6.4.1: National/regional developments shaping VET

Important innovations are taking place in how VET is organised and the places where it occurs. At national/regional levels, the following broad trends are important.

1. In many countries, there has been a decentralisation of responsibilities within VET so as to grant more autonomy to employers and/or to regional and local levels (e.g. in the Netherlands, Italy and the UK) so that it is more responsive to the labour market[343]. Such autonomy is often granted in the context of the redesigning central frameworks for funding (e.g. performance management systems) and also for the design of programmes and qualifications. In Poland, the introduction of a core VET curriculum in the context of the national qualification framework has been accompanied by more autonomy for vocational schools and employers to determine the competences, skills and knowledge to be delivered[344]. The increased autonomy granted to key institutions in the VET system over time – and the flexibility it potentially confers – potentially allows change to be introduced in curricula relatively quickly. As noted in Section 6.1.2, regional and local autonomy also facilitates participation in regional innovation strategies.

   In some countries, VET providers are able to trade and to make profits, which can act as a stimulus to innovate by being able to obtain income from innovations. In Estonia, the Netherlands and Slovakia, profits must be re-invested back into education and training. In Slovakia about one third of schools make profits in this way.

2. The increased importance of lifelong learning is leading to a reconsideration of the boundaries between initial VET and continuing VET. There has been much talk about the blurring of the boundaries between these two sectors, but a recent Cedefop project[345] reminds us that: 'in most countries in Europe, initial and continuing VET are quite separate: IVET is usually part of a highly regulated school system, while CVET is more heterogeneous. This distinction, and the different principles governing IVET and CVET, make it difficult to establish links between the two systems'[346]. Furthermore, the same report notes that whilst there have been increases in adult participation in lifelong learning and in the average hours spent on CVET courses within the last decade, the change has been quite minor. Nonetheless, CVET is being increasingly covered in lifelong learning policies and strategies, such that, at policy level, there is no longer any clear distinction between IVET and CVET: increasingly, IVET providers offer CVET programmes and IVET programmes are being opened up to adults; and systems of validation of prior learning and qualification frameworks have helped to bring together the two systems. In addition, CVET is no longer focused on occupation-specific and job-related skills, but in many countries also includes training for key competences. Furthermore, participation by VET graduates in non-formal education has improved over the past 20 years with a significant driver being wider and more diverse provision of learning offers, sometimes also tailored specifically to more vulnerable groups or according to the need for certain skills in the labour market. In some countries, the ESF has been as an important mechanism for providing such offers. However, much diversity remains

343 Cedefop (2018). The changing nature and role of vocational education and training in Europe. Volume 3: the responsiveness of European VET systems to external change (1995-2015). Luxembourg: Publications Office. Cedefop research paper; No 67. http://data.europa.eu/doi/10.2801/621137

344 Ibid. Box 14, p. 87

345 Cedefop (2019). The changing nature and role of vocational education and training in Europe. Volume 7: VET from a lifelong learning perspective: continuing VET concepts, providers and participants in Europe 1995-2015. Luxembourg: Publications Office. Cedefop research paper; No 74. http://data.europa.eu/doi/10.2801/357

346 p.6 Cedefop (2019). The changing nature and role of vocational education and training in Europe. Volume 7: VET from a lifelong learning perspective: continuing VET concepts, providers and participants in Europe 1995-2015. Luxembourg: Publications Office.

across countries. In most countries, all types of CVET provision have expanded, but in some countries some types of CVET provision have declined significantly and the reasons for this have not yet been explored.

3. A trend towards more individualised learning pathways is seen in a number of structural developments such as reforms to national qualifications frameworks and qualification and curriculum modularisation. In Finland, it is at the heart of current reforms, which aim to achieve an innovative lifelong learning VET system organised around personal study paths, broad-based competences and close cooperation with working life. Under the new system, IVET and CVET are merged and there are no fixed VET paths for anyone: rather, individual competence needs are addressed by offering learners the opportunity to acquire qualifications flexibly, attending programmes in education institutions, workplaces or digital learning environments. National digital solutions are a central part of implementing such individualised learning, including Arvo, a digital education management information service, and ehooks, an online service to support individual study paths.

4. Another trend that continues to gather pace is the blurring of boundaries between formal learning on the one hand and non-formal and informal learning on the other. A key element of this is the introduction of methods to validate non-formal and informal learning (VNIL), which are becoming more widespread[347]. They offer the prospect of opening up new pathways into VET since learners can receive recognition for learning achieved virtually anywhere under any circumstance. They are likely to be especially important in CVET where most learning is non-formal, offering, for example, opportunities to receive credit towards qualifications. Such qualifications may have originally been designed for IVET so that, in this way, VNIL may contribute to the breaking down of the IVET–CVET distinction noted above. VNIL is also a key element of excellence in VET. Validation of non-formal and informal learning can be a vital tool in VET reforms – for example, they play an important part in recent reforms in Finland where a further step is being taken in the competence-based system to achieve greater personalisation of learning pathways. VNIL was given a stimulus by an EU council recommendation of 2012 which acknowledged the role to be played by digital technologies by calling for the development of VNIL 'to enable individuals to have knowledge, skills and competences which have been acquired through non-formal and informal learning validated, including, where applicable, through open educational resources'[348]. Nonetheless it has been found that validation provision 'is still far from being comprehensive in most EU Member States which tend to prioritise validation in relation to certain areas, subjects, sectors or occupations, and not others, thus limiting opportunities for the widest possible access to validation'[349]. As noted elsewhere in this report, online learning opportunities such as MOOCs are often not provided through traditional formal channels and thus present a challenge to traditional validation methodologies, requiring greater cooperation between formal and non-formal VET providers (see Section 3.5), although digital technologies are also part of the solution (e.g. blockchain, see Section 4.2.3).

347 Cedefop; European Commission; ICF (2017). European inventory on validation of non-formal and informal learning – 2016 update. Synthesis report. https://www.cedefop.europa.eu/files/4153_en.pdf

348 COUNCIL RECOMMENDATION of 20 December 2012 on the validation of non-formal and informal learning (2012/C 398/01) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012H1222(01)&from=EN

349 European Commission (2020) Study supporting the evaluation of the Council Recommendation of 20 December 2012 on the validation of non-formal and informal learning, p. 4. https://op.europa.eu/en/publication-detail/-/publication/ea175fa5-ca31-11ea-adf7-01aa75ed71a1/language-en

6.4.2: Governance for high quality VET: companies, learners and other stakeholders

The development of quality and of environments that support innovation requires the involvement of all stakeholders. It is therefore appropriate that VET governance systems should involve all parties with an interest in quality and innovation, not just VET providers and employers but also learners, trade unions and other stakeholders, e.g. higher education.

More companies are being brought into VET through the spread of work-based learning and apprenticeships across Europe and this is being accompanied by new models of organising the management and organisation of VET as well as increasing the use of workplaces as locations of learning. Employers are coming into VET either individually or collectively through sector bodies.

The role of learners in VET governance warrants consideration in many VET systems where it is often under-developed, despite the growth of mechanisms in the wider world to hear the voice of young people, e.g. youth parliaments. Young VET learners' experiences of new technologies makes it particularly important that their voice is heard in regard to digital learning where the internet is having an impact on expectations with regard to digital content and learning processes (the internet offers instant engagement and feedback and almost limitless choice). Adult learners deserve to have their views expressed through trade unions, but the role of unions in respect to VET is often in need of development[350].

The involvement of other stakeholders in VET governance reflects other important – often wider – needs in VET. For example, links with higher education are important for VET's pursuit of innovative ways of developing pathways into higher levels of education and for VET's involvement in regional innovation systems (see sections 6.1.2 and 7.2). Similarly, VET governance may involve other players involved in, for example: regional development and sustainability, including regional/local authorities with responsibility for economic development and innovation, innovation hubs, research institutes and enterprise support bodies; upskilling and reskilling, including public employment services and career guidance organisations; and social development including civil society organisations.

6.4.3: Leadership

A common thread in much of the literature on innovation and digitalisation is an emphasis on the importance of individual education and training institutions in implementing innovations and the deployment of technology successfully. Leadership at provider level has a particularly important role to play, with providers needing to consider all elements, including organisational structures, pedagogy, learning environments and the curriculum, if they are to become innovative institutions. They also need to consider the relationships between teachers, trainers and learners and how these need to change to make the most effective use of digital technologies. In addition, in VET, leadership by companies in respect of apprenticeships and work-based learning has an important role to play in ensuring the adoption of more innovative approaches to training, teaching and learning and in maintaining effective relationships between workplaces and VET schools.

Leadership by VET providers and training companies is key in engaging teachers, trainers and learners in innovation and digitalisation[351]. Institutional leadership is instrumental from vision and planning through to the fostering innovative cultures and buy-in to the provision of infrastructure and appropriate organisational structures[352]. Clear leadership for innovation helps to ensure that innovation has

350 The UK's unionlearn is a notable exception, e.g. https://www.unionlearn.org.uk/blog/unionlearns-covid-19-initiatives

351 European Training Foundation (2013) Good Multilevel Governance for Vocational Education and Training, URL: https://www.etf.europa.eu/sites/default/files/2018-09/ INFORM; Kirkland, K., & Sutch, D. (2009) Overcoming the barriers to educational innovation Literature reviews: Futurelab. Dexter, S. 2008. Leadership for IT in Schools, in J. Voogt & G. Knezek (Eds.), International Handbook of Information Technology in Primary and Secondary Education, Springer Science, Vol. 2, pp. 543-554:

352 Alexander, B. 2006. Web 2.0: A New Wave of Innovation for Teaching and Learning? Educause Review 41(2): 32–44; Moyle, K. 2006. Leadership and learning with ICT: voices from the profession. Canberra: Teaching Australia, Australian Institute for Teaching and School Leadership Ltdo. Document Number.

a meaningful transformative effect[353]. It is also essential to drive the six interconnected organisational conditions necessary for supporting teaching, training and learning with ICT, namely:

1. a strategic plan;
2. a vision;
3. an institutional culture of creativity and openness;
4. a whole-provider approach/coordinated policies;
5. provider infrastructure; and
6. organisational structures[354].

Leadership is effective in ICT when:

1. teachers and trainers are considered to be decisive in adapting learning to ICT;
2. the provider is prepared and able to use ICT;
3. roles change for learners and teachers/trainers as a result of ICT and these changes are tied into the need for new assessment practices;
4. VET providers and company leaders influence how much teachers and trainers collaborate, discuss and learn from each other in order to develop the pedagogical usage of ICT[355].

This indicates that the ability of an institutional leader to set a clear vision is a function of the level of autonomy of an institution [356]. In general, institutions with a comparatively high level of institutional autonomy vis-à-vis the government and more control over their financial resources and their allocation tend to develop more bottom-up practices; while those with less institutional autonomy tend to have more top-down, state-driven approaches to innovation[357].

Another key issue to consider at school level is the changing nature of relationships between learners and teachers. As noted in Chapter 4, many of the innovative pedagogical and technological developments taking place are making learning more learner-centred, which resonates with the structural shift noted above towards individualised learning pathways in some countries. In short, new technologies are apt to re-orientate relationships. An example of how this can take place is shown in the box below.

In addition, young people especially spend much of their time in a highly 'democratised' digital world where there are high levels of individual choice and instant engagement, leading to new mindsets about how they want to engage with learning and with teachers, which they inevitably bring into the classroom. Thus, a preparedness to rethink the relationships between teachers/trainers and learners is one of the success factors in deploying e-learning.

353 European Commission (n/a), idem, p. 10.

354 Moyle, K. (2006) Leadership and Learning with ICT. Voices from the Profession: what Australian School Leaders Say, in EdMedia + Innovate Learning, June 2006.

355 Ottestad, W. 2013, School Leadership for ICT and Teachers' Use of Digital Tools, in Nordic Journal of Digital Literacy, 8(1-2): 107-25.

356 Hoareau McGrath et al., 2016, Ibid. See also further examples in European Commission. 2019. Mapping of Centres of Vocational Excellence, draft report; including the case of Tknika (p.4). Tknika is the Basque centre for research and applied innovation. This centre uses networking and direct involvement by the Basque Vocational Training teaching staff to develop innovative projects in the areas of technology, education and management, URL: www.tknika.eus . European Commission (n/a) Annex 1: key messages from PLAs, p. 3.

357 Brennan et al. 2014. Ibid. p. 4.

Box 39: The Trialog mobile app – daily mobile internship feedback for learners

The Trialog mobile app is an easy to use tool that permits teachers from schools, tutors from companies and learners to better cooperate in a work-based context. The app was created through a strategic project partnership under the Erasmus+ programme in an effort to bridge the gap between educational standards, training programmes and real-world challenges. The approach is built on small feedback cycles, in which the learner receives daily feedback for demonstrated competences, including soft skills, during the work-based internship. More specifically, through the Trialog mobile app, the learner is able to:

1. register himself/herself in an internship already defined by the teacher and tutor;
2. visualise the elements of the internship, including relevant competences and the daily task for each single day (visible to both the learner and teacher);
3. easily inform the tutor, if, because of various reasons he/she will not attend the planned activities;
4. upload their own self-evaluation at the end of each day, concerning the concrete tasks accomplished, and;
5. receive feedback from the tutor, in real time, for the demonstrated/validated technical skills and the list of soft-skills relevant for the tasks of the day (this daily feedback will provide the final competence profile of the students).

