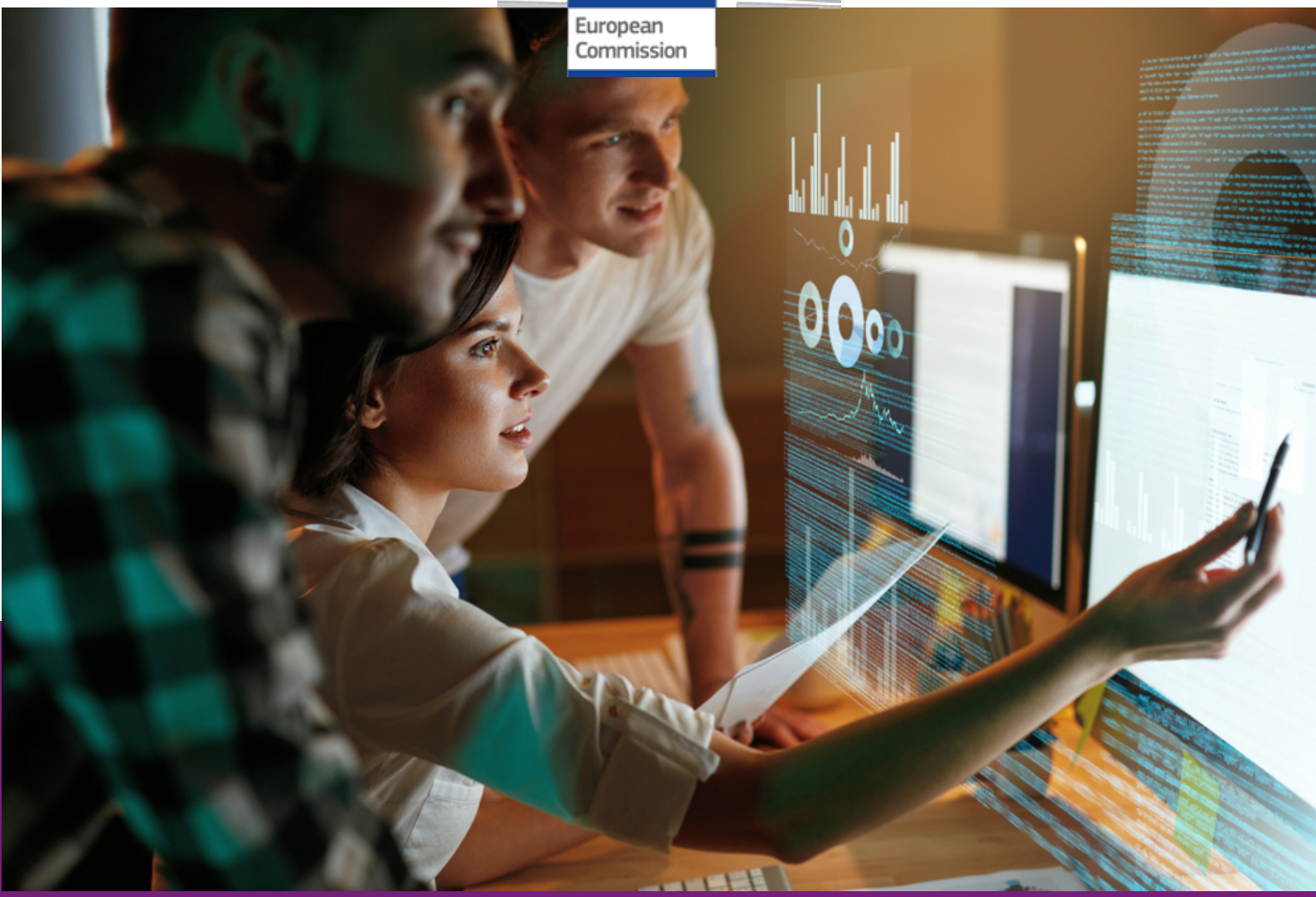

Skills for Industry Strategy

Online Training

Promoting Opportunities for the Workforce in Europe

FINAL REPORT

Written by PwC
June 2019

EUROPEAN COMMISSION

Executive Agency for Small and Medium-sized Enterprises (EASME)
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Skills for Industry Strategy

