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Statement
- Responses to Key Questions

Öffentliche Anhörung

zum Thema
„Berufliche Aus- und Weiterbildung im internationalen Vergleich (2. Sitzung): Vergleich zu digitalisierten Regionen, Lernen von den Besten“

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STUDY COMMISSION ON VOCATIONAL TRAINNG IN THE DIGITAL WORK ENVIRONMENT

DEUTCHER BUNDESTAG

''Vocational training and continuing training: an international comparison – comparison with digitally advanced regions, learning from the best'

RESPONSES TO KEY QUESTIONS SUBMITTED BY PARLIAMENTARY GROUPS

- *To what extent does each country's vocational training and continuing training system contribute to its success/capacity for innovation?*
- *Who supports and drives forward economic development in digitally advanced regions? Is it holders of academic or vocational qualifications?*

Many studies find a strong relationship between human capital stock and GDP per capita growth (Barro and Lee, 1993; Benhabib and Spiegel, 1994; Barro, 1998; Hanushek and Kim, 1995). However, very few have analysed how different levels of education, namely different types of general and vocational education, contribute to economic growth and innovation. To mitigate this deficiency, Cedefop study on *VET's macroeconomic benefits* (2014) sought to analyse relationships between labour productivity levels (value added per employee) and different types of skill e.g. workers with various initial VET and general education qualifications, complemented by stock of continuing VET, for seven EU countries (including Germany).

Many of the key mechanisms by which skills exert an influence on national economic performance are connected with innovation, including cross-border knowledge transfer and the introduction of new technologies. Much of the literature on these topics emphasises the role of high-level skills rather than intermediate vocational ones. However, it is possible to identify at least two channels of influence by which (intermediate and upper) vocational skills may potentially also contribute to economic performance:

(a) vocational skills may contribute to more effective use of ICTs;

(b) vocational skills may play key support roles in absorptive capacity (being 'open' to ideas) and in research and development (expenditures on R&D) areas.

Indeed, although at national level growth accounting analysis suggested that the contribution of skills to labour productivity growth between the 1980-end 2000s came through higher-level (bachelor degree and above) skills, in six of the seven countries in the Cedefop study, upper-intermediate and lower-intermediate vocational skills also made a positive contribution.

To achieve higher productivity countries therefore need both high- and intermediate level vocational qualifications. For example, a one percentage point rise in lower intermediate vocational skills combined with a one percentage point rise in upper intermediate skills (both provided through initial VET) is estimated to have increased trend productivity in Spain and the Netherlands by 3.5 to 4%. In

terms of GDP growth, estimated effects of similar increases in lower intermediate and upper intermediate skills provided through initial VET are highest in Germany and Spain, with GDP rising by about 1.5 to 2.5%.

Differences in national productivity performance are however driven to some extent by different combinations of sector specialisation and skill use. For example, impact tends to be stronger in countries with a well-established apprenticeship system and when skills are broadly defined to include non-certified skills provided through continuing VET. This could reflect key support roles for technicians in product design and development areas and for craft skilled workers in improving production processes.

In conclusion, it appears that, for productivity and innovation potential, general and vocational skills are complements rather than substitutes, implying that continuing VET is also complementary, reinforcing skills formed through initial VET.

Most innovation capacity is also driven via its relationship with work organisation and workplace learning practices in enterprises. According to a related Cedefop study Learning and innovation in enterprises (2012), there seem to be significant positive correlations between learning-intensive forms of work organisation and innovation performance. Countries showing higher levels of learning-intensive forms of work organisation tend to rank higher in innovation performance.

A closer inspection of two main characteristics of learning-intensive forms of work organisation – task complexity and autonomy of employees – shows that task complexity seems to have a stronger impact on innovation performance than the other characteristics. The findings also indicate that participation in CVT – including formal, non-formal and informal learning – might be an equally important or even better predictor of innovation performance than participation in higher education, the latter being a frequently used indicator of a country's innovative ability. VET – in a broad sense – seems to be underrepresented and underestimated as a core prerequisite for innovative ability and, ultimately, for innovation performance, both in research and in innovation reporting systems and scoreboards.

Finally, it is worth highlighting that VET also supports social innovation. Civic competences and social awareness skills acquired through VET not only improve work organisation, but also strengthen civil society. In Germany, VET programmes to integrate young adults with special needs into mechatronics apprenticeships illustrate the close partnership between VET and social innovation.

- *How high is the proportion of skilled workers in digitally advanced regions whose work can be replaced as a result of digitalisation, and how are these job losses being dealt with?*

Identifying the exact share of workers whose jobs can be replaced by automation and digitalisation is an imperfect science. There are many estimates of the risk of automation for jobs in the EU and across the globe. While a University of Oxford study in 2013 highlighted that close to a half of all jobs in the US (and UK) are at risk of automation, recent estimates that have employed a task-based or skill-needs approach (e.g. Arntz et al., 2016; Nedelkoska and Quintini, 2018; Pouliakas, 2018) have shown that the share of jobs at high risk of automation is between 9-14%. Nevertheless, there remains a high proportion of jobs, between 30-40%, whose tasks have a high probability of being trans-

formed in the near future. In addition, it is well-acknowledged that digitalisation is fostering the creation of many new job types.