In this sense, the Trialog app aims to ensure the effective communication in real time between the three interested parts of the teaching-training-learning process, namely the learners, educators and company-based tutors.

Source: Trialog, 2018[358]

358 Trialog, 2018. About the Trialog Project. http://criovest.ro/trialog/.

Key issues highlighted in Chapter 6

Innovation and digitalisation in VET require a multitude of support (covering software and hardware, support to trainers and teachers, and many other aspects) and this brings the risk that government policies and actions become fragmented and lack coherence. Indeed, there appears to be a need for strategies that are more comprehensive and recognise the connections that are needed between the required support. In addition, if VET is to support innovation it is important that it is integrated into strategies not just at national level but also at regional level and is not simply a 'bolt-on'.

As noted above in Chapter 2, the extent and nature of innovation and digitalisation rely to a significant degree on micro-decisions taken in schools and workplaces. In this context, care needs to be taken that strategies and plans are not too 'top-down' and do not stifle local initiative and enthusiasm.

Innovation and digitalisation are not necessarily cheaper options than traditional approaches to learning. Indeed, ICT-based learning can be resource- and labour-intensive. They also carry the risk of failure, which in turn risks deploying funds up front on activities that may not bear fruit. Funding models need to be more flexible and allow for risks in ways that may be unfamiliar.

Strong leadership is required at institutional, organisational or even company level to steer a vision and strategy and set examples of how to support the objective of more effective innovation and digitalisation in VET. Leadership teams at VET school level face a number of challenges since they play a particularly important role in innovation, with schools needing to consider all elements, including organisational structures, pedagogy, learning environments, and the curriculum, if they are to become innovative institutions. They also need to consider the relationships between teachers, trainers and learners and how these need to change to make the most effective use of digital technologies.

Digital learning is changing the relationships between trainers/teachers and learners. 'Cooperative robots' – cobots – are already on the horizon. At the same time, young people spend much of their time in a highly 'democratised' digital world of individual choice and instant engagement. This is leading to new mindsets about how they want to engage with learning and with trainers/teachers. Space needs to be made for such new relationships in policy and practice.

7.0

New approaches to excellence in VET

New approaches to excellence in VET

New approaches to excellence in VET

New approaches to excellence in VET

New approaches to excellence in VET

The preceding sections have shown the many ways in which digitalisation and innovation can support the drive to achieve higher quality in VET and how policymakers, practitioners and wider stakeholders can play a role in this. It is also important to constantly seek new ways to achieve excellence in VET.

This section of the report examines two ways in which excellence can be pursued: through the development of Centres of Vocational Excellence and VET at higher levels. Such developments can act as beacons of excellence, engaging VET in a broader range of activities with a wider set of stakeholders to support environmental, social and economic goals. They build on VET's core strengths whilst taking it in new directions, helping to achieve a step change in quality and 're-loading' VET so that it is more resilient to the type of system shocks experienced with the COVID-19 crisis.

7.1. Centres of Vocational Excellence

Centres of Vocational Excellence (CoVEs) are developing across Europe and provide a focal point for quality and excellence – with EU funding since 2019 for their development. A separate report produced by the VET Working Group maps CoVEs in detail and identifies key features of vocational excellence[359]. CoVEs can comprise both national/regional networks of partnerships/providers and individual VET providers functioning as CoVEs.

359 European Commission (2019) Mapping of Centres of Vocational Excellence https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8250&furtherPubs=yes

Box 40: Examples of Centres of Vocational Excellence in Europe

In Belgium-Wallonia, the Centres de Compétence form a regional network (25 centres across 42 sites), with each centre specialising in a particular sector relevant to a local economic development pole, although they are also able to receive students from other regions within Belgium-Wallonia. Each centre is a public-private partnership and is a provider in its own right. There is coordination across the network to share good practice and achieve synergies. Centres have been created since 2001.

In Finland, Omnia is the Joint Education Authority for the Espoo Region, owned by three municipalities, and offers upper secondary VET, apprenticeship training, general upper secondary education, workshops and liberal adult education courses. It has both regional and national responsibilities. Licensed by the Ministry of Education and Culture, it cooperates with ministries (national and foreign), cities, chambers of commerce and entrepreneurs (cooperation agreements are in place with over 2,000 companies in the region), as well as trade unions within education and training. Omnia also hosts and sends abroad hundreds of experts and students yearly, manages EU network development projects and participates in different global education networks. In this context, Omnia's VET mobility charter for the years 2016–2020 enables Omnia to link its development work, global networking and international mobility actions closely to its training programmes and learning paths.

In Lithuania, Vilnius Technological and Business Vocational Training Centre is a state VET centre with two sectoral practical training centres – the Engineering Industry Sectoral Practical Training Centre and the Energy Sector Practical Training Centre. The centre provides training programmes, which respond to the needs of the Lithuanian labour market, in particular the demand for IT professionals. It cooperates with various partners, including organisations from public and private sectors. Together with two other organisations, the centre set up a training initiative called Akademija.IT, where theoretical training in two IT directions (Java programmer and software tester) is combined with practical apprenticeships in companies. Akademija.IT cooperates with a range of IT companies.

Malta College of Arts, Science and Technology (MCAST) functions as a CoVE for the whole country. A large proportion of provision offered at the MCAST corresponds to the six key areas of smart specialisation in Malta (ICT, business management and commerce, community services, engineering and transport, applied sciences and creative arts). To do this, it collaborates with a variety of partners, including research institutes, higher education institutions and companies. In addition, the MCAST increasingly focuses on promoting (youth) entrepreneurship.

Source: Mapping of Centres of Vocational Excellence, 2019[360]

360 European Commission, (2019). Mapping of Centres of Vocational Excellence. https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8250&furtherPubs=yes

There is variation in the form and function of individual CoVEs. However, all CoVEs go beyond what VET would normally be expected to do:

> ***quality and excellence mean not just matching provision closely to the needs of the labour market but going further so that VET can become an essential and proactive element of skill ecosystems with strong links to wider local and regional agendas for sustainability and social and economic development.***

This means actively looking for innovations in all areas and embracing digitalisation at the core of teaching and learning activities.

At a strategic level this means:

- seeking innovative ways of building partnerships with businesses and HE institutions in order to become part of knowledge triangles;
- becoming more involved in research activities, integrating research with teaching and learning, and creating new knowledge linked to organised research programmes/centres;
- playing a leading role in innovation hubs, technology centres and business incubators;
- building on and extending participation in international projects through international strategies to include international campuses/academies;
- designing and implementing sustainable funding models involving strong and reliable contributions from the private sector;
- integrating different management systems (e.g. quality, innovation, social responsibility, environment, health and safety, etc.) and seeking third party accredited certification to validate their implementation.

In terms of core VET teaching and learning, quality and excellence in CoVEs involves:

- developing and/or implementing innovative teaching and training methodologies, including those based on digital technologies (e.g. MOOC's, simulators, etc.);
- project-based learning;
- curricula that develop transversal, as well as technical, skills;
- provision of both IVET and CVET based on lifelong learning principles, with little or no distinction between the two;
- collaborations with higher education, from sharing facilities through to offering joint qualifications;
- opening up pathways to higher level VET;
- developing transnational joint VET curricula;
- supporting the continuing professional development of teachers and trainers, with feedback mechanisms between CPD practice and research;
- offering guidance and validation of prior learning services to all students as an integral part of the VET offer.

It is currently rare to find CoVEs that have all of the features listed above. But CoVEs display three common factors that are central to their success:

- Strong and enduring relationships involving VET providers at upper secondary level, businesses and providers of higher education and higher VET, in which interactions are reciprocal and mutually beneficial (rather than 'one-way traffic');
- Being firmly anchored into frameworks of regional development, innovation and smart specialisation, which allows for the identification of synergies between policies and amongst stakeholders;
- Integration of activities so that VET provision can achieve more than some of its parts, with, in particular, the building of reflexive relationships between activities and research.

The Basque Country's strategic priorities for smart specialisation are strongly linked to the Basque Network of Science Technology and Innovation, and the IV Basque VET Plan. Teachers are positioned at the core of this system, connected with different levels of the government and with the private sector (mainly SMEs).

In this context, the establishment of a Basque International Campus for Smart Specialisation in vocational training is based on cooperation between training centres, companies and institutions in the Basque Country, with the aim of helping to favour employment, competitiveness, social cohesion and economic development. The approach further aims to help attract talent to the Basque Country by offering advanced training.

Source: V Basque Vocational Training Plan 2019–2021[361]

361 V Basque Vocational Training Plan 2019–2021. Vocational Training in the context of the 4th Industrial Revolution. http://www.euskadi.eus/contenidos/informacion/fpgeneral/es_def/adjuntos/V-PLAN-FP-ENG.pdf

7.2. Higher skills and higher VET

Higher VET has a key role to play in the supply of higher skills that are increasingly needed in European economies and is also well placed to be a focal point for driving quality and excellence, with great potential to take part in the activities described in the section above on Centres of Vocational Excellence. More generally, it can increase the attractiveness of VET by opening up opportunities for learners to progress via VET to the highest levels of educational attainment. The 2020 proposal for a council recommendation on VET recommends that EU Member States further develop higher VET programmes at EQF levels 5 to 8 to support a growing need for higher vocational skills as well as innovation and smart specialisation, including modularising VET programmes and expanding them to higher levels of qualifications and micro-credentials; it also calls for greater permeability and transparency[362].

There is no doubt that VET is ideally positioned to respond to some of the critical challenges of our times. As noted in the Renewed EU Agenda for Higher Education[363]:

- too many students graduate from general/academic higher education with poor basic skills (literacy, numeracy, digital) and without the range of transversal skills (problem solving, communication, etc.) they need for resilience in a changing world;
- people from disadvantaged socio-economic or migrant backgrounds remain far less likely to enter and complete higher education; academics and graduates are too often perceived as detached from the rest of society; and
- higher education should allow students to acquire skills and experiences through activities based on real-world problems, including work-based learning and, where possible, offer international mobility. Cooperation with employers can allow HEIs to increase the relevance of their curricula and deliver them effectively and increase opportunities for students to access high quality work-based learning.

362 European Commission (2020) Proposal for a COUNCIL RECOMMENDATION on vocational education and training (VET) for sustainable competitiveness, social fairness and resilience {SWD(2020) 123 final}

363 European Commission (2017). Renewed EU agenda for higher education: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2017) 247 final

In light of this, consideration should be given to how far higher VET has already developed and what remains to be done.

Higher VET (generally encompassing vocationally oriented education and training at levels 5 to 8 of the European Qualifications Framework[364]) has seen an expansion and diversification in European countries over the last two decades, with rises in participation, new separate strands added to higher education and new forms of pedagogy, programmes and qualifications introduced. There has been a notable expansion in many countries in 'short cycle VET degrees' at EQF level 5[365] which provide a significant upskilling function. On-the-job learning has also been increasingly integrated into vocationally oriented education and training at higher levels and in different ways, either in the form of internships as part of programmes or as new formats of dual or apprenticeship training[366].

Most European countries operate with binary, differentiated higher education systems, where traditional universities exist side-by-side with more vocationally oriented institutions. Some countries have seen the emergence of new, vocationally oriented higher education approaches in the last 10–15 years, such as Yrkeshögskolan (YH) in Sweden or the new developments in Slovenia shown in the box below. In Germany, higher VET is usually completed after in-company vocational training and/or several years of employment and the majority of higher vocational training qualifications are assigned to level 6 on the German qualifications framework. A recently revised VET law includes the introduction of 'certified professional', 'bachelor professional' or 'master professional' degrees which provides for parity of esteem between VET and higher education, internationally understandable degrees and career mobility. At the same time, between 2000 and 2017, whilst the number of people achieving academic qualifications enjoyed a major increase, achievements of higher VET qualifications remained largely unchanged, pointing to the need to raise the attractiveness of higher VET. This provides a good example of some of the challenges facing higher VET's development.

364 This is the definition developed in the recently completed Cedefop project on the changing nature and role of vocational education and training in Europe. Looking across Europe, the study found that vocationally oriented education and training at higher levels 'is not clearly defined in most cases, is usually not considered as a sector on its own, and there is often an overlap with continuing vocational education and training (CVET) or higher education (HE).' Cedefop (2019). The changing nature and role of vocational education and training in Europe. Volume 6: vocationally oriented education and training at higher education level. Expansion and diversification in European countries. Luxembourg: Publications Office. Cedefop research paper; No 70. http://data.europa.eu/doi/10.2801/02004

365 Cedefop presentation, 'The role of higher VET in Europe', to VET WG webinar, 17th July 2020

366 Cedefop presentation, 'The role of higher VET in Europe', to VET WG webinar, 17th July 2020

Slovenia's new higher VET strategy

Slovenia is adopting a national strategy for 2020–2030 on higher vocational colleges/ short-cycle higher education. Higher vocational colleges offer 2-year study programmes with 120 ECTS at level 6 in the national qualification framework SQF (equivalent to level 5 in the EQF/and short-cycle programmes as per the EHEA qualification framework). Programmes are based on labour market needs, and key to the programmes' success is the emphasis on WBL and apprenticeships, which constitute 40% of overall curricula (400 hours each study year). Programmes are accredited by a ministerial commission as well as subject to an external evaluation by the agency responsible for quality assurance in higher education.