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Executive Agency for Small and Medium-sized Enterprises (EASME)
COSME – PROMOTING ONLINE TRAINING OPPORTUNITIES FOR THE WORKFORCE IN EUROPE
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Executive summary

In 2019, enterprises are facing great challenges related to digital transformation of the economy. In addition, regulatory and market requirements to meet the United Nations sustainability targets by 2030, demand a significant shift in the environmental footprints of enterprises and their business processes. These megatrends will have a considerable impact on skills and their implications for the workforce and the future of work. The changes driven by artificial intelligence, robotics and automation, as well as globalisation and key topics such as demographics, diversity, gender equality and social inclusion, necessitate better and greater training opportunities for all. Moreover, these should be made accessible throughout the entire professional life.

Upskilling and reskilling strategies will be crucial for competitiveness, growth and jobs. However, lifelong learning does not yet have clear delivery and funding models to ensure massive adoption. Furthermore, there is still no agreement on how to provide lifelong learning for all. It should not be surprising: the question of funding for primary, secondary and higher education has been one of the thorniest political topics in the 20th century. Creating the conditions for making lifelong learning and employability a reality will be a crucial topic in the 21st century. Achieving this goal will provide a competitive advantage in the global competition for talent and in the search for social cohesion.

In order to better anticipate and manage change, enterprises need to develop a new mind-set and embrace a culture of just-in-time and just-for-me learning. It requires the assessment of current skills and new skill needs; identification of skills shortages, gaps and mismatches; selection of suitable learning paths and training; guidance, coaching and support; evaluation and validation of acquired knowledge and skills. It is particularly difficult for small and medium-sized enterprises (SMEs), having to deal with budget constraints, limited capacity, fierce competition for talent and extreme time pressure. There is a need for new approaches matching their needs and realities in a digital world.

Online training is part of the solution. Online training refers to training that is delivered, enabled or mediated using digital technology, associated with learning scenarios and interactive activities, for the explicit purpose of upskilling or reskilling in organisations. It includes a wide range of solutions such as online courses, educational resources, video content, mobile learning, virtual and augmented reality, gamification, artificial intelligence etc., both formal and non-formal. It is a ‘jungle’ of offerings of various quality and relevance. While considerable progress has been made since the introduction of computer-based training in the 1980s, the tipping point has still not been reached. Online training is rapidly evolving, as it is steadily integrating new technologies enriching the learning experience with the perspective of shifting from “digital learning” towards efficient “learning in a digital world”.

Today, the adoption of online training by SMEs still happens at a slow pace. This initiative explored the realities of SME learning and the ways how the needs of the workforce could be effectively met by online training solutions, whenever relevant, in combination with traditional forms of training. Based on this analysis, a vision and recommendations for specific support measures towards 2030 were developed. Effective approaches to deliver new skills based on flexible and adaptable online training solutions were identified, including the ways to foster the uptake of best practices. The results aim to inform policy makers and other key stakeholder groups about new possible policies, solutions and funding mechanisms.

State-of-play analysis of online training market in Europe

The overall online training market is on the rise. It is estimated[1] to grow at a compound annual growth rate (CAGR) of around 9.5% over the period 2017-2026, accounting globally for about 157 billion EUR in 2017, with a projection to reach approximately 355 billion EUR by 2026[2]. The key factors that are favouring the market growth include flexibility in learning, low costs, easy accessibility, and increased effectiveness of animated learning. Furthermore, the escalation in the number of Internet users and growing access of broadband pooled with mobile phones with online capabilities are also actively supporting the market growth. The corporate training market in Europe is one of the most diverse markets due to the presence of multiple training solution providers and training professionals.

The online training market in Europe is more fragmented and specialised than in other global regions. Consolidation and the emergence of large-scale platforms occur here at a much slower pace than in the United States. Market analysts predict that the rise of demand for continuous learning in Europe will increase the adoption of different methodologies and products. Factors related to change management, fast technology innovation pace, and vendor-developer partnerships are major restraints hindering the growth of the market. The learning landscape today looks completely different than it did a few years ago. Learners now expect content to be short and personalised and seem more committed to their learning goals. This indicates the need for change for both content and technology in the learning space.