Even though there is lack of agreement on the exact figure/magnitude of the risk of automation, there is nevertheless convergence that it is mainly routine jobs, whose job tasks can be codified by machines, which will be prone to being replaced by machines. By contrast, jobs that are likely to be insulated from the threat of automation are those that depend more on human and cognitive skills, such as creativity, communication, collaboration, critical thinking/problem-solving, socioemotional intelligence etc.

In addition, it is well-documented that the countries/regions at higher risk of job substitution by machines are those that are digital laggards. By contrast, countries/regions that have already invested in previous years in digitising their production processes and economies are likely to be relatively insulated from automation fostering significant job displacement.

For most countries there are particular policy avenues explored so as to tackle the growing threat of job losses due to advancing digitalisation. Strengthening continuing vocational training is key, including promoting more adult learning and digital skills via personal learning portable accounts, pursuing individualised skills profiling and job placements via improved career guidance services (including labour market intermediaries) and crucially, reconsidering social insurance systems that are delinked from a person's employment history (portable benefits). Further initiatives carried out include the strengthening of country's skills anticipation and matching systems, namely their ability to use big data and algorithmic skills matching so as to enhance the speed and efficiency of job placement and labour market reintegration[1]. But in the EU much attention is also given to strengthening the set of key competences of learners during initial vocational training, so as to facilitate their future ability to be adaptable and resilient to workplace change.

- *Which skilled workers are sought after but unavailable? And what actions should be taken to tackle any shortage of skilled labour?*

Skill shortages and mismatches constitute a major waste of EU human resources and lost productivity. According to estimates based on Cedefop's European skills and jobs survey (ESJS), skill mismatches account for an estimated annual productivity loss of 2.14%, which equates to EUR 0.8 per hour worked in 2014 in nominal terms.
According to a Cedefop study on '*Mismatch Priority Occupations*'[2], those which tend to display critical skill shortages include both high skilled (ICT professionals, medical doctors, STEM professionals, teachers, nursery and midwife) but also intermediate level skilled occupations (welders, cooks, truck drivers).

([1]) See Cedefop's '*Assisting EU countries in skills matching*' programme http://www.cedefop.europa.eu/en/events-and-projects/projects/assisting-eu-countries-skills-matching

[2] https://ec.europa.eu/epale/sites/epale/files/skill_shortage_and_surplus_occupations_in_europe.pdf; https://skillspanorama.cedefop.europa.eu/en/analytical-highlights/browse-analytical-highlights?f%5B0%5D=field_collection%3A767

According to Cedefop's recent *Online Vacancy Analysis Tool for Europe*[3], which captures the skill demand of employers from EU countries based on their online job vacancy descriptions, about 56% of job postings require high skilled workers (e.g. software developers, system analysts, material and quality engineers), while the remaining demand is for skilled non-manual workers (shop assistants, administrative secretaries, junior accountants), skilled manual workers (truck drivers, vehicle mechanics, metal machine operators) and low skilled labour (freight handlers, manufacturing labourers, office cleaners).

Analysis of EURES data identifies a number of occupations that have experienced rising vacancy posts in recent years across several EU countries, including:

- health care professionals (health service managers, nurses, midwifes)
- construction professionals (managers, civil engineers and technicians, floor layers, tile setters, carpenters and joiners, house builders etc.)
- manufacturing occupations (welders, flame cutters, metal and woodwork machine tool operators, professions in textile industry)
- Service sector workers (accountants, sales professionals, clerks)
- ICT professionals
- Others (accommodation and hospitality professionals, transportation professionals, gardeners, shop assistants, motor vehicle mechanics and repairers)

Actions recommended to tackle skill shortages and mismatches include:

- ❒ Strengthening attractiveness of vocational training (initial and continuing)
  - Promotion of work-based learning
  - Quality assurance of VET
  - Strengthening key competences in VET
  - Strengthening opportunities for professional development VET teachers and trainers
- ❒ Facilitating labour market mobility (including targeted migration policy)
- ❒ Improving skill utilisation via workplace innovation and recognition of informal skills
- ❒ Improving labour market intermediation and quality of job-skills competency-based matching
  - Development of skills profiling and skills assessment tools
  - Development of real-time skill needs identification tools
  - Linking skills validation, skills assessment and job-skills matching
  - Use of AI methods for job-skills matching
  - Web-based feedback of effectiveness of active labour market policies
  - One-stop shop career guidance centres
- ❒ Improving the governance of skills anticipation and matching
  - Development of big data labour market information tools
  - Stakeholder cooperation (labour market – education – economy; government and social partners and private industry)
  - Strategies for use of labour market intelligence in sectoral/national training plans

[3] http://www.cedefop.europa.eu/en/data-visualisations/skills-online-vacancies/countries-and-occupations

- Development of customised dissemination portals of labour market intelligence for different user groups

❒ Holistic policy approach: combination of skills, activation, employment and mobility policies with product market, housing & other social policies

- *Are countries which have stronger dual elements in vocational training more successful in integrating young people into the education system and the labour market? What indicators show this is the case?*

There is no conclusive evidence on this question. Integration of young people in the labour market largely varies across countries but it depends on many different factors and the dual structure of their initial VET systems is only one. Availability and quality of data currently limits research possibilities that could provide more concrete inputs to this topic.

The two charts shown below consider upper secondary students in combined school and work based VET programmes (as % of all upper secondary students) as a measure of the importance of dual VET at country level, based on data from the Unesco–OECD-Eurostat (UOE) database on formal education system.