Sweden – Higher vocational education: Yrkeshögskolan

In Sweden, higher vocational education (HVE) has doubled since 2014. HVE is a post-secondary form of advanced vocational training (EQF levels 5 and 6), aimed at meeting labour market needs and designed and delivered in close cooperation with employers and industry. HVE is expanding quickly (from 25,000 full-time study places in 2014 to 50,000 in 2021) and also diversifying through the launch of shorter HVE programmes mainly aimed at the upskilling and reskilling of already skilled workers and a pilot scheme on 'flexible HVE' where recognition of previous learning is combined with HVE courses as a faster path to a HVE diploma. The Swedish National Agency for HVE (NAHVE) is responsible for analysing the labour market demand for skills, for annual selection of programmes that qualify to be offered as HVE, for allocating government grants as well as for quality assurance and development.

In general, across Europe a number of important challenges remain to be addressed, including:

- how to strengthen the visibility and esteem of HVET, in light of the lack of transparency/focus of its role in the education system;
- whether VET should strive to cover all EQF levels, even up to level 8;
- whether higher VET should be developed inside existing higher education systems, or in separate institutions;
- creating bridges between HVET and university-level education in order to allow movement between the education forms, avoid overlap, increase validation, recognition of previous learning and shorten study paths;
- the role companies and other stakeholders should play - e.g. 'ownership' of the higher VET 'system' or influencing individual programmes/curricula[367].

Box 41: Didactic Initiative of Excellence in Higher VET, Poland

Since 2019, the Didactic Initiative of Excellence has aimed at improving the quality of practice-oriented profile of studies at public vocational higher education institutions in Poland. Based on quality assurance assessments and tracking of graduates' labour market outcomes, vocational institutions selected under the initiative receive additional financial resources that can be spent on activities boosting their innovative capacity, such as modern teaching and learning methods and technologies. The excellence initiative further targets public vocational higher education institutions which are deemed to play a significant role in regional development. The project aims to increase the innovative potential of institutions by encouraging them to develop an action plan for modernising teaching methods and competences of their staff and students.

Source: Didactic Initiative of Excellence, 2019[368]

Regarding the activities described in the preceding section that define features of vocational excellence, leading higher VET institutions are notable for their ability to integrate activities, especially research with teaching and learning (including the teaching of teachers/trainers) – building feedback loops between the two – and going beyond just sharing staff and facilities with businesses to helping VET students to set up their own businesses through incubators and innovation hubs.

367 Cedefop presentation, 'The role of higher VET in Europe', to VET WG webinar, 17th July 2020
368 http://www.bip.nauka.gov.pl/przedsiewziecie-dydaktyczna-inicjatywa-doskonalosci/

Areas where higher VET's contribution is particularly noteworthy are included in the overview below.

1. Promoting innovative, modern, creative business environments

Box 42: Latvia – business incubator at Riga State Technical School

The Riga State Technical School (RSTS) has recently established their business incubator which allows the RSTS to support and promote an innovative, modern and creative business environment.

The purpose of the business incubator is, in partnership with industry and higher education institutions, to develop excellence in VET, actively participate in skill forecasting and formulation of regional development needs and innovation strategies, as well as their implementation. Their mission is to stimulate industry professionals' engagement in the study processes, hands-on and work-based learning in companies, providing support and investment not only for young persons' careers and professional development, but also for adult continuing education, innovative and creative thinking and entrepreneurship.

The business incubator's key role and activities include serving as:

1. an information platform for interdisciplinary cooperation and exchange of information with practitioners;
2. a communicative tool allowing employers to select prospective specialists through express interviews, as well as to present their companies and the specifics of their operations both in person and online;
3. a brainstorming platform for educators to improve their competence and innovation capacity;
4. a career start-up studio for students to pursue a professional career and further education, and;
5. a meeting point for promoting lifelong learning.

The business incubator brings together students, educators, alumni, employers, researchers, project and cooperation partners, as well as other relevant professionals and stakeholders, including professionals from other educational institutions and universities.

Source: Riga State Technical School, 2020[369]

369 https://www.rvt.lv/eng/1081-riga-state-technical-school-more-than-education

2. Embedding entrepreneurship in the curriculum

Box 43: Croatia – Strukovna škola Vice Vlatkovića

In Croatia, Strukovna škola Vice Vlatkovića has been offering support and education in the digital and financial skills necessary for successful entrepreneurship through the project '(P)ostanimofinancijsko i digitalnopismeni'. The school played a leading role in the project, which was implemented in five other institutions (three secondary schools and two adult learning institutes). The school is one of the 'experimental schools' within the 'School for Life' project (financed by the ESF). The project consists of testing new curriculum approaches from the perspective of their value and applicability on the market. It focuses on problem solving skills and increasing students' satisfaction from learning.

Box 44: Denmark – VIA University College

VIA University College in Denmark was chosen by the Danish Foundation for Entrepreneurship as the most entrepreneurial institution of higher education of 2018. VIA works strategically with entrepreneurship and innovation in all of its 42 educational programmes, including programmes that are traditionally not focused on developing students in this area. In particular, VIA has put specific efforts into integrating entrepreneurship in the general curricula, and not as a separate activity, for more than 19,000 students. Faculty members have been trained to teach courses in entrepreneurship and VIA offers special electives and courses on entrepreneurship. They have also established student entrepreneurship centres on most campuses. One specific goal is to enable more students to establish their own companies – which more and more students across programmes do. In addition, VIA participates in a number of EU-funded development projects in the area of student entrepreneurship and innovation. One hundred mentors have also been trained as part of VIA's vocational business educational programmes, which provide VET students with tailored career guidance.

Source: Strukovna škola Vice Vlatkovića, 2020,[370] VIA University College, 2020[371]

370 http://www.ss-strukovna-vvlatkovica-zd.skole.hr/
371 https://en.via.dk/

3. Developing trans-national joint curricula

Box 45: Slovenia, Šolski Center Nova Gorica

In Slovenia, the Šolski Center Nova Gorica is introducing innovative work-based learning models with personalised tutoring, as well as innovative work-related projects, within the framework of an Erasmus+ KA 3 project, RAY. Part of the project involves sharing the products through international mobility and a virtual campus. In addition, the BoQua project (European Qualification Concept 'Professional Career Specialist') aims to develop a new and Europe-wide uniform qualification concept for professionals who are active in the field of 'vocational orientation' (e.g. teachers, social pedagogues, professional advisers). The project's products should contribute to improving the quality of work in the field and make the experts' qualification and the implementation of vocational orientation at schools, consulting institutions, and within the framework of open youth work Europe-wide, more comparable.

Source: Šolski Center Nova Gorica, 2020[372]

Key issues highlighted in Chapter 7

The development of Centres of Vocational Excellence and VET at higher levels are two ways in which VET can act as beacons of excellence, building on VET's core strengths whilst taking it in new directions and engaging with a wider set of stakeholders to support environmental, social and economic goals.

Through Centres of Vocational Excellence, VET has the opportunity to become an essential and proactive element of skill ecosystems at regional level. This is by no means a straightforward task: it involves not simply doing the 'VET basics' well – matching provision closely to the needs of the labour market – but going further to look for innovations in all areas and embracing digitalisation at the core of teaching and learning activities.

VET at higher levels is increasingly needed to support the demand in the economy for higher-level skills. Indeed, more than that, higher-level VET is needed that can play a role in innovation and the growth of the business base, e.g. through incubators and innovation hubs. Yet many countries lack an institutional framework to respond to this challenge and some key challenges remain, e.g. whether capacity should be developed alongside or within existing institutions, how to improve higher VET's profile, the extent of its coverage in terms of higher EQF levels, and the role of other stakeholders, especially employers.

372 http://www.scng.si/

8.0.

Vision, viewpoints, insights

Vision, viewpoints, insights

Vision, viewpoints, insights

Vision, viewpoints, insights

Vision, viewpoints, insightsVision, viewpoints, insights

Vision, viewpoints, insights

8.1. Vision and viewpoints: From responsive to proactive VET

We live in an age of environmental crisis and rapid economic and social developments. The challenges are complex and multi-faceted, and, as the COVID-19 pandemic has demonstrated, it is more important than ever to understand how to prepare VET to respond. Innovation and digitalisation provide the means to respond to these challenges. Policy choices need to be made in terms of priorities, reforms and investments to manage the digital and green transitions smoothly.

> ***The VET sector needs to be proactive and multi-faceted in order to better anticipate and integrate the impact of innovation and digitalisation in a smart way, while in turn also driving innovation and digitalisation beyond the VET sector. The latter entails enabling VET to have a broader innovation function to generate new or improve existing products and services in companies and other organisations.***

The European Commission proposal for a council recommendation on VET for sustainable competitiveness, social fairness and resilience outlines principles for making VET more agile in order to better adapt to dynamic labour markets, to strengthen personal flexibility and progression, and to increase the attractiveness of VET by making it more modern and enhancing digital skills in a globalised world. The Osnabrück Declaration adopted November 2020 aims to operationalise the broad strategic objectives of the council recommendation on VET through a concrete set of actions at both national and European level during the period 2021–2025. This publication should be seen as complementary to these strategic policy documents, as well as to other key policy initiatives, such as the European Pillar of Social Rights, the European Skills Agenda (in particular Action 6: Skills to support the twin transitions), the European Education Area and the Digital Education Action Plan (2021–2027). Ultimately, the business of VET is to empower the workers and citizens of tomorrow who will not just live and work in a world of innovation but should also be equipped to be agents of innovation themselves.

The future of VET in relation to innovation and digitalisation should be considered from two different but coexistent, interwoven and complementary viewpoints:

- On one hand, VET systems need to reflect on how to better anticipate and to react to the increasing pace at which innovations and digital technologies are developed and are ready to be implemented (the impact of innovation and digitalisation on VET, see 2.1).
- On the other hand, policymakers and key stakeholders are invited to proactively build the capacity of VET to support innovation and digitalisation in our societies. This also means connecting VET more systematically to smart specialisation strategies, universities and research (building the capacity of VET to support innovation and digitalisation, see 2.2).

8.2. Eight insights

8.2.1: Impact of innovation and digitalisation on VET

INSIGHT 1: EMBRACING THE BENEFITS OF INNOVATION AND DIGITALISATION AND SPEARHEADING MORE ADVANCED INNOVATION

Digitalisation and innovation are closely related, but not all digitalisation leads to innovation, and not all innovation relies on digitalisation. Even before COVID-19, we were starting to experience innovation that was radical and disruptive, linked to the demand for new skills driven by technological change and the growing use of digital technologies in VET. VET needs to step up the pace of adopting more advanced innovations in teaching, training and learning.

Challenges: Innovations in technologies and learning methods have enormous potential to add value to VET, but there is no guarantee that they will lead to desired benefits: some MOOCs have low completion rates; student performance may worsen using computers compared to books. Such risks may be one reason why more advanced technologies appear to have been less extensively adopted than less disruptive technologies: the risks are lower, but the depth of the effect in terms of positive benefits for learners is lower too. For teachers, trainers and VET providers, understanding the risks – the costs and benefits of innovation – is challenging. There is ongoing rapid growth of digital learning and a thriving 'EdTech' market which means it can be difficult to know what is 'good' and what is not. Often the up-front purchase of infrastructure can be costly until there are returns on investments. New online learning is also shifting the boundaries between formal and non-formal VET and massively increasing the scope for self-learning, but this raises risks for learners about how such learning should be validated and by whom.

Self-learning raises important issues about validation – who should validate learning and against what standards – at a time when validation methods and systems are still developing across Europe. Alternative modes of validation are emerging, such as 'digital badges', but it is important that these are tied to qualifications that are recognised and validated by the state and social partners. Countries that are individualising their learning pathways and embedding opportunities to validate prior learning may be well suited to cope with these new challenges.

Opportunities: There is a need to take a more systematic and interconnected approach to identify the costs and pedagogical benefits of innovation and digital learning technologies and to determine efficiency and effectiveness to inform choices. Intermediation structures (new or building on existing ones) are required that can help to coordinate and organise teachers' and trainers' engagement with new technologies to maximise the benefits from them, and act as knowledge management organisations which can benchmark good practices. Responses also need to reflect the fact that VET covers the full range of occupational areas. This in turn affects considerably how e-learning might be used (e.g. the use of virtual reality will differ in welding and care services), which therefore requires a differentiated approach.

High quality digital resources offer unprecedented opportunities for co-creation of learning content between VET providers, learners and employers. The advantage is that they can be easily adapted as needed and avoid the use of technology for its own sake. Companies and sectoral or professional organisations also have a role to play in creating high quality online content and therefore avoid 'instructional' videos actually showing bad practice.