The latest trends that will have significant impact on the learning ecosystem in the workplace include the following:

- Real-world learning is on the rise;
- There is a rapid growth in mobile learning;
- Gamification has proven to be an effective strategy;
- Social learning is becoming the mainstream approach;
- There is a growing need for micro-learning;
- Learning engagement systems and personalised/personal learning are rising;
- Open Educational Resources (OER) are growing in popularity.

The analysis of key dynamics within European enterprises suggested that they expect their investment in digital learning platforms and content to increase or stay the same in the near future. Most expansion in digital learning courses comes from decreasing investment in traditional instructor-led training approaches. Despite the momentum in investment, however, budgets for digital learning tend to remain relatively low.

The use of Massive Online Open Courses (MOOCs) remains a minority approach and traditional e-learning approaches still form the basis of the learning content market. It is dominated by off-the-shelf content. Mobile learning is in high demand. The field is moving into the direction of creating Learning Engagement Systems (LES), i.e. solutions that use AI and learning analytics based on profile data about learners, their personalities, habits, goals and feedback from others to drive personalised learning.

1 This estimate refers to both academic e-learning and corporate e-learning. Depending on technology, market is segmented into Learning Management System (LMS), mobile e-learning, application simulation tool, rapid e-learning, podcasts, learning content management system, virtual classroom knowledge management system and other technologies.

2 Statistics Market Research Consulting (2018) “E-Learning - Global Market Outlook (2017-2026)”, September 2018, see: https://www.researchandmarkets.com/research/pqwzjc/global_elearning?w=12

SMEs are reported to be restricted in the efficient use of different forms of learning and technology for learning and in adequate management learning approaches. The key challenges faced by SMEs include high costs associated with the development of bespoke training solutions, the need to interrupt working processes and the associated lack of time and budget, difficulties when identifying suitable training providers and appropriate training programmes. The most popular form of learning in SMEs is a non-formal one, and the integration with formal training is often not planned.

In the context of the quality of online training, the challenge remains how to develop and maintain a competitive ecosystem of suppliers around digital learning projects that stimulates better levels of service and solution. The risks around selecting the right suppliers appear to be the greatest when it comes to learning content. In areas such as gamification, business systems solutions, user generated content, serious games, MOOCs, off-the-shelf performance support and virtual reality, enterprises are more likely to get merely an acceptable or mediocre quality solution. Blended learning and mobile learning do not score significantly better. Only in video content and bespoke content, the quality of the offer is reported to be acceptable. Social learning and analytics are also associated with a high risk of low quality.

The affordability of online training for SMEs is a highly sensitive issue, as they are often reluctant to pay for staff training. The questions of who should pay, of the return on investment (ROI) and free riding remain open. Many enterprises still prefer to recruit skilled people who often have been trained and acquired their skills elsewhere. This can be explained by the fact that SME owners often do not have enough knowledge about the ROI, the value of training and of staff loyalty in sustaining competitive advantage, as well as about suitable, efficient, and affordable learning solutions. The investment required in order to develop personalised online training platforms and courses is often too high for many SMEs. The most common solution adopted is the purchase of off-the-shelf e-learning courses, with the standardised content. One of the approaches to tackle the abovementioned issue refers to do-it-yourself strategies. However, these approaches should be treated with caution, as professional involvement, including coaching and mentoring, is often needed in order to ensure a high-quality training course. Another approach would be to put a greater focus on supporting individuals. Thereby, public funding and incentives (such as individual learning accounts, incomes sharing loan agreements etc.) would reduce the burden on SMEs and offer better chances for all to get access to training and make lifelong learning a reality.

Regarding the adoption rate of online training, Member States demonstrate different levels of maturity. This can be explained by their level of infrastructure, their legacy, their perceived business value of learning and other factors. Internet connectivity levels and costs still significantly vary across the European Union. Mobile phone and social media usage, as well as ownership patterns also vary greatly. Nordic countries are reported to be the most advanced and are net exporters of online training solutions and learning technologies. The German market is the biggest and is growing rapidly. France has seen a considerable growth, which has recently slowed down. Spain is recovering and is actively exporting its solutions to Latin America. Eastern Europe has substantially benefited from the EU Structural Funds, and much of the necessary infrastructure has been put in place that facilitates the adoption of online training solutions. Strong market growth is forecasted for these countries for years to come.