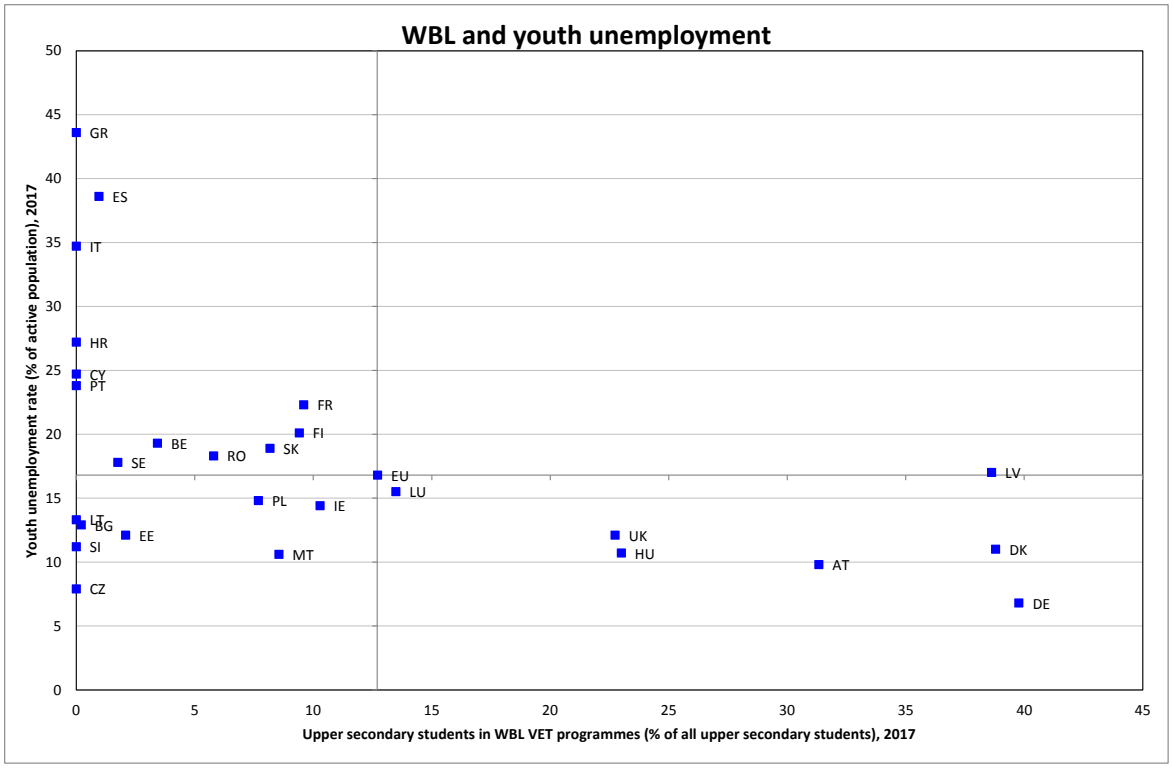
In chart 1, this measure of dual VET is plotted against the youth unemployment rate (Source Eurostat, EU LFS).

In the second chart, it is plotted against the *employment premium for young VET graduates* (20-34 years olds no longer in further education and training) o*ver those of the same age who are low educated* i.e. have not complete upper secondary education (Cedefop calculations based on Eurostat, EU-LFS). The employment premium is expressed as the difference in percentage points between the two corresponding employment rates and 2017 data are used.

The basic descriptive picture/associations shown in the charts below fail to show a clear/uniform direction between Work-based learning (WBL) and youth unemployment/VET employment premium. There are many other factors that need to be taken in account (e.g. macroeconomic policies, institutional environment, business cycle effects, employment/education policies etc.) before drawing strong conclusions regarding causality of the variables. However, what can be seen from the first chart is that that countries where WBL accounts for an important share of upper secondary students (i.e. higher than EU average) tend to have lower youth unemployment rates (i.e. lower than EU average). However, countries with lower levels of participation in WBL may or may not have high unemployment rates (i.e. higher than EU average).