INSIGHT 2: ENCOURAGING INNOVATIONS IN TEACHING AND TRAINING NEEDS INNOVATIVE TEACHERS AND TRAINERS

VET needs to ensure that teachers and trainers are properly supported and encouraged to engage with new pedagogies and digital learning tools. Examples include developing networks or platforms that enable teachers and trainers to share experiences and expertise, appropriate career structures, and new models like 'hybrid' professionals.

Challenges: The impact of innovations in training, teaching and learning technology rely largely on teachers and trainers. This also brings challenges and opportunities in relation to their traditional roles. Innovations are changing the relationship with learners, augmenting the existing trend towards teachers and trainers spending more of their time as facilitators of a more personalised and learner-centred approach. Technologies are also changing the way in which teachers and trainers interact by providing digital platforms for the coordination of classroom and workplace VET. And they may soon be teaching or training alongside collaborative robots (cobots). Yet many teachers and trainers have not been educated to see themselves as innovators or do not believe that innovations will be well received in their schools/workplaces.

Opportunities: Teachers and trainers – and indeed all those who accompany learners – need the skills and mindsets to be innovators and, faced with the scale of the changes facing VET, there is now a greater need for effective initial training and continuing professional development. In addition, supportive school/workplace environments can provide a clear direction and the space and time for innovation. Provided that teachers and trainers receive the support they need, there are a number of opportunities to seize in terms of integrating new pedagogies and digitalisation. For example, being able to effectively integrate virtual and physical learning opportunities through blended learning techniques and developing new forms of social learning through online platforms.

At the same time, the development of networks and communities of practice can enable teachers and trainers to share experiences and expertise on training, teaching and learning methods and digital tools. Career structures for trainers and teachers may also need to be changed to ensure that skills and roles associated with innovation and digitalisation are recognised and appropriately funded. The development of new ways of working may also offer solutions, such as through 'hybrid' professionals, when teachers and trainers work both in VET institutions and companies. This would help to bridge the gap between these two worlds and allow mutual benefits for both.

INSIGHT 3: EMBRACING DIGITALISATION IN WORK-BASED LEARNING IN A SMART WAY

Work-based learning is key to the acquisition of experiential, practical skills and VET needs to determine how digital tools can best support WBL, for instance by making greater use of immersive technologies like virtual and augmented reality and linked to artificial intelligence.

Challenges: Work-based learning, as a form of VET, is very well positioned to respond to wider environmental, social and economic challenges. This is because it has the potential to meet new skill needs and offer experiential, practical learning either within schools (e.g. through onsite labs, kitchens or restaurants, junior or practice firms or simulations) or in companies or other workplaces, particularly for apprenticeships. It can therefore support not just technical and job-specific skills, but also transversal skills needed for innovation. However, with many companies and VET schools closing down during COVID-19, it has been difficult to maintain VET and work-based learning. A key challenge is therefore to what extent VET programmes should integrate digital learning into their curricula. The pandemic has demonstrated that there are enormous variations between sectors in the use of digital tools. While they can reduce the unit costs of learning and provide new ways of teaching/training and assessing learners, it is debatable how far they can replace real-life practical experiences.

Opportunities: There is scope for WBL to make more use of digital learning that simulates practical experiences in schools, e.g. through immersive technologies like virtual and augmented reality. In addition, there is also scope to improve the cooperation and dialogue between VET schools and companies through jointly used digital tools for learning and training (i.e. in particular between teachers and in-company trainers). However, it is important that the pros and cons are weighed up carefully and that the optimum blend is achieved between real-world and virtual experiences. ICT decouples learning from fixed times and places and therefore has the potential to replace the physical separation of learning in two locations and to improve coordination of knowledge acquisition and practical learning. The potential of digital tools to support project-based WBL also needs to be exploited further: project-based WBL helps to develop transversal skills and digital platforms can unite individuals from different subject backgrounds. More generally, digitalisation is providing an opportunity to rethink how VET providers cooperate with companies, which still have the greatest access to the latest technologies, which should be grasped.

8.2.2: Building the capacity of VET to support innovation and digitalisation

INSIGHT 4: ENABLING EFFECTIVE GOVERNANCE AND MANAGEMENT ARRANGEMENTS AND STRONG LEADERSHIP

A faster and more effective response to environmental, social and economic challenges is needed, for example through balanced frameworks giving direction to trainers and teachers to allow creativity for innovation, enabling bodies to intermediate with the growing market of education technology (EdTech) companies and fostering communities of practice.

Challenges: The pace of economic, environmental and social change means VET needs to be able to respond more quickly to external changes. However, the reality is that change in VET tends to be incremental, uncoordinated and fragmented. VET needs to deal with developments at a system-wide level more effectively. Furthermore, it needs to ensure sufficient autonomy to release the creativity of teachers and trainers and to hear the voice of learners for whom choice and personal expression are an increasing expectation. Given the scale of the challenges it is more important than ever to harness the capabilities of all relevant actors through enhanced cooperation.

Opportunities: There is an opportunity to follow a holistic approach to innovation and digitalisation which balances bottom-up and top-down considerations and combines actions coherently and in a sustainable way:

1. Policy frameworks need to set direction whilst also providing autonomy and flexibility at local and regional levels to support innovation in teaching, training and learning.
2. Support bodies and partnerships are needed that can 'intermediate' between, on the one hand, teachers, trainers, schools and employers and, on the other hand, the growing array of digital learning tools, providing digital repositories and guidance for quality and cost-effective solutions for VET stakeholders. As an example, networks and communities of practice for teachers and trainers need to be developed and strengthened to enable them to share practical experiences of teaching, training and learning methods and digital tools. In addition, social partners also have a key role to play in making constructive proposals on digitalisation and innovation, connecting both the world of work with education and training.
3. Strong leadership is required at institutional, organisational and company level to steer a vision and strategy and set examples of how to support the objective of more effective innovation and digitalisation in VET.

Governance at national/regional/local and sectoral level has an important role to play in innovation and digitalisation in VET. Explicit strategies on innovation and digitalisation in VET, which include appropriate quality assurance mechanisms, are needed to provide the optimal frameworks to encourage and enable the up-take of these opportunities holistically. For example, qualification frameworks need to ensure adequate reflection not just of technical skills but also of key competences to support innovation (e.g. creativity, critical thinking) and new pedagogies with strong potential in VET, like blended and game-based learning, need to be encouraged.

Furthermore, these strategies should not be too 'top-down' but rather provide flexible support. Individual education and training institutions play a crucial role in implementing innovations and successfully employing technologies: their 'visions' and strategic plans need to embed innovation and digitalisation and take a whole school/institution approach, along with quality management systems that incorporate SMART objectives, continuous improvement and benchmarking of best practices, and fostering a culture of innovation.

Support bodies and partnerships also need to be a feature of a new VET landscape. Trainers, teachers, schools and training companies need intermediary bodies to support them in accessing the best digital technologies (also see Insight 5 below). Such 'innovation intermediaries' can play a key role in creating 'innovation ecosystems' involving clusters of proactive VET schools/institutions, VET authorities, universities and EdTech companies. The EdTech market comprises an increasing array of private sector players and effective engagement with them is key to ensuring they deliver the digital learning solutions VET requires, tailored to the varying needs of IVET, CVET and higher VET. The European EdTech market is under-developed compared to the US and Asia and there is an opportunity to shape its development.

INSIGHT 5: PROVIDING STRATEGIC AND FLEXIBLE FUNDING

Reflections on innovation and digitalisation in VET need to weigh the risks involved in innovation and not just the costs of digital hardware and software, but also the wider investments needed.

Challenges: Digital tools are not necessarily cheaper than traditional forms of instruction. On the contrary, ICT-based learning can be demanding of both resources and labour for staff and learners, which raises the stakes of ensuring that funding support is accurately targeted. Furthermore, innovation in VET is not simply about digital hardware and software: as noted above, strategies need to be holistic as well as flexible, reflecting the non-technological aspects as well as the technological.

Opportunities: A strategic approach to funding innovation and digitalisation in VET is needed, including taking into account EU funding related to skills (e.g. Recovery and Resilience Facility, ESF+, ERDF, InvestEU, Erasmus+), where the advantages are deemed to be cost-effective and efficient, sustainable as well as of pedagogical value. There also needs to be acknowledgment that funding innovation necessarily involves an element of risk, whilst also potentially bringing enormous benefits. It is desirable to monitor and feedback mechanisms to measure impact; and sharing knowledge and experience and taking advantage of open access resources. National funding also needs to be flexible enough to respond to the specific needs of local VET institutions, particularly in relation to smart specialisation strategies or supporting learners with entrepreneurial activities (e.g. start-ups). Providing sufficient time and funding to support the professional development of teachers and trainers is also crucial in order to empower them to incorporate innovation and digital technologies into their educational practices, and to make innovations relevant for deep learning and digital pedagogy.

INSIGHT 6: BOOSTING LEARNER DIVERSITY AND INCLUSION THROUGH INNOVATION AND DIGITALISATION

Innovation and digitalisation should be used to support the inclusion of disadvantaged groups and ensure equal opportunities, for example, in relation to women's position in the labour market. For instance, by putting a greater focus on how social background, ethnicity and gender can affect people's engagement with the digital world, and actively supporting the recruitment and training of women in VET to tackle gender imbalances in occupations and senior positions.

Challenges: Innovation and digitalisation in the economy are bringing both challenges and opportunities and it is important to ensure that everyone, regardless of gender or background, is equipped with the skills to deal with the challenges and benefit from the opportunities. For people from disadvantaged backgrounds, innovation and digitalisation have the potential to provide new types of learning opportunities that can widen access to VET. At the same time, poorer households are less likely to have access to ICT – as the COVID-19 outbreak has acutely highlighted – and these are the same households that are less likely to successfully engage in education and training. These two factors combined bring a risk that, without appropriate action, the increasing spread of digital learning might unintentionally widen the digital and learning gaps, including when it comes to CVET through self-directed learning. Furthermore, regarding gender equality, women continue to be under-represented in many occupations and senior positions.

Opportunities: VET has the potential to improve the learning outcomes and subsequent life opportunities of key groups who face disadvantages in accessing learning and employment. VET is well positioned not only to counter such risks but also to use pedagogical and organisational innovations and digitalisation to enhance the engagement of learners from disadvantaged backgrounds. In this way, learner diversity and inclusion can be used as a push for innovation. Governance and management frameworks need to ensure they are equipped to monitor inclusion and provide support where needed to ensure equal access.

The VET sector includes people with lower skill levels, such as early school leavers, and digital learning offers scope to tailor learning to their needs to an unprecedented degree. This is why VET needs to enhance its capacity to better take into account the complex ways in which people's engagement with the digital world is affected by social background and gender. Moreover, expanding the use of digital learning tools to suit the learning disposition of disadvantaged groups, such as game-based learning, has a great potential in VET but has so far been under-utilised.

In relation to gender, VET can contribute to achieving gender goals regarding women's under-representation in certain occupations and senior positions, e.g. by actively supporting the recruitment and training of women to tackle these imbalances in IVET, and seeking to develop programmes specifically to address the low proportion of senior jobs occupied by women, e.g. management courses as part of CVET.

INSIGHT 7: IMPLEMENTING NEW APPROACHES FOR VET EXCELLENCE

It is imperative to constantly seek new ways to achieve excellence in VET, to develop beacons of excellence, such as the Centres of Vocational Excellence (CoVEs) that build on the core strengths of VET whilst taking it in new directions. Driving forward quality and excellence of training provision, including at higher level, will help to make VET more resilient to the type of system shocks experienced with the COVID-19 crisis.

Challenges: Skill projections show that there is a need for higher level skills in the EU 27 and beyond. There is a strong case for examining how the very broad VET sector links to other parts of the education and training system. The borders between IVET and CVET are becoming increasingly blurred, whilst VET at higher levels continues to develop and expand, as does the link with research organisations and businesses as part of 'the knowledge triangle'. For higher VET in particular, key questions to address include where capacity should be developed, i.e. alongside or within existing institutions, how to improve the visibility and parity of esteem of higher VET with general education, how to best expand it to the higher EQF levels, and the role to be played by other stakeholders, especially employers.

Opportunities: In higher level VET, there is much scope to make use of digitalisation too given that the academic higher education is already utilising digital learning methods widely. This suggests that learning at this level may be more amenable to digitalisation than at other levels since learners are relatively older and therefore more experienced with better developed (self-)learning skills. Digitalisation can be an opportunity to modernise higher VET and increase numbers of participation.

CoVEs have shown that engagement with social partners and other stakeholders like regional development authorities strengthens the ability of VET to support innovation in the economy. Regional cooperation is crucial, e.g. through regional VET centres in order to introduce and disseminate innovative learning opportunities across VET schools, facilitate acquisition of state-of-the-art facilities through scale economies and stimulate intensive cooperation with local enterprises and other VET stakeholders. Moreover, these centres have the potential to establish and strengthen a whole culture of innovation.

INSIGHT 8: DEVELOPING SKILLS FOR MASTERING INNOVATION, DIGITAL AND GREEN TRANSITIONS IN A GLOBAL WORLD

For a successful and sustainable European recovery, it is vital that the right set of skills is imparted by VET. Measures could include using ICT to deliver CVET in cost-effective ways, implementing green skill modules combined with digital skill development, and providing opportunities for virtual mobility.