At the same time, SMEs represent a highly diverse population, and the adoption rate significantly differs per sector and size. While some SMEs may be traditional and slow-paced, others are highly advanced when it comes to learning. Different SMEs have different learning requirements, associated with different technologies and different pedagogies. As such, the sheer diversity of SMEs suggests that there is no one size fits

all policy approach and that a multi-pronged strategy should be employed to address the learning needs of SMEs.

With regard to key players, the digital learning market in Europe remains immature. Single providers hardly ever take a lead in supporting the entire learning solutions portfolio. Most tend to be specialist providers, so it is difficult to purchase high quality solutions for all cases from one provider. Examples of full-service providers operating in Europe (i.e. the providers offering online training content, learning platforms to deliver that content, and the advice and support needed to make those solutions work) include Skillsoft, CrossKnowledge, Cornerstone on Demand, IMC, WillowDNA and SAP Successfactors[3]. Many of the providers active in Europe, however, are headquartered outside the EU. A clear trend can be observed with regard to preferred partnering between providers rather than trying to provide a whole set of digital learning solutions by one provider.

State-of-play analysis of relevant initiatives and strategies

The analysis of policy initiatives suggested that there are only a few initiatives in Europe focusing explicitly on promoting online training for SMEs. Many of them emphasise the importance of lifelong learning and imply combining different delivery mechanisms. They target a broader public, going beyond enterprises and including also educational providers, and working individuals in general. They have a national focus and pursue multiple objectives including promotion and awareness raising, dissemination of good practices, offering guidance and practical support, training and consultancy services, developing and maintaining an ecosystem of providers and users, offering training materials, providing financial support for upskilling etc. However, such initiatives often lack clear approaches for implementing their objectives and monitoring progress.

Online training content needs to be localised or adapted to the local context in various Member States to more effectively convey the relevant meaning in the target group. At the same time, localisation strategies are often associated with additional costs that many SMEs cannot afford. There is a need to look for alternative approaches that would be affordable and would ensure a better interconnectedness of the workforce. Examples refer to the use of Universal Design for Learning and the notion of social learning, implying active interaction of the workforce with peers, teammates and managers while following a non-localised course. Adaptation and localisation would be performed in a tacit form by the employees themselves through exchanges of feedback and experiences with others. This exchange could occur via existing online tools or in a physical setting.

The key factors influencing the development costs of online training include among others instructional and outline design, size of the application, media richness and complexity, data reporting and performance support functions, embedding environment and degree of sophistication and friendliness of navigation and user interactivity. Other relevant factors refer to standards compliance and usability testing. Some additional costs that need to be taken into account when developing online training include the cost of refining an online training solution and the cost of technology. When developing an online training solution, the critical first step is to fully understand the associated development costs and the decisions that will control those costs in order to achieve the key training objectives, within budget. On top of that, marketing and maintenance costs must be added to ensure promotion, market take-up and customer satisfaction.

3 Srivastava A. (2019) “Full-Service eLearning Companies”, Learning Light, see: https://www.learninglight.com/full-service-elearning-companies/

Multiple funding sources co-exist when it comes to financing the development and take-up of online training: private investment, venture capital, loans, public funding, public-private partnerships, bundled service agreements, micro financing, technology grants, bring your own device programs and user fees etc. A critical success factor is that the funding and business models need to be scalable and sustainable. Therefore, to achieve the goal of bringing employee training to a new paradigm of learning, investment in technology-enhanced learning cannot be a one-time effort, restricted to initial development and prototyping. There is a need to identify and prioritise the factors that make some online training offerings perform better than others on the market place, including the underlying funding and business models.

Latest innovations in online training pedagogies include learning through social media, learning through games, learning from the crowd, formative analytics, open textbooks, immersive learning, learner-led analytics, collaborative learning and rapid prototyping. In order to identify the conditions that would form the base for good online training experience, SMEs first need to perform an analysis of their needs and objectives of learning. The key characteristics generally include robust analysis, structured and interactive content, assessment opportunities, enjoyable and pleasant activities, and achievable milestones. Other relevant factors among others include visual stimulation, 24/7 accessibility, the use of real-life case studies, certification and accreditation.