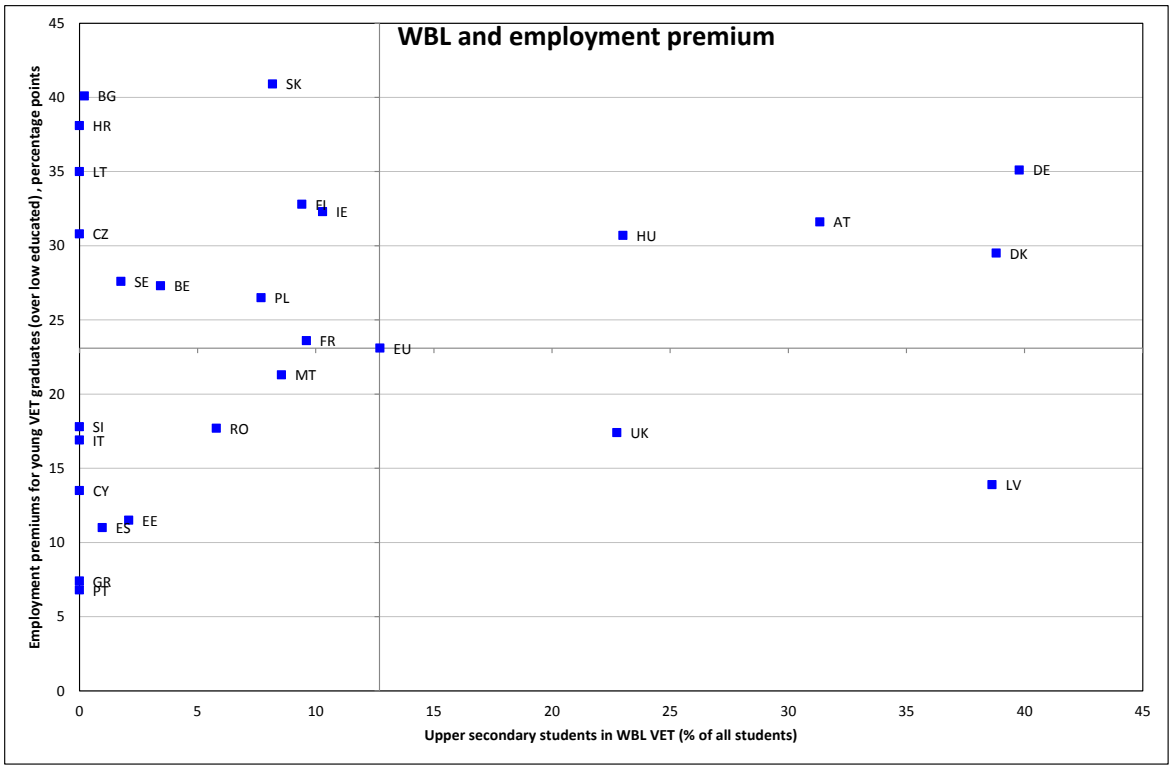
In the second chart, it can also be seen that countries where WBL accounts for an important share of upper secondary students (i.e. higher than EU average) tend to have a higher employment premium for VET graduates. However, countries with lower levels of participation in WBL may or may not have a high employment premium (i.e. higher than EU average).

FIGURE 1: INTENSITY OF WORK-BASED LEARNING AND YOUTH UNEMPLOYMENT, EU, 2017



NB: Countries with zero % of upper secondary students in WBL are indicated in the Eurostat online database as 'not applicable'.

FIGURE 2: INTENSITY OF WORK-BASED LEARNING AND VET EMPLOYMENT PREMIUM, EU



NB: Countries with zero % of upper secondary students in WBL are indicated in the Eurostat online database as 'not applicable'.

Cedefop investigated the labour market outcomes of VET graduates, based on the 2009 ad hoc module of the EU Labour Force Survey (EULFS). The report showed that, in terms of labour market outcomes, there are substantial cross-country differences in the returns to VET. Young people in countries with strong VET systems, with a close connection between school and work-based components, are much more likely to be employed than their general education counterparts and to benefit from a faster transition to the labour market. Conversely, young adults in countries where the work-based component of VET is less developed experience a lower VET employment premium and experience greater difficulties in labour market integration. Factoring in differences in national labour market institutions and policies suggests that success or failure of education programme orientation depends on a complex interaction between policies and institutions that are particular to each national context.

A new variable is expected to be stably included in the core EU Labour Force Survey in forthcoming data waves, indicating whether work experience has occurred as part of the highest level of education attained by young individuals. This new variable is expected to support relevant investigation of the issue at stake, with better and more frequent data.

- *Which core skills are taught in the "best" regions?*
- *Are there special learning approaches which are tailored to the digital economy?*

It has been widely acknowledged that digital competences and skills are part of the overall set of key competences that learners need to acquire so as to operate effectively in modern society. In addition to being a key competence, basic digital skills are a prerequisite also for the acquisition of other key competences, for instance workers in jobs needing a basic digital skill level must also possess a high-level of cognitive skills (literacy, numeracy, problem solving, learning to learn) ([4]).

Access to broadband and digital skills is a necessary requirement for knowledge diffusion and functional digital literacy underpinning VET and skill development across all areas of society. At the same time more than 80% of adult employees in the EU need a certain level of digital competence to perform their job duties ([5]). Across Europe Internet access across Europe has improved substantially in recent years although the EU population is still viewed as having insufficient digital skills. 43% of EU adult workers lack basic digital skills ([6]) and around one third of EU workers are at risk of digital skills gaps ([7]). Countries which exceed the EU average level for digital literacy include the Nordic countries, Belgium, Czechia, Germany, Estonia, France, Luxembourg, the Netherlands, Austria and the UK. Large sections of eastern and southern Member States tend to show limited digital skills; e.g. Bulgaria and Romania, 74% and 69% of the population, respectively, report no or limited levels of digital competence.

In the last four years (2015-2018), the majority of EU Member States' training policy initiatives were geared towards providing people both in initial and continuous VET with digital skills. Among all

([4]) Cedefop (2016), *The great divide: Digitalisation and digital skill gaps in the EU workforce*, #ESJsurvey Insights No 9, Thessaloniki, Greece.