Challenges: Increasingly Europe's society and economy, including for the recovery, demands skills to support innovation, to find and implement solutions to deal with environmental crises and to meet the challenges of globalisation. This means developing not just technical skills, but transversal or key skills – also with the aim to keep ahead of robots – like problem solving, critical thinking, creativity, empathy, group work and curiosity. However, in most countries VET has traditionally focused on low and medium skills and on technical rather than key skills. Moreover, CVET is under-developed, whilst participation in transnational mobility in VET lags behind schools and higher education.

Opportunities: Meeting these needs means developing the capacity of VET in a number of areas. In addition to IVET, there is scope to improve the teaching, training and learning in CVET related to key competences. These competences need to be considered more widely as part of a lifelong learning culture. ICT has the advantage of delivering learning in new and cost-effective ways in CVET directly into the workplace and decoupling learning from fixed learning times and places, providing the basis for learning expansion.

The inherent labour market connections of VET mean it is ideally placed to contribute to upskilling and reskilling for the digital and green transitions. This applies both to the supply of people with digital skills and skills for new green jobs, such as in solar or wind power generation, or when re-training workers and upgrading skills, such as for occupations that are being 'greened' (e.g. in the transition to electric vehicles in automotive manufacturing). There are opportunities for innovations and/or digitalisation which VET should embrace. For example, common modules on 'greening skills' for use across curricula in various sectors could be considered, in combination with digital skills.

VET potentially has important roles to play in addressing the challenges of globalisation. Innovation and digitalisation in VET can, for instance, help to develop new products and skills to compete globally, whilst regional cooperation (e.g. through CoVEs) and connections to smart specialisation strategies can shorten supply chains and obtain comparative advantage through specialisation. A globalised economy also demands an international outlook that can be acquired through transnational mobility. Digital innovations open up possibilities both for virtual mobility and supporting physical mobility. Regarding physical mobility, online channels and platforms can help with promoting mobility as well as enhancing mobility preparation and follow-up activities and provide support e.g. through online language resources and training. Virtual mobility can enhance exchanges with people from other cultures and has potential to scale-up mobility for inclusion, enabling participation from people from disadvantaged backgrounds. In particular, online platforms can help actors in VET collaborate in international networks. There is scope for more systematic and coherent approaches to incorporate online tools for virtual mobility and exchange, such as eTwinning, in order to advance international cooperation objectives. Nurturing complex problem solving, critical thinking, creativity, group work, empathy and curiosity will allow us as humans to keep ahead of robots in our daily lives.

Glossary

Active learning: Active learning is a form of instruction that emphasises seeking information, organising it in a meaningful way and having the chance to explain it to others during interactions with peers and instructors, which involves a cycle of constant activities and feedback[373]. Many studies have shown the positive effects of active learning on student attitudes, skills and learning outcomes[374]. Forms of active learning include project-based, problem-based or inquiry-based learning also described below.

Algorithm: In mathematics and computer science, an algorithm is an unambiguous specification of how to solve a class of problems. Algorithms can perform calculation, data processing, automated reasoning and other tasks[375].

Artificial intelligence: Artificial intelligence (AI) includes the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalise or learn from past experience[376].

Augmented reality: Augmented reality is an interactive experience of a real-world environment where the objects that reside in the real world are 'augmented' by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory[377].

Blended learning: Blended learning involves the way e-learning is combined with traditional classroom methods to create a new hybrid teaching methodology[378].

Blockchain technology: Blockchain technology facilitates the recording and sharing of information by a community. In this community, each member maintains his or her own copy of the information and all members must validate any updates collectively. The information could represent transactions, contracts, assets, identities, or practically anything else that can be described in digital form. Entries are permanent, transparent, and searchable, which makes it possible for community members to view transaction histories in their entirety. Each update is a new 'block' added to the end of a 'chain'. With blockchain, cryptology replaces third-party intermediaries as the keeper of trust, with all blockchain participants running complex algorithms to certify the integrity of the whole[379].

373 Allen D., Tanner K. (2005) Infusing active learning into the large-enrollment biology class: seven strategies, from the simple to complex, in Cell Biology Education;4:262–268.

374 Allen, D. and Tanner, K. (2005) Idem. See also: Bransford J.D, Brown A.L, Cocking R.R (1999) How People Learn: Brain, Mind, Experience, and School. Washington, DC: National Academies Press; Ebert-May D., Brewer C., Sylvester A. (1997) 'Innovation in large lectures teaching for active learning', in Bioscience;47:601–607; Hake R. (1998) 'Interactive engagement versus traditional methods: a six-thousand student survey of mechanics test data for introductory physics courses', in American Journal of Physics.;66:64–74. Udovic D., Morris D., Dickman A., Postlethwait J., Wetherwax P. (2002) 'Workshop biology: demonstrating the effectiveness of active learning in an introductory biology course', in. Bioscience; 52:272–281. Knight J. K., Wood W. B. (2005) 'Teaching more by lecturing less', in Cell Biology Education; 4: 298–310.

375 Blass, Andreas; Gurevich, Yuri (2003). "Algorithms: A Quest for Absolute Definitions". Bulletin of European Association for Theoretical Computer Science. 81.

376 Encyclopedia Britannica, URL: https://www.britannica.com/technology/artificial-intelligence

377 Wikipedia, URL: https://en.wikipedia.org/wiki/Augmented_reality

378 Mindflash, URL: https://www.mindflash.com/elearning/what-is-blended-learning

379 Grech, A. and Camilleri, A. F. (2017) Blockchain in Education. Inamorato dos Santos, A. (ed.) EUR 28778 EN; doi:10.2760/60649, p.16.

BYOD/bring your own device: BYOD (or BYOT/bring your own technology) refers to the policy that allows or even encourages students to bring personally owned mobile devices (laptops, netbooks, tablets, smartphones, etc.) to their educational institution and to use those devices to access information, applications and services to support their learning[380].

Centres of Vocational Excellence: CoVEs support regional and local strategies while supporting overall structural changes and economic policies in the European Union, based on relevant partnerships and acting as a driver of quality vocational skills in the context of national, regional/local and sectorial challenges, with a strong element of work-based learning, digital content and mobility experience abroad[381].

Competence-based approaches: Competence-based approaches focus on assessing the learner's demonstrable competencies rather than his record of attendance.

Critical literacies: Critical literacies is a method of teaching that involves the critical interpretation of texts in different environmental and cultural contexts[382]. This allows educators and students with an opportunity to read, evaluate, and reflect on texts, and embark upon the creative process of actively constructing or reconstructing these texts.

Culturally relevant pedagogy: A culturally relevant pedagogy is a teaching pedagogy focused on students' academic success, cultural competence, and critical consciousness[383].

Digitalisation: Digitalisation is the process of leveraging digitisation to enabling, improving or transforming processes[384].

Digitisation: Digitisation is the process of converting information into a digital format. Digitisation is an act that may enable digitalisation, but the latter always requires the former[385].

Discussion-based learning: Discussion-based learning enables student involvement through instructor-directed questions and student participation. This requires that students contribute and learn from each other in an environment that is directed by prepared instructors[386].

380 European Commission (n/a) Annex 1: key messages from PLAs.

381 European Commission (2016) Main actions implementing the Erasmus programme, Staff document, 30 May, p. 6. URL: https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-actions-erasmus-programme-swd_en.pdf

382 Luke, A. (2000) 'Critical literacy in Australia: A matter of context and standpoint', in Journal of Adolescent & Adult Literacy, 43(5): 448-461.

383 IGI Global (2019) 'What is culturally relevant pedagogy?', URL: https://www.igi-global.com/dictionary/culturally-relevant-pedagogy/52842

384 API product management (2018). What is Digital Transformation, Digitalisation, and Digitization: How API related to Digital Transformation. https://medium.com/api-product-management/what-is-digital-transformation-digitalisation-and-digitization-c76277fbdd6

385 What is tech target (n/a). Digitization. https://whatis.techtarget.com/definition/digitization

386 BYU Idaho, Instructional tool, discussion-based learning. URL: https://www.byui.edu/Documents/instructional.../Discussion-based%20Learning.pdf

Digital pedagogy specialist: A digital pedagogy specialist is a professional that collaborates with faculty, staff, and students to employ technological solutions in the realisation of teaching and learning aims[387].

Embodied learning: Embodied learning is a way to teach while involving the whole body, for example teaching maths while throwing small bags of sand to each other[388].

Experiential learning: Experiential learning is the process of learning through experience, which includes for example hands-on learning[389].

Flipped classroom: Flipped classroom is a hybrid form of learning during where students listen to recorded lectures outside of class in their own time, while the physical meetings focus on solving exercises.

Gamification: Gamification is the process of taking something that already exists – a website, an enterprise application, an online community – and integrating game mechanics into it to motivate participation, engagement, and loyalty[390]. Gamification typically involve learners in fictional or real-world situations that call for them to put their knowledge into practice, applying and integrating various aspects of their studies and problem solving.

Higher VET: Higher VET typically refers to forms of VET programmes or qualifications at ISCED level 5 or above, or EQF level 5 or above; although there is no commonly accepted definition of higher VET across Member States[391].

Horizon 2020: Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. Horizon 2020 is the biggest EU research and innovation programme ever with nearly €80 billion of funding available over 7 years, available between 2014 and 2020.

Industry 4.0: Industry 4.0 represents the fourth industrial revolution that is occurring in manufacturing in the design, manufacture, operation and service of systems and products. This fourth industrial revolution enhances the progress that was made in the third industrial revolution with the adoption of computers and automation, and enhances it with smart and autonomous systems fuelled by data and machine learning [392].. Angela Merkel defined industry 4.0 as 'the comprehensive transformation of the whole sphere of industrial production through the merging of digital technology and the internet with conventional industry'.

387 For more information, see DP&S Bucknell Library & IT (n/a) 'Digital pedagogy specialist', URL: http://dps.bucknell.edu/digital-pedagogy-specialist/

388 Waag technology and society (2012) 'What is embodied learning?', URL; https://waag.org/en/article/what-embodied-learning

389 https://en.wikipedia.org/wiki/Experiential_learning

390 Bunchball (2018) 'What is gamification?', URL: https://www.bunchball.com/gamification

391 Luomi-Messerer, K, and Auzinger, M. (2016) 'Higher VET – An Emerging Sub-system of Education and Training in European Countries?', conference paper, European educational research association, URL: https://www.eera-ecer.de/ecer-programmes/conference/21/contribution/38681/

392 European Parliament (2015) 'Innovation 4.0: Digitalisation for productivity and growth', p. 2 URL: http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/568337/EPRS_BRI(2015)568337_EN.pdf ; Merkel, A. (2014) Speech by the Federal Chancellor Angela Merkel to the OECD conference, 19 February, URL: http://www.bundesregierung.de/breg-en/chancellor/speech-by-federal-chancellor-angela-merkel-to-the-oecd-conference-477432; Marr, B. (2018) 'What is Industry 4.0? Here's a super easy explanation for everyone', in Forbes, URL: https://www.forbes.com/sites/bernardmarr/2018/09/02/what-is-industry-4-0-heres-a-super-easy-explanation-for-anyone/#2fc4d5b9788a ;

Innovation: Innovation is the use of new or significantly redesigned teaching and learning tools, methods or environments (such as digital learning tools, MOOCs or virtual reality) or new organisational methods (for example using a new app or software to interact with employers) aimed at improving the quality of VET in response to environmental sustainability and social and economic needs.

Inquiry-based learning: Inquiry-based learning is a learning and teaching method that prioritises student questions, ideas and analysis, and can include case studies, group projects, research projects and fieldwork.

Knowledge clusters: Knowledge clusters are a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities, which aim to exchange and generate knowledge[393].

Knowledge triangle: The knowledge triangle refers to the interaction between the three areas of (academic) research and knowledge creation, education and training, and (business) innovation. In the European Union, it also refers to an attempt to better link these key concepts, including VET.

Lab-based learning: Lab-based learning is learning which occurs in a laboratory and is particularly well tailored to experiential and project or problem-based learning[394].

Learning analytics: Learning analytics can be defined as the measurement, collection, analysis and reporting of data about learners and their contexts for the purposes of understanding and optimising learning and the environments in which it occurs. In simpler terms, it can be understood as collecting 'traces' that learners leave behind and using those traces to improve learning[395].

Learning hub: A learning hub is a technology-rich learning environment with both physical and virtual components that provide formal and informal opportunities for learners to come together with peers, teachers, and other experts in their field. Here, individuals can access relevant knowledge and information, enlist support from educators and other learners, and, in so doing, develop new opportunities to improve their livelihoods[396].

Learning outcome: Statements of what a learner knows, understands and is able to do on completion of a learning process. The achievement of learning outcomes has to be assessed through procedures based on clear and transparent criteria. Learning outcomes are attributed to individual educational components and to programmes at a whole. They are also used in European and national qualifications frameworks to describe the level of the individual qualification[397].