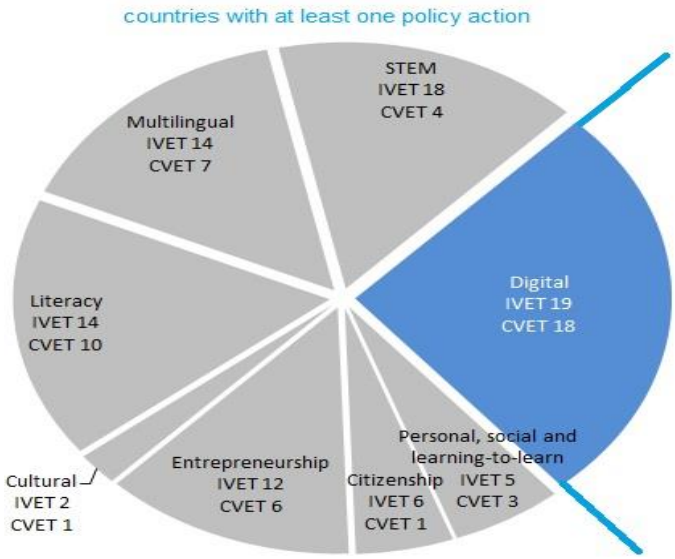
([5]) Cedefop (2018) *Insights into skill shortages and skill mismatch: Learning from Cedefop's European skills and jobs survey*, Cedefop reference series. No 106.

([6]) European Commission (2018). *Human Captial: Digital inclusion and skills*. In Digital Economy and Society Index Report.

([7]) Cedefop (2016), *The great divide: Digitalisation and digital skill gaps in the EU workforce*, #ESJsurvey Insights No 9, Thessaloniki, Greece.

policies targeting key skills in VET, those aiming at the provision of digital skills had the highest rate of full-scale implementation and government regulation.

FIGURE 3: 2015-2018 POLICIES SUPPORTING DIGITAL AND OTHER KEY COMPETENCES IN EU28+



Source: Cedefop based on contributions from the ReferNet network

But a 'robot-proof' education is not only about digital competences; it is dependent on blending the wide array of key competences (digital, entrepreneurship, data literacy, STEM, foreign languages, learning to learn) within curricula and learning methods, for which comprehensive VET programmes and policy actions are needed. Overall, the VET curriculum in EU countries is hence becoming more oriented towards delivering transversal skills. Transversal skills increasingly encompass and complement digital skills in an effort to prepare people for a fast-changing technological environment. For example, in the Netherlands, the introduction of 21st century skills into the VET curriculum includes both entrepreneurial and digital skills. While in Austria VET programmes are being re-designed with combinations of different qualifications (e.g digital business, media design, mechatronics). New technologies are also being embedded in the VET curriculum in forward-looking ways. In Finland, as part of the current VET reform, there is a plan to implement new technologies (such as AI and robotics) in VET (see Box 1).

Box 1 AI Aurora (Finland) ([8])

In Finland the Ministry of Finance launched in September 2018a feasibility study of the national artificial intelligence (AI) programme (Aurora). The study was completed in February 2019. It is part of the proposals made in the report Finland's age of artificial intelligence ([9]). The feasibility study aims to speed up the transition of public administration towards the age of AI and to create a trial version of the decentralised service network Aurora made up of AIs/autonomous applications, which will create preconditions in society for providing human-centric and proactive services.

([8]) https://vm.fi/auroraai
([9]) http://julkaisut.valtioneuvosto.fi/handle/10024/80849

The trial engages an extensive network of public and private sector operators. Service design, consultation of users and generation of ideas together, and the principles of transparency and information are emphasised.

The Aurora AI programme would for its part also respond to the needs of education and training by providing solutions for how to assess competence, goals and interests and helping users to obtain recommendations for how to develop their competence and find employment. For example, the AI programme would include recommendations for work opportunities and competence development suitable for the person's life situation at the time and guidance by an expert.

Learning approaches tailored to the digital economy, including those that can shield individuals from the threat of job displacement due to automation, include those that blend different disciplines and bestow to learners fundamental *data literacy* (e.g. ability to understand and interpret data and statistics), *technological literacy* (e.g. ability to implement and understand programming and coding and deal with new technological developments) but, crucially, *human literacy* (e.g. creativity, problem-solving, socioemotional skills).

To achieve the aforementioned goal, a key element of reforms is to 'digitalise' the VET system by incorporating digital learning platforms and simulators into learning delivered by vocational schools. For instance, digitally pioneering countries are investing in the development of so-called STEAM (science, technology, engineering, arts, mathematics) labs, in which specific attention is given to integrating learning of natural, technological and social sciences with 3D modelling, multimedia design, gaming and digital learning resources. The goal is to transfer the learning of principles of natural sciences, mathematics as well as history and other social sciences into the practice of visualisation and model building via design and arts electives.

Other more recent examples of learning approaches tailored to the digital economy include the use of artificial intelligence 'virtual teachers' to assist with building confidence among school children as well as facilitate learning in rural/remote areas. Artificial intelligence methods are also being used to scrape and synthesise available open educational resources online with the goal of offering targeted and personalised education delivery to both young and adult learners. Indeed, one of the key value-added of ICT technologies and, increasingly, of artificial intelligence, for reshaping education delivery is the ability to foster individualised learning pathways as a learning approach, where the mode, place and content can be adapted according to the needs of the learners. There are also pilot projects in vocational colleges to explore how to make more use of robotics and big data.