393 Tallman, S., Jenkins, M., Henry, N. and Pinch, S. (2004) 'Knowledge, Clusters, and Competitive Advantage', in the Academy of management review, 29(2): 258.
394 Davies, C. (2009) Learning and teaching in laboratories, London: Higher Education Academy, URL: https://www.heacademy.ac.uk/system/files/learning-teaching-labs.pdf
395 European Commission (n/a) Annex 1: Key messages from the PLAs, p. 7.
396 Cisco (2013) Learning hubs: where learning takes place in a digital world, p. 4, URL: https://www.cisco.com/c/dam/en_us/about/ac79/docs/ps/Learning-Hubs.pdf
397 European Commission (2015) 'Glossary', ECTS' Users Guide, 09 October, URL: http://ec.europa.eu/education/ects/users-guide/glossary_en.htm#learning-outcome

Massive Online Open Courses (MOOCs): MOOCs are an online course aimed at unlimited participation and open access via the web[398]. MOOCs are openly accessible, large scale, and self-paced, allowing the learning load to match a student's progress, for example, to augment traditional modes of teaching.[399] Additionally, lectures can be attended numerous times, at no additional cost, and tests can be retaken until the sought after level of proficiency is attained.

Module: A course unit in a system in which each course unit carries the same number of credits or a multiple of it[400].

Multi literacies: Multi literacies recognises the variability of meaning making in different cultural, social or domain-specific contexts, as well as the fact that meaning is becoming increasingly multimodal, in which written-linguistic modes of meaning interface with oral, visual, audio, gestural, tactile and spatial patterns of meaning, largely as a result of new information and communications media.

Pop-up workshops: Pop-up workshops are brief, informal and interactive sessions designed to deliver bite-size, timely, targeted information to learners on a range of themes[401].

Problem-based learning: Problem-based learning is a learning method which involves having students solve real-world problems as a driving force for the curriculum[402].

Project-based learning (PBL): PBL is a learner-centred approach in which learners engage in active exploration of real-world challenges and problems by involvement in a projects organised around a driving question or challenge.

Quality assurance: The process or set of processes adopted nationally and institutionally to ensure the quality of educational programmes and qualifications awarded. Quality assurance should ensure a learning environment in which the content of programmes, learning opportunities and facilities are fit for purpose. Quality assurance is often referred to in the context of a continuous improvement cycle (i.e. assurance and enhancement activities)[403].

Robotisation: Robotisation is the automation of a system or process by use of a robotic device[404].

Self-directed learning: Self-directed learning is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, and choosing and implementing appropriate learning[405].

398 Wikipedia, URL: https://en.wikipedia.org/wiki/Massive_open_online_course
399 McKinsey (2013). Disruptive technologies: Advances that will transform life, business, and the global economy. Tech. Rep., McKinsey Global Institute.
400 European Commission. 2015. Idem.
401 Imperial College London (2019) Postdocs and fellows development centre, URL: https://www.imperial.ac.uk/postdoc-fellows-development-centre/courses/pop-up-workshops/
402 Stepien, W.J. and Gallagher, S.A. (1993) 'Problem-based Learning: As Authentic as it Gets', in Educational Leadership. 50(7) 25-8.
403 European Commission (2019) 'Glossary', URL: http://ec.europa.eu/education/ects/users-guide/glossary_en.htm#ectsTop
404 Definition.net, URL: https://www.definitions.net/definition/ROBOTIZATION
405 Infed Self-directed learning, URL: http://infed.org/mobi/self-directed-learning/

Service-based learning (SBL): SBL is an educational approach that combines learning objectives with community service in order to provide a practical and progressive learning experience while responding to societal needs.

Smart specialisation: Conceived within the reformed Cohesion policy of the European Commission, smart specialisation is a place-based approach characterised by the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP) with wide stakeholder involvement, based on targeted support to Research and Innovation (R&I)[406]. It is outward looking and embraces a broad view of innovation including but certainly not limited to technology-driven approaches, supported by effective monitoring mechanisms[407]. A smart specialisation strategy is often referred to as S3.

Teaching uncertainty competences: Teaching uncertainty competences entails providing learners with the tools to manage knowledge uncertainty in a complex world, more specifically by teaching learners to appraise, tolerate and reduce uncertainty.

Third mission: The third mission is an additional function of universities, which relates to their mission to engage with societal needs and market demands by linking the university's activity with its own socio-economic context. It comes in addition to the first mission (qualifying the human capital) and the second mission (producing new knowledge)[408].

Triple helix: A triple helix is a model, developed by Henry Etkowitz and Loett Leydersdorff in the 1990s, to conceptualise the different forms of university – industry – government interaction.

Virtual campus: A virtual campus refers to both an online location for learning and an internet tool for exploring education options. Some colleges and universities use the phrase 'virtual campus' to refer to the information centre that allows their students to access online courses and degree programmes, while this phrase is also used to describe an online tour of a physical college campus[409].

Virtual classroom: A virtual classroom is a teaching and learning environment where participants can interact, communicate, view and discuss presentations, and engage with learning resources while working in groups, all in an online setting. The medium is often through a video conferencing application that allows multiple users to be connected at the same time through the Internet, which allows users from virtually anywhere to participate[410].

Virtual reality: Virtual reality (VR) is an interactive computer-generated experience taking place within a simulated 3D environment. It incorporates mainly auditory and visual feedback, but may also allow other types of sensory feedback. This immersive environment can be similar to the real world or it can be fantastical[411]. VR can model of machines or entire surroundings, and involve the user through a mouse or keyboard, or a more immersive environment in the form of a helmet[412].

406 European Commission (2014) 'Smart Specialisation and Europe's growth agenda', April, URL: https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/smart_spec_growth_agenda.pdf
407 European Commission (2018) 'Smart specialisation platform: what is smart specialisation?', URL: http://s3platform.jrc.ec.europa.eu/what-is-smart-specialisation-
408 IGI Global (2019) What is University's third mission?, URL: https://www.igi-global.com/dictionary/universitys-third-mission/51708
409 Learn.org (2019) What is a virtual campus?, URL: https://learn.org/articles/What_is_a_Virtual_Campus.html
410 Technopedia (2019) What is a virtual classroom?, URL: https://www.techopedia.com/definition/13914/virtual-classroom
411 Wikipedia, URL: https://en.wikipedia.org/wiki/Virtual_reality
412 Latchem, C. (2017) Using ICTs and Blended Learning in Transforming TVET, Burnaby: UNESCO and Commonwealth of Learning, 2017.

Annexes

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Annex One: Mandate

WORKING GROUP ON VOCATIONAL EDUCATION AND TRAINING	ET 2020 Working Group on Vocational Education and Training (WG) Innovation and Digitalisation: Boosting high-quality VET and Higher VET
Duration Mandate	July 2018 – September 2020
Corresponding DG/ HLG meeting	Directors - General for Vocational Training
Coordinating Unit(s)	EMPL.E3
Chair (Head of Unit level)	Dana-Carmen Bachmann/ Norbert Schöbel
Coordinating official(s)	Helen Hoffmann

Rationale

There is a great potential of innovation and digitalisation supporting high quality VET and higher VET. Boosting high quality VET and higher VET would further enhance employability and personal development of young learners and people of working age, hence contributing to the competitiveness of companies, sustainable growth and social cohesion.

However, this potential is not yet fully exploited. Other forms of education and training, such as higher education are more easily recognised as stimulating innovation, but the contribution of VET is often understated8. In addition, with the rapidly changing world of work, job-polarisation, new technological and digital developments (e.g. industry 4.0, robotisation, artificial intelligence), people of working age regardless of their level of education or qualification need to obtain an initial qualification and continuously update their skills or reskill to enter, re-enter or remain on the labour market.

Against this background, VET systems need to reflect and integrate these changes and re-define their role to support innovative processes and products. The purpose of the Working Group is to discuss innovation and digitalisation in view of creating more flexible and modern high quality VET systems. This reflection will be carried out taking into account also other key elements, such as governance and financing under tight public budgets, including the support of VET learning mobility, as well as trends, such as ageing population, circular economy and globalisation.

Policy context

1. Since the launch of the 2002 Copenhagen process, European cooperation on VET is increasingly adding value to national policies and practices.
2. For the period 2015-2020, Member States governments and social partners have agreed to focus on 5 Medium Term VET deliverables (Riga Conclusions) supported by VET providers. As part of the follow up to these Medium Term deliverables (MTDs), previous ET2020 working groups were set up in relation to MTD1 (work based learning and apprenticeships, 2014-2015) and MTD5 (teachers and trainers, 2016-18). This Working Group will address MDT4 (further strengthening key competences). However, as recognised in the Riga conclusions, while most national agendas have focused on making VET more inclusive to help reduce early school leaving and promote further learning among learners at risk, less attention has been paid to promoting VET excellence through creativity, innovation and entrepreneurship –which could help enterprise performance and job creation.
3. There is now a need to approach the potential of innovation in VET in a more holistic perspective, exploiting in an efficient way the role of initial VET (IVET) but also of continuing VET (CVET) and VET at higher levels (HVET) in a context of blurring borders, as well as strengthening the link with the knowledge triangle9 (education institutions, research organisations and business). The ET2020 Working Group therefore needs to look at the innovation potential of the VET sector as a whole and how it links to other parts of the education and training system.
4. The relevance of this holistic approach is underlined by the 2016 New Skills Agenda for Europe. The European Pillar of Social Rights jointly proclaimed by the Commission, the Parliament and the Council also points to the need for an integrated approach to address broader challenges in society and highlights the need for everyone to have access to learning throughout life.
5. In "Strengthening European Identity through Education and Culture" (14 November 2017) the European Commission proposed a shared vision for a European Education Area in which by 2025 learning, studying and doing research is no longer limited by borders. A key aspect of quality education is to make sure that the education systems, including vocational ones, impart all the knowledge, skills and competences that are deemed essential in today's world.
6. The Review of the Education and Training 2020 strategy and the debate on the Future of VET are all gathering speed to shape the post-2020 policy priorities. The Working Group on VET will contribute to the discussion by exploring how innovation opportunities could proactively support the modernisation of VET systems across the EU.

MAIN "CONCRETE ISSUE(S)" THAT WILL BE ADDRESSED:

The Working Group will focus on innovation and digitalisation in VET and higher VET at system level, taking account existing relevant policy strategies (e.g. smart specialisation strategy for local and regional development), relevant tools (e.g. SELFIE self-reflection tool for digitally capable schools) and focusing on VET provision as seen from different stakeholders' perspectives. The Working Group will finalise its work programme in its first meeting by defining a focused list of topics linked to innovation and digitalisation taking as a starting point the following topics:

- New pedagogical and andragogical approaches for teachers and trainers (e.g. what and how we teach and train, how we learn)
- New learning environments and organisational developments in training institutions and companies
- Use of modern learning technologies in VET and higher VET, e.g. Open educational resources (OER)
- Proactive and flexible VET systems supporting smart specialisation strategy and industrial clusters
- Strengthening key competences by adapting curricula/training programmes and regulations responsive to rapidly changing labour markets
- Governance and financing in terms of cost-sharing and investing in infrastructure
- Quality and excellence in VET
- Support of VET learning mobility, careers without borders and VET internationalisation.

Input would be given by key stakeholders and be based on new trends in VET identified in Cedefop research.

The work will be divided into the following stages:

1. Kick-off phase to fine-tune the mandate, including a clustering of concrete issues to be tackled
2. Develop a work plan with a focus on a strategic selection of peer learning activities to achieve the expected outputs
3. Selection of widely accepted good practices and creation a community of good practice
4. Develop policy guidance on the topics agreed upon
5. Develop a strategy to disseminate and exploit the findings to a wider audience, at European and national levels.

Given the broad focus suggested in this mandate, the Working Group should cooperate with other relevant ET2020 Working Groups, particularly the Working Group on Adult Learning but also the respective Working Groups on Higher Education and Digital Skills. The latter will focus on all forms of learning undertaken by adults having left initial education and training. Their output will also be fed into the Working Group on VET.

Contribution to other "concrete issues":

Work done by the group will contribute to several concrete issues identified in the ET2020 Joint Report (2015):

- Priority 1: Strengthening the development of transversal skills and key competences, including entrepreneurship; Promoting transitions to and between VET, higher education and adult learning, including non-formal and informal learning, and from VET to work
- Priority 2: Addressing the increasing diversity of learners and enhancing access to quality and inclusive mainstream education and training for all learners; addressing the issue of gender gaps and promoting more gender-balanced educational choices
- Priority 3: Exploring the potential of innovative and active pedagogies such as inter-disciplinary teaching and collaborative method, including by fully embracing the digital era, addressing the development of digital competences at all levels of learning; fostering cooperation among all relevant stakeholders and increasing synergies between education, research and innovation;
- Priority 4: Raising the attractiveness, for both genders, and the status of the teaching profession and supporting the promotion of excellence in teaching at all levels
- Priority 5: Fostering transparency, quality assurance, validation and thereby recognition of skills and/or qualifications; mobility and internationalisation
- Priority 6: Sustainable investment and cost-sharing

Contribution to major Commission initiatives:

- EU jobs and growth strategy
- European Education Area
- European Framework for Quality and Effective Apprenticeships
- New Skills Agenda for Europe
- European Pillar of Social Rights
- Digital Education Action Plan
- Digital Skills and Jobs Coalition

EXPECTED OUTPUTS:

Methodology

The group will:

1. Contribute to the stock taking of current existing evidence for innovation and digitalisation in VET/ Higher VET; supported by Cedefop research
2. Identify opportunities for innovation and digitalisation in VET/higher VET, followed by peer learning activities (pioneering, experimental and innovative practices, including success factors)
3. Select widely accepted good practices and case studies and create a community of practice
4. Develop a strategy and communication material to disseminate the findings to a wider audience and exploit them at European and national levels.