- *How do other countries validate informally acquired skills? Can these approaches be applied to Germany?*
- *Are informally acquired skills certified in these countries and, if so, how?*

The European inventory on validation (www.cedefop.europa.eu/validation/inventory) provides an overview of country approaches to validation in Europe since 2005. The 2018 edition, to be published at the end of 2019 in Cedefop's webpage, shows that almost in all EU countries it is possible to validate the skills and competences acquired in non-formal and informal settings in some way. Validation is a process in which an authorised body corroborates that an individual has acquired certain learning outcomes measured against specific agreed standards. The process has been divided into four phases: identification, documentation, assessment and certification. Not all validation processes lead to a certification, as some might create a training plan for the individual.

Approaches differ from country to country and the sector in which the validation is allowed. Most of the validation initiatives are linked to formal education programs, allowing the access or the acquisition of formal (full or partial) qualifications. This means that procedures will be different if the individual is trying to access higher education or vocational training. The standards used to assess the informal learning tend to be those of the formal system of education, although some countries have created parallel systems, in which validation of informally acquired skills is done against occupational standards.

In terms of the actual tools used to validate informal learning, countries tend to use a variety of methods, using portfolios as one of the main ways of documenting the skills acquired, combined with tests or interviews. It is important to emphasize that for the documentation of non-formal and informal learning, the individual is normally supported by a guidance practitioner. It might be someone from the training provider, a counsellor or from the Public employment services, depending, again on the structure in which the validation process takes place.

Learning acquired through digital means is not yet validated much differently than any other skills acquired informally (or in a non-formal setting), for example skills acquired through volunteering. Many of the digitally acquired skills are actually acquired through MOOCS or on-line courses that are indeed another form of delivery of formal education. Nevertheless, while many countries have developed digital tools to assess skills[10], relying mostly on self-assessment by individuals themselves, the extent to which they are integrated within a digital infrastructure that can allow for recognition, validation and certification of skills is still in its infancy (see Box 2).

Box 2 e-Competence identification

In Finland in general, vocational competences are assessed by means of a practical test in which learners demonstrate, in performing practical work tasks, how well they have acquired the essential skills or knowledge defined in the requirements. The design and implementation of the skills demonstrations is guided by the national requirements defined for vocational qualifications, which have been identified in cooperation with companies and relevant work organisations.(1) Learners can participate in the tests regardless of the way they have acquired the skills. The identification and assessment of acquired skills and competences can be supported by the e-tool Osaan, designed to reflect on the progress made in competence development related to a specific vocational qualification. The tool offers assessment of skills and competences related to different types of qualification: vocational qualifications (secondary level), further and specialist vocational qualifications. The tool is offered for 566 qualifications in total. The tool also offers links to training providers for persons interested in completing a qualification. The result of the assessment is a report that helps the individual to set up the Personal Competence Development Plan together with the training provider.

The Samsung Digi pass four-month training programme in Estonia[11], designed to address the problem of youth unemployment and smart device addiction, and based on cooperation between Samsung Electonics Baltics, Tallinn University and the Estonian National Youth Council, is offered to vocational school students every year. By the end of the programme students acquire a competence-based digital portfolio/special digital passports, which can be used to prove the skills and experience acquired to their future employer.

[10] Other relevant examples of using digital assessment tools for assessment of skills include the European Commission's DigComp framework, the "Libretto formative" (on-line skills portfolio) in some regions in Italy and the "ProfilPASS" in Germany.

[11] http://www.samsungdigipass.ee

- *How are the vocational training and continuing training systems dealing with the challenges posed by the digital transformation? How are small and medium-sized businesses, for example, approaching these challenges? What can Germany learn from this?*

According to Cedefop's changing nature and role of VET project[12], there are 2 competing narratives for VET - a negative and a positive one:

The negative:

Vocational Education and Training (VET) is coming under threat by a changing labour market in which automation and digitalization are 'hollowing out' the middle level skills traditionally provided by VET. In this scenario, we are heading towards a situation where young people are increasingly attracted to general and academic subjects, side-lining VET as a poorly esteemed second chance option. The skills provided by VET are less in need due to digitalization and job polarization.

The positive:

We are facing a situation where VET, not least through its focus on practice and work-based learning, is becoming increasingly important for a labour market in constant change, offering relevant and high-quality skills at all levels and for people of all ages and in all life situations. The skills provided by VET are essential for continued economic growth and for upholding welfare.

Paradoxically, both stories are true. It depends on your conception of VET. If you are looking at VET as a narrow concept, i.e. as formal learning for young people only, focussing on specific occupation and middle skilled jobs then it is really under threat. If you have a broader understanding of VET, as vocational oriented learning, including lower and higher levels, you see VET thriving; in this respect VET has been very successful covering most of adult education and large parts of higher education.

Keeping in mind this role of VET, the nature of recent technological changes (including robots, AI) has resulted in some VET schools (in both digitally advanced but more so in less advanced regions) struggling to keep pace with the rate of change**.** They are expected to equip people with skills that are in short supply in the labour market and have access to the latest technologies. Accordingly, they struggle in recruiting staff with the skills required and having access to the latest technologies. To counter this, vocational schools in several countries are moving closer to employers– or are being encouraged to do so: the anticipation is that employers will give access to their technologies and general know-how.

Higher-level skilled jobs, requiring their incumbents to use cognitive skills which cannot be readily substituted by automation, and lower-skilled jobs requiring their incumbents to interact with customers – such as deliveries – are similarly not readily substituted by automation. Evidence suggests that this trend towards a hollowing out of the skills structure is rather more marked notable in countries that have more market-based economies, such as in Ireland and the UK, compared than with in other European countries that are less market-oriented (Eurofound, 2016).