The group will, according to the specific agenda item of each meeting, use the opportunity to invite experts and practitioners on an ad hoc basis to make pertinent contributions in the relevant area. The group will use webinars between formal meetings with the double aim to reduce travelling time and ensure an effective information flow.

Final outcome

The Group will prepare a report (supported by a small editor group composed of Working Group members on a voluntary basis, selected consultants and EU officials) which will cover commonly agreed policy guidance, including a set of key challenges and success factors, an inventory of good practices and selected in-depth case studies.

Studies and seminars

The Commission may launch a study to support the Group in their work, e.g. through in-depth mapping of good practice or case studies. It may also on demand organise targeted seminar(s) and/or webinars for knowledge transfer among Member States.

Peer learning activities

Any peer learning activity (PLA) will fully involve relevant actors and experts at national/regional levels, to ensure that all perspectives are taken into account. Member States representatives will fine-tune the topics to be addressed or may propose additional themes.

Cooperation with other ET 2020 Working Groups

PLAs could be organised jointly with other ET2020 Working Groups if topics are found to be close and if it would benefit mutual learning.

Dissemination and exploitation activities

A strong commitment at national level is required for the outputs of the WG to go beyond the Group itself. A Communication plan will be developed to support dissemination and implementation of WG outputs.

Dissemination and exploitation activities should to a large extent take place in Member States, close to the stakeholders, during the lifetime and after the end of the WGs mandate. Experts are expected to be in close contact with national stakeholders, to be identified in the Communication plan, for continuous feedback from and to the WG.

Communication activities during the lifetime of the WG should be supported by information and communication modules (presentations, videos, guidelines) being produced during the course of the WG and communicated by the WG members.

Outputs of the WG will be disseminated at European level (e.g. European Vocational Skills Week, EAfA, DGVT, ACVT, Cedefop Policy Learning Fora etc).

RECURRENT ACTIVITIES: Country-specific support

If relevant, provide support to clusters of Member States in response to issues identified in European Semester country-specific recommendations (CSRs), by having such Member States benefit from the practical experience and good practices of other Member States.

Links to EU funding

This WG will draw on projects co-financed by existing EU programmes and funds (Erasmus+, ESF etc) for further improving the coherence and effectiveness of VET policies.

If relevant, this WG will provide support to the incubation and follow-up of Erasmus+ KA3 policy experimentation.

INDICATIVE ROADMAP:

Phase 1: September – October 2018

- Kick off meeting (date to be confirmed
- Finetuning of the Working Groups' mandate, including clustering key activities.

Output phase 1:

- Consensus on mandate in terms of objectives, methodology, content and planning

Phase 2: November 2018 – July 2019

- Identify opportunities for innovation and digitalisation in VET/higher VET, taking into account existence evidence and practices
- Arrange a strategic working plan for peer learning activities, with a focus on pioneering and experimental practices

Output phase 2:

- Work plan and implementation of peer learning activities

Phase 3: September 2019 – February 2020

- Selection of widely accepted good practices, and, if possible in-depth cases studies
- Creating a community of good practice
- Input, particularly relevant good practices and in-depth cases studies for other relevant policy bodies (e.g. ACVT, DGVT)

Output phase 3:

- Final report taking stock of relevant evidence (including terminology) with the main deliverables

Phase 4: March 2020 – June 2020

- Final meeting to discuss the final output, particularly policy guidelines and best practices, organised in a conference style including a broader audience, if possible with the support of the EU Presidency
- Dissemination and exploitation of the final outcomes

Output phase 4:

- Communication material

EVIDENCE-BASE

Relevant Europe 2020 target/ET 2020 benchmarks: e.g. VET mobility benchmark, adult participation in learning based on available main sources of evidence:

- Cedefop and ETF work on innovation and digitalisation in VET/higher VET;
- Cedefop/ETF Riga interim mid-term report 2017
- Eurofound company survey on continuing VET
- Education and Training Monitor (Directorate General for Education and Culture);
- Labour Force Survey, Training in Enterprises Survey (CVTS), Adult Education Survey (Eurostat);
- PIAAC (OECD)
- Relevant national reports and studies

MEMBERSHIP:

Member States

Candidate & EFTA/EEA Countries

Relevant EU bodies (Cedefop, ETF, Eurydice, CRELL …)

Relevant international organisations (OECD, Council of Europe, UNESCO)

European social partners

VET providers

Relevant European-level stakeholder associations

Annex Two: List of Peer Learning Activities (PLAs)

No.	Date	Type	Topic
1	21-22 February 2019	PLA	VET excellence: Innovative regional approach for excellence in VET (Timisoara, Romania)
2	3-5 April 2019	PLA and SELFIE Forum with VET workshop	VET Teacher Training: New technologies, pedagogies and learning environments as drivers for innovation (Madrid, Spain)
3	5-6 December 2019	PLA	Innovation and digitalisation in VET and the research triangle (Budapest, Hungary)

Annex Three: Keynote speakers

Name	Title	Meeting	Topic
Stéphan Vincent-Lancrin	Senior Analyst, Deputy Head of Innovation and Measuring Progress Division (IMEP), OECD	1 WG meeting, 04-05 October 2018	VET and Innovation
John Edwards	Research Manager, Joint Research Centre (JRC)	2 WG meeting, 24-25 January 2019	VET and Smart Specialisation
Ádám Horváth	Head of Division, Centre for Digital Pedagogy and Methodology, Hungary	PLA, 5-6 December 2019	VET and Digitalisation
Nani Pajunen	Leading Specialist, Carbon-Neutral Circular Economy, The Finnish Innovation Fund Sitra	Final WG meeting, 23 September 2020	The role of VET and Adult Learning for the transition towards a carbon neutral circular economy

Annex Four: List of members of the VET Working Group (July 2018 - September 2020)

EU Member States			
AUSTRIA	WENNINGER-JOST	Birgit	VET Expert, Federal Ministry of Digital and Economic Affairs
BELGIUM (FLANDERS)	LAMOTE	Carl	Policy Officer, Flemish Department for Education and Training
BELGIUM (FLANDERS)	OP DE BEECK	Christel	Policy Officer, Flemish Department for Education and Training
BELGIUM (WALLONIA)	BERNARD	Anne-Claire	Policy Officer, Walloon Institute for dual training and self-employment in small and medium-sized enterprises
BULGARIA	TIVIDOSHEVA	Vanya	Chief Expert, Vocational Education and Training Division, Curricula and Educational Contents Directorate, Ministry of Education and Science
CROATIA	ŠENJUG UŽAREVIĆ	Vedrana	Senior Expert Advisor, Ministry of Science and Education
CYPRUS	TSIARLISTOS	Michael	Inspector Hotel and Catering
CZECH REPUBLIC	STARÁ	Marta	Head of Unit, Ministry of Education, Youth and Sports
DENMARK	SCHUSTER	Torben	Chief Consultant, Ministry of Children and Education

EU Member States			
ESTONIA	KASK	Rita	Adviser, Vocational Education Department, Ministry of Education and Research
FINLAND	KYTÖLÄ	Tomi	VET Expert, Ministry of Education and Culture
FRANCE	BRILLET	Franck	Inspector General, National Education Economics and Management Group IGEN / MEN
GERMANY	LE MOUILLOUR	Isabelle	Head of Division, Federal Institute for Vocational, Education and Training
GERMANY	PUDENZ	Stephanie	Ministerial Councillor, Ministry for Schools and Education Northrhine Westphalia
GREECE	KARAVITIS	Vasileios	Desk Officer, European Union Department, Ministry of Education, Research & Religious Affairs
GREECE	KAPOUTSIS	Ioannis	Head of Department, Directorate for Vocational Education , Ministry of Education and Religious Affairs
HUNGARY	ZOLTÁN	Katalin	Senior Counsellor, Ministry for National Economy
IRELAND	NÍ FHLOINN	Ciara	Assistant Manager Online Learning, Further Education and Training Authority (SOLAS)
ITALY	D'ANNIBALE	Alessia	Official, Ministry of Labour and Social Policies
LATVIA	BULIGINA	Ilze	Senior Expert, Department of Education, Ministry of Education and Science

EU Member States			
LITHUANIA	VALANTINIENÈ	Kristina	Chief Officer, Vocational Education Division, Department of Lifelong Learning, Ministry of Education and Science
LUXEMBOURG	MEYER	Karin	Deputy Director of Vocational Training, Ministry of National Education, Children and Youth
MALTA	MAIONE	Vince	Deputy Principal, Curriculum, Quality Assurance and Professional Development, College of Arts, Science and Technology
NETHERLANDS	VAN IJSSELMUIDEN	Peter	Coordinator International Affairs, Directorate of Vocational Education, Ministry of Education, Culture and Science
POLAND	ANNUSEWICZ	EWA	Head of Higher Education Policy Unit, Department of Innovation and Development, Ministry of Science and Higher Education
POLAND	WILKIEL	Stefania	Counsellor to the Minister, Vocational and Continuing Education Department, Ministry of National Education
PORTUGAL	LAMEIRA	Sandra	Head of Department Integrated Management of Qualification Systems (National Agency for Qualification and VET)

EU Member States			
ROMANIA	SANDULESCU	Felicia Ioana	Deputy Director, National Centre for TVET Development
SLOVAKIA	JAKUBÍK	Karol	Head State Counsellor, Vocational Education and Training Department, Regional Education Division, Ministry of Education, Science, Research and Sport
SLOVENIA	HAFNER VOJČIĆ	Nataša	Secretary, Secondary, Higher Vocational and Adult Education Directorate, Ministry of Education, Science and Sport
SPAIN	HERAS LÁZARO	María Ángeles	Deputy Director General for Guidance and Vocational Education, Ministry of Education and Vocational Training
SWEDEN	MENDES	Malin	Deputy Director, Ministry of Education and Research

EU candidate countries			
ALBANIA	DAUTI	Luljeta	Directorate of Employment and Vocational Training Policies, Vocational Education Sector, Ministry of Finance and Economy
MONTENEGRO	BOGIĆEVIĆ	Zora	Head of the Directorate for Vocational Education, Ministry of Education
REPUBLIC OF NORTH MACEDONIA	JANEVSKA	Natasa	State Advisor, Ministry of Education and Science
REPUBLIC OF SERBIA	ŽIVKOVIĆ	Radovan	Head of Department for VET Education, Ministry of Education, Science and Technological Development
TURKEY	ÇIÇEK	Mehmet	National Education Assistant Expert, Ministry of National Education General Directorate for VET

EFTA countries			
ICELAND	SIGRÚN BJÖRNSDÓTTIR	Íva	Senior Adviser, Ministry of Education, Science and Culture
LIECHTENSTEIN	KINDLE-KÜHNIS	Marion	VET Expert, Agency for International Educational Affairs
NORWAY	THORSEN	Sigurd-Moskvil	Senior Adviser, Ministry of Education and Research
SWITZERLAND	HÜGLI	Jérôme	Project Manager, State Secretariat for Education, Research and Innovation

Social partners, European stakeholders and civil society organisations			
BUSINESSEUROPE	TANDERUP	Helene	Senior Adviser, Confederation of Danish Employers (DA)
EUROPEAN FEDERATION OF EDUCATION EMPLOYERS	FEIJEN	Veronique	Senior Adviser, Internationalisation, Strategy and Education (MBO-Raad)
EfVET	ANASTASSOPOULOS	Panagiotis	VET Expert
ETUC	NORDHAUS	Hans Ulrich	Executive Board, Head of Unit, Department Education and Qualification Policy, German Trade Union Confederation
ETUCE	BABRAUSKIENĖ	Tatjana	International Secretary, European Trade Union Committee for Education
EUROCHAMBRES	TANTI	Joe	Chief Executive, Malta Business Bureau
SMEUNITED	MAYR	Thomas	Director of ibw Austria; Expert at the Austrian Federal Economic Chamber

European Commission and European Agencies			
CEDEFOP	KOROVILOS	Vlasis	Expert
CEDEFOP	RUSTICO	Lisa	Expert
CEDEFOP	JEMELJANOVA	Irina	Expert
EUROPEAN COMMISSION	BACHMANN	Dana	Head of Unit, DG Employment, Social Affairs and Inclusion
EUROPEAN COMMISSION	RIONDINO	Chiara	Head of Unit, DG Employment, Social Affairs and Inclusion
EUROPEAN COMMISSION	SCHOEBEL	Norbert	Team Leader, DG Employment, Social Affairs and Inclusion
EUROPEAN COMMISSION	HOFFMANN	Helen	Policy Officer, DG Employment, Social Affairs and Inclusion
ETF	STANLEY	Julian	Specialist in VET Policies and Systems
JOINT RESEARCH CENTRE	HIPPE	Ralph	Scientific Officer

International organisations			
OECD	MANN	Anthony	Senior Analyst

International organisations			
ECORYS	MCCOSHAN	Andrew	Senior VET Expert
ECORYS	MELSTVEIT	Maria	VET Expert

Annex Five: Lighthouse projects

As discussed with the Working Group, the idea behind selecting lighthouse projects has been to highlight some inspiring projects identified throughout the course of drafting the report. The selection process was informed by an aim to create a diverse list of project examples that 1) represents inspiring practice within one of the three featured themes; digitalisation, innovation and/or promoting social/green objectives, 2) where sufficient information about the project was readily available, while 3) ensuring a regional balance across selected projects.

Theme: Digital

1. Belgium, FL: The teacher-led interactive virtual reality training module VRhoogte, p. 43-44.

Summary: The teacher-led project VRhoogte represents an interesting use of VR application for learning. The project, funded by the Flemish government, has developed a high-quality VR training module for secondary VET students to learn how to work safely in high places, such as high-voltage pylons or wind turbines. Through the VR training module students can work and train a number of basic skills in a safe, interactive, and challenging environment in preparation for the workplace. The module itself deals with scaffolding installations and construction. In addition to software and hardware, the project consortium is further developing a manual and training for schools and teachers so that they can transfer the module to their schools.

For more: EN:
http://www.immersiveeducation.be/2020/01/30/vrhoogte-veilig-leren-werken-op-hoogte-met-vr/

BE-FL: https://www.imec-int.com/drupal/sites/default/files/inline-files/VR_HOOGTE_V4_0.pdf

2. Malta: BlockCerts - Blockchain in educational pilots, p. 49.

Summary: In Malta, the use of blockchain technology for encrypting qualifications represents an important innovation in education. More specifically, from the year 2020, Malta is predicted to be the first country in the world where education certificates and credentials of all students will be on blockchain. This step is made possible through BlockCerts technology that facilitates an open standard for creating, issuing, viewing, and verifying blockchain-based certificates. As a result, through an online portal, learners can organize and store educational and professional certificates, enabling digital access to educational records accumulated over time to store and share. Benefits include increased autonomy over credentials for users and the ability to add certificates over time, as well as lowered administrative costs.

For more:
http://publications.jrc.ec.europa.eu/repository/bitstream/JRC108255/jrc108255_blockchain_in_education%281%29.pdf

3. Italy: INDIRE– a multimedia resource bank facilitating ICT training, p. 35-36.

Summary: INDIRE has a rich resource bank for professional development related to the use of ICT in schools, including over 1,400 text or multimedia resources (including over 10 hours of video tutorials), many of which introduce subject-specific uses of ICT. Training is often blended, combining face-to-face sessions with online activities and materials.

Among other resources, INDIRE hosts a platform for best practices, tools and resources for schools known as D.I share. D.I. share allows school professionals and the broader education community to:

- Find out and share methodological, didactic and interdisciplinary best practices that are possible sources of inspiration for formal and informal educational activities. In this sense, D.I. share constitutes a repository of didactic experiences carried out by schools to facilitate peer learning, reproducibility, exchanges of ideas, sharing of didactic strategies and the implementation of innovative methods.
- Access innovative contents for classroom teaching. D.I. share aims to provide selected and constantly updated didactic resources and the teachers will have the possibility to easily identify useful materials.
- Communicate and document didactic practices. D.I. share will provide easy-to-use tools to highlight didactic experiences, best practices and innovative methods to colleagues.
- Create dialogue with other teachers on the theme of innovation in order to facilitate the development of professional communities and to understand what works and what does not.

Since the academic year 2018/19, INDIRE has also enriched its resource bank with an online support environment consisting of various trainings and tools for newly recruited and role-transition teachers.

For more information: http://www.indire.it/progetto/didatec/

4. Spain: INTEF package of measures– MOOCs, NOOCs, SPOOCs, Edu Pills and Open Badge Backpacks in teacher training, p.33.

Summary: Innovative teacher training accessible for teachers to improve their skills offered by the National Institute for New Technologies and Teacher Training (INTEF) include;

- An online tutored course to be offered from September-November 2019 for VET teachers named 'Professional Future'.
- Massive Open Online Courses (MOOCs), each with its own Facebook group and Twitter hashtag for teachers to connect and help each other. The hashtags and Facebook groups continue after the end of the MOOC to create communities of teachers.
- NANO Open Online Courses (NOOCs), which give participants the opportunity to explore, learn and be evaluated on a key element of a competence, a skill, or an area of knowledge in a period of time that can go from a minimum of 1 hour to a maximum of 20 hours of effort in total.

- Self-paced Open Online Courses (SPOOCs), in which courses can be undertaken by the learner at their own pace, without any time limits.
- EduPills, a micro-learning app to acquire and/or develop digital abilities, skills and competences in a fast and simple way (3-8 minutes).
- Insignias INTEF Open Badge Backpack, which stores, imports, downloads and shares digital badges on social media related to training in competences.

For more: https://enlinea.intef.es/

Theme: Innovation

5. Romania: Simulated training firms in initial VET, p. 30-31.

Summary: The National Centre for TVET Development (NCTVETD) in Romania employs the concept of the simulated, training firm in initial VET. The simulated training firm is an interactive method to learn and acquire entrepreneurship skills by integrating interdisciplinary knowledge. Students are asked to form groups that are coordinated by a teacher and create a virtual company with all the necessary staff and activities. They register the virtual company on the electronic platform called the Romanian Coordination Centre of Training Firms (ROCT) and simulate all the registration steps for a real company and its economic activities. They make internal and external transactions and simulate all activities regarding payments including social security, health insurance and taxes. The training firm simulation concept positions students as the main actors in all related activities and has become a highly successful approach to project-based work.

For more:
https://www.cedefop.europa.eu/en/news-and-press/news/romania-vet-and-training-firms-boost-entrepreneurship-skills

6. Poland: Didactic Initiative of Excellence in Higher VET, p. 108.

Summary: Since 2019, the Didactic Initiative of Excellence has aimed at improving the quality of practice-oriented profile of studies at public vocational higher education institutions in Poland. Based on quality assurance assessments and tracking of graduates' labor market outcomes, vocational institutions selected under the initiative receive additional financial resources that can be spent on activities boosting their innovative capacity, such as modern teaching and learning methods and technologies. The excellence initiative further targets public vocational higher education institutions which are deemed to play a significant role in regional development. The project aims to increase the innovative potential of institutions by encouraging them to develop an action plan for modernizing teaching methods and competences of their staff and students.

For more: http://www.bip.nauka.gov.pl/przedsiewziecie-dydaktyczna-inicjatywa-doskonalosci/

7. **Ireland: SOLAS, Ireland – a game-based approach to delivering further education and training (FET), p. 94.**

Summary: SOLAS, the Futher Education and Training Authority, launched an Innovation through Collaboration Call in 2019 for FET providers to form new and imaginative bridges with enterprise to achieve a major step-up in innovation in employee development across Ireland. This funding is specifically intended to provide an innovation space in which FET providers can experiment, forming collaborative relationships outside of the FET sector. This fund directly addressess the considerable innovation expected from the sector in meeting the challenges of the Supporting Working Lives and Enterprise Growth in Ireland: 2018 – 2021 Further Education and Training Policy Frameworks for Skills Development of People in Employment. The priority innovation categories under the 2019 call were Recognition of Prior Learning (RPL), information and outreach, delivery and design of programmes, regional and sectoral approaches, and enterprise engagement. Ten projects were awarded funding across the advanced manufacturing, aquaculture, haulage, near zero emission building (NZEB), hospitality, SME managament, food processing and care sectors.

For more information: http://www.solas.ie/SkillsToAdvance/Pages/Innovation.aspx

8. **Finland: Omnia's Edutech Bootcamp, p. 32.**

Summary: in Finland is an intensive blended learning experience for VET students are challenged to ask questions, try things out and learn through a mix of collaborative, hands-on and online learning. VET teachers collaborate through social media and cloud-based services to support learning, as well as create, and share content.

In military and business contexts, bootcamps are short, intensive courses of training for new recruits. Omnia's Edutech Bootcamp is a blended learning experience that applies the intensive, immersive nature of this training method to helping VET teachers and teachers in training acquire the knowledge, skills and attitudes called for in mastering new technologies and new ways of acquiring and constructing knowledge. It places the students in the role of novices and dares them to ask questions, to try things out and to learn through a mix of collaborative, hands-on and online learning. The aim is to involve the students in authentic experiential learning where they take the initiative, challenge assumptions, reflect on their experiences, share their learning and develop new depths of understanding in demanding but enjoyable ways. The core learning outcome targets of the Edutech Bootcamp are to improve the students' familiarity with the role of technology in the traditional classroom and online and mobile learning; understanding of the pedagogical applications of ICTs including social media, mobile and cloud-based services; and ability to create and share mobile and online educational content.

For more information:
https://www.theseus.fi/bitstream/handle/10024/124177/Vainio_Oksanen-Ylikoski_Ylikoski.pdf?sequence=1&isAllowed=y

Theme: Social/ Green:

9. Belgium, FR: A new recognised job profile as recycling coordinator ('valoriste'),p. 85.

Summary: The Belgian federation Ressources represents social enterprises from the circular economy sector in Wallonia and Brussels aimed at reducing waste and creating local sustainable jobs. Accordingly, the association has created a new recognised job profile as recycling or waste management coordinator ('valoriste'). The training targets in particular unemployed persons who are encouraged to obtain a job certificate as recycling coordinator. As a next step, the federation Ressources is developing further training to link competences to the job certificate."

For more: https://www.res-sources.be/fr/valoriste/

10. Germany: Federal initiative for sustainability in VET, p. 65.

Summary: Since 2004 the Federal Institute for Vocational Education and Training (BIBB) has directed funds from the Federal Ministry of Education and Research (BMBF) to fund joint projects aiming to anchor sustainable development in vocational education and training under the pilot project funding priority "Vocational Education and Training for Sustainable Development (ESD-VET; BBNE)".

The corresponding research and development activities include elaborating schemes for sustainable competence development of apprentices and teaching/training staff, e.g. in commercial and nutrition sectors and in crafts and industries, as well as an initiative on the sustainable design of learning venues in companies and schools. In addition, it encompasses the development of competence schemes for company owners and managers, especially in SMEs. As a result, the federal initiative ESD-VET provides research based didactic concepts which come along with recommendations for sustainability in VET at the level of regulations, learning processes and teaching practices. Currently a call for projects focuses on the transfer of the results into further training for teaching and training staff in apprenticeship in the context of digitalisation.

Running from 2015-2019 (extended until 2021) the above-mentioned projects for sustainability in VET are budgeted with 12 million Euro from the German Federal Budget. Furthermore, 2,4 Mio. Euro will be spent on projects that run from 2020 until 2022 and focus on the transfer of the results of elaborated concepts for sustainable competence development. By 2019, 19 projects had been selected and a total of 50 training methods and modules have been developed, implemented in practice and evaluated.

For more: https://www.bmbf.de/upload_filestore/pub/Berufsbildungsbericht_2020.pdf

11. **Bulgaria, Cyprus and Greece: and two candidate countries Albania and the Republic of North Macedonia: Innoventer - Innovative Vocational Social Entrepreneurial Training, p. 66.**

Summary: The Interreg-funded project INNOVENTER aims to create a VET learning framework to promote social entrepreneurs' competences and skills. The core idea is to establish VET oriented social entrepreneurship trainings for SME entrepreneurs so that they innovate themselves, while at the same time also engage disadvantaged people as employees. Main project outputs include ECVET-compliant training courses on social entrepreneurship tailored to the relevant national contexts, including curriculum, learning modules and handbooks. The project also aims to produce online and mobile training platforms with interactive tools for SMEs. The project brings together three EU member states (Bulgaria, Cyprus and Greece) and two candidate countries, Albania and the Republic of North Macedonia, across the Balkan-Mediterranean regions.

For more information: http://www.interreg-balkanmed.eu/approved-project/41/

12. **Portugal: INCODE – promoting social inclusion through training units on Digital Literacy, p. 62.**

Summary: Portugal's INCoDe.2030 National digital competences initiative is an integrated programme for Portugal, bringing together and encouraging collaboration between people with different experience and knowledge as well as multiple public and private organisations. It aims to ensure digital literacy and inclusion for the exercise of citizenship; to encourage specialisation in digital technologies and a higher added-value economy; and to produce new knowledge in international cooperation. This initiative has five major priorities (1) inclusion; (2) education; (3) qualification; (4) specialisation; and (5) research.

Within the programme, several actions are taking place in the area of initial VET and lifelong learning, such as the integration of training units on Digital Literacy in the National Catalogue of Qualifications with the intention of promoting the acquisition of competences for the qualification of effective digital citizenship. These training units target people over 18 years old, employed or unemployed, but with a particular focus on those with the lowest levels of digital literacy.

For more information: https://www.incode2030.gov.pt/

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