[12] Over a three-year period, the project analysed how vocationally oriented education and training has changed in the European Union (as well as Iceland and Norway) in the last two decades (1995-2015) and, based on these results, investigated the main challenges and opportunities the VET sector is facing today and may face in the future.

Regardless of whether technical change brings about a hollowing out the labour market, the evidence points to increasing demand for high level skills across Europe. What is perhaps less clear from the data is the extent to which technical change creates a demand for higher level VET skills or a higher demand for higher education graduates (typically from traditional higher education institutions). Countries have a degree of strategic choice in how they manage this state of affairs. Some have made substantial efforts to develop a separate VET track at the higher education level (as in France and the UK), while others have placed more emphasis on allowing people to progress from upper secondary VET to general higher education (Finland).

What is clear is that national approaches to and systems of VET varied greatly in the past (since 1995) and still vary at present times. However, there are a number of common trends that are evident across EU national VET systems, which have also arisen to strengthen their ability to respond to technological and other macro-drivers. These include:

- developing improved systems for skills anticipation and the introduction of competence-based VET programmes and qualifications. Additionally the way in which the social partners are engaged in the process has also changed.

- promoting apprenticeships/workplace-based training in 'non-traditional' sectors by trying to strengthen employer engagement in the development of training standards. In this way the training standard gains currency with employers.

- extending VET to higher levels and providing individualised learning pathways (Finland). This is part of the process of ensuring that VET is attractive to young people and that there is sufficient permeability between VET and higher education.

- *Do strategies exist in digitally advanced regions for dealing with low-skilled workers, such as skills development strategies, in order to meet the higher demand for skilled labour in the digital sector?*

In many digitally advanced EU regions technology and the internet have proved to be useful tools for raising awareness among particular low-skilled groups and engaging them in activation and skill development measures. Public employment services (PES) in particular, have assumed a greater responsibility in incorporating e-tools and platforms in their websites and overall communication strategy and other stakeholders have sought to raise awareness through their own (dedicated) websites or platforms. With social media use becoming increasingly common among different age groups and different types of users, its relevance as a tool to engage different groups of long-term unemployed or low-skilled workers is also increasing. Among comparatively more tech-savvy younger cohorts ('millennials'), introducing a profile of the PES or of a specific measure or support programme on social media platforms can attract the interest of such users more effectively compared to traditional approaches. Either way, the internet is increasingly used to collect and provide information about skill needs and relevant skill development opportunities, but it is also used as a counselling tool to guide and support long-term unemployed and other low-skilled individuals after their

awareness has been raised. Smart combinations of online "self-service" tools and regional service provision appear to be particularly effective[13].

Using the internet to provide information and stimulate engagement has obvious benefits. It helps reach out to long-term unemployed and low-skilled workers in remote areas or facing mobility challenges due to personal or family reasons. E-tools allowing them to register as unemployed or as recipients of training programmes eliminate the need to travel/visit the local PES office – a clear advantage for those taking care of children or a family member. Information and guidance through e-tools can also be a means to re-engage very long-term unemployed who have lost trust in 'traditional' ways of support. They may empower them in terms of offering feedback about the quality of training courses received. Finally, up-to-date, accessible and understandable information online helps reduce costs and reserve caseload capacity for people requiring face-to-face support.
ICT platforms/tools have also been developed for assessing and forming social and soft skills, or to organise stakeholder involvement in developing training programmes more effectively and establishing evaluation capacity to make the use of ICT in activation more evidence-based.

Overall, digital tools are also considered key as part of the European *Commission's Upskilling Pathways* initiative, which foresees a case management approach whereby a first screening of low skilled individuals' skills set takes place using digitally-assisted tools, but also with the close assistance of professional career guidance and counsellors, to develop an individualised skills deficit and training action plan.

Coupling such individualised information on training plans for low-skilled workers, new digital technologies (e.g. machine learning, artificial intelligence) have increasingly enabled the development of ICT tools for skills matching services. Innovative web-based tools, such as for example the careeronestop website in the US, the Dutch lerenenwerken platform and VDAB's (PES Flanders) competence matching system can facilitate skills matching by providing to job seekers a seamless online service platform combining real-time job vacancy and individuals' skills information (via Big Data extraction or self-assessment tools).

Using such skills intelligence tools, several EU countries have sought to develop programmes/policy initiatives to tackle digital skills gaps (Box 3).[14]

Box 3 Examples of national skills matching programmes for meeting digital skill gaps

The **Choose IT**[15] initiative from Estonia, for instance, combines the needs of the labour market with the provision of adequate (re)training opportunities from the education system, and it is dedicated to adults, specifically to adults with non ICT higher education, who are currently employed or unemployed. Furthermore, adults who have discontinued their non-ICT higher education, but have attained 50% of the curricula before dropping out, can apply for the programme. Lastly, applicants must have at least 3 years of work experience.

[13] Cedefop (2018) *From long-term unemployment to a matching job: The role of vocational training in sustainable return to work* http://www.cedefop.europa.eu/en/publications-and-resources/publications/3076

[14] See Cedefop's '*Matching skills: Inspiring policies for anticipating and matching skill needs*' (http://www.cedefop.europa.eu/en/tools/matching-skills) online database for examples

[15] http://www.cedefop.europa.eu/en/tools/matching-skills/all-instruments/choose-it

In Ireland the **ICT skills conversion programme**[16] aims at building the supply of high-level ICT graduates (up-skilling and reskilling), explicitly addressing the current shortage of skills in the ICT sector. The programme offers an intensive NFQ level 8 higher diploma ICT skills conversion programme by higher education providers in partnership with industry. The commitment to funding and collaboration of various stakeholders (Government, education and training providers and businesses) has led to the success of the instrument. The output of computer graduates in Ireland had increased by 25% in 2013 over the last two years, and a doubling of graduate output was predicted to be achieved by 2015 - three years ahead of the Action Plan target of 2018. Under this initiative, sectors with identified skills needs are targeted, and courses are provided in ICT, manufacturing, entrepreneurship, hospitality and financial services.

- *Are the opportunities of digitalisation explicitly communicated in vocational training and continuing training? And if so, how?*

In EU Member States, specifically digitally advanced regions, several initiatives exist for communicating the opportunities of digitalisation in VET.

For many such initiatives a key innovation in recent years has been the fact that **large multi-stakeholder projects** have been initiated, soliciting cooperation among high-technology companies/industry, VET providers, government agencies and other social and/or local partners. In addition, several countries have sought to facilitate a **'digital learning market'** among different schools, ensuring synergies, cross-school efficiencies and knowledge transfer and more carefully balanced needs-based assessments of their ICT requirements and gaps.

Box 4 Examples of initiatives for 'bringing digitalisation into schools'

In the Netherlands the **Education and ICT 'breakthrough' project** involved the setting up of **learning labs** where more than 200 teachers from primary and secondary education could experience working with ICT technologies. For instance, they could experience how students will be able to master their own learning process with the aid of ICT. Another aim was to set up a **'digital learning market'** and to promote purchasing by school collectives, instead of individual schools.

Besides the formal setting (sector chambers, committees) in which the effects of technological developments on educational qualifications are discussed in the Netherlands, a new initiative, by way of experiment, was recently launched; in particular, a number of internet-based '**trend communities'** have been initiated, inviting people working at all levels of companies – not only organisational representatives – to act as 'trend watchers' and provide information at sector, or occupation level, to be published in trend reports and used to update VET qualifications, or introduce new ones.

In Sweden 'Smart Factories' is a collaborative project blending the worlds of education and business, at national and regional level, and supported by Sweden's Innovation Agency, Vinnova. A manifestation of the project is the setting up of a testbed factory, designed and built by students at all qualification levels and some 50 companies, and serves as a platform for development of competence and dissemination of knowledge about the digital industry, increasing interest by students for technology and industrial professions.

[16] http://www.cedefop.europa.eu/en/tools/matching-skills/all-instruments/ict-skills-conversion-programme

In the UK the **3D animated Virtual Project Manager** is a mini game that allows young people to try building new virtual homes. The game is intended to showcase - in an innovative, fun and engaging way - opportunities in the construction sector, whilst portraying skills needed to enter the profession. The developers used virtual reality technology to deliver educational messages to a young audience. The mini game is available as a downloadable app and was launched during the 2017 annual Scottish Apprenticeship Week. It was developed as part of Skills Development Scotland's *My World of Work Live!* programme in collaboration with the Construction Industry Training Board, Heriot-Watt University and Animmersion UK Ltd.

Source: Cedefop Refernet collection 'Adapting VET to digitalisation and the future of work' (Nov2018-Jan 2019)

- *How does the recruitment and skills development of skilled workers take place in digitally advanced regions? What role do businesses play in this, including SMEs and startups?*

There is very little and strong evidence to address this question at EU level. Admittedly very little is known about the recruitment and skill development practices of EU companies, and their relationship with their state of digitalisation. However, a new round of the European Company Survey is currently being carried out jointly by Cedefop and Eurofound and new data are expected in 2020. This dataset is likely to bring new and relevant evidence and insight into the extent and role of digitalisation in European firms, of all sizes and age, and how it interacts with their skill development practices.

What is known from existing EU datasets (2014 Community Innovation Survey), in relation to the responsiveness of EU companies to innovation and their skill formation actions, is that on average 44.8% of enterprises in the EU engaged in technological innovation provided supportive training to their staff to support that innovation.[17]

On average, 66% of EU employers in enterprises with 10 or more workers provided vocational training to their employees in a given year, as indicated in the 2010 wave of the Continuing Vocational Training Survey (CVTS). Percentages vary widely across countries and show some positive correlation with the degree of digital advancement i.e. the highest values are found in Denmark, Sweden, and Austria, where more than 85% of employers provided vocational training. By contrast, in Bulgaria, Greece, Romania and Poland less than 40% of employers did so.[18] In addition, it is also well-reported that in general the share of employees participating in continuing vocational training in small and medium-sized firms is considerably lower than the share in larger-sized firms.[19]

[17] http://www.cedefop.europa.eu/en/publications-and-resources/statistics-and-indicators/statistics-and-graphs/22-how-many-enterprises

[18] http://www.cedefop.europa.eu/en/publications-and-resources/statistics-and-indicators/statistics-and-graphs/07-how-many-enterprises

[19] http://www.cedefop.europa.eu/en/publications-and-resources/statistics-and-indicators/statistics-and-graphs/09-how-many-employees