The following main conditions to be fulfilled for a massive take-up of online training by SMEs were identified:

- Promoting attractiveness, pedagogical and learning relevance of online training;
- Identifying and promoting relevant and successful online training solutions (with clear benefits for both employers and employees), based on the needs of SMEs;
- Helping SMEs with capabilities to easily implement online training solutions;
- Supporting networks (including SMEs) and developing understanding of learning economics and joint human resource development programmes;
- Supporting pan-European cooperation (both sectoral and cross-sectoral) between enterprises, education and training providers and supporting structures, to foster greater transferability and flexibility in educational and training systems;
- Developing measures aiming at quality assurance and pan-European standards;
- Developing and promoting schemes for the assessment and recognition of online training in the academic and business sectors; and encouraging the use of micro-credentials.

Policy initiatives and funding programmes have been traditionally supply-oriented with consortia led by the academic sector. Nowadays, there is a need for more demand-led partnerships with a greater involvement of industry. This implies initiatives aiming at providing SMEs with solutions, information and guidance that match their needs; and at increasing their interest, benefits and motivation to use online training solutions.

Vision and top priority measures towards 2030

The vision and the supporting actions aim at increasing the capacity of industry, social partners, education and training providers and policy makers at all levels to successfully shape and manage the workforce transformation in Europe. Online training is, however, not a “silver bullet” solution for all training needs. In some cases, traditional training can still be needed or a blended learning format can be more appropriate.

The analysis clearly showed that there is no single best way to tackle the challenges. The population of SMEs is highly heterogeneous, demonstrating clear differences in terms of needs, opportunities and required approaches, depending on size, sector,

cultural and demographic characteristics etc. In order to be specific enough, the vision needs to cultivate a diversity and combination of approaches. As a result, the proposed vision has a multi-dimensional nature with four strands:

- Blue strand: refers to industry leadership, and addresses the intrinsic motivation of employers. It includes all measures aiming to inspire employers, to share good practices with them and facilitate exchange of experiences to help business leaders that recognise the value of learning for their organisations.
- Green strand: puts employees in the driver's seat and aims at the intrinsic motivation of learners. It refers to all measures aiming to enable the learners themselves to define their learning pathway and organise their learning processes; it gives leaners full control of their learning journey.
- Yellow strand: builds on the fact that most enterprises are reluctant to allocate time and resources to staff training (including online training). It includes all measures aiming to reward employers for stimulating (online) training and/or punishing for not doing that. In essence, employers are accountable for promoting learning.
- Red strand: builds on the fact that most people are reluctant to devote time and efforts to learn new skills and change their routines. It targets the extrinsic motivation of learners. It refers to all measures aiming to extrinsically motivate learners to engage in learning activities (including monetary rewards and non-monetary recognition). Employees are accountable for their learning.

The priority setting exercise, implying active stakeholder engagement, suggested that the vision needs to be formed with the elements of all the four strands, with the blue strand having a dominating position.

Top priority measures include the following:

- Establishing communities of practice for enterprises engaged (or considering to get engaged) in online training, where good practices and experiences can be exchanged by enterprises themselves;
- Setting up cooperation platforms (including small and large enterprises, training providers and support structures) with regard to anticipating skill needs for a certain sector or value chain, including dissemination of knowledge and sharing of good practices for identifying skill needs and online training solutions;
- Developing platforms for individual learning accounts and e-portfolios, portable from job to job and ensuring recognition of acquired skills;
- Encouraging the provision of tools for employees to have their personal learning environment centred around their own learning needs;
- Facilitating the recognition of prior learning and experience programmes in partnership with formal education institutions and awarding bodies;
- Developing learning in real situation, at the workplace, with the support of electronic performance support systems (EPSS);
- Providing spaces for experimentation and innovation at a collaborative level, i.e. online collaborative spaces for online training developers and practitioners, in which they can experiment and share good practices;
- Recognising staff loyalty and the contribution of employee's learning to the organisational performance, e.g. responsibility, career progression, awards etc. and making learning part of the regular employee and management review.

Ensuring a demand-led approach

The suggested top priority measures have a clear demand orientation, i.e. they aim to explicitly focus on the learners and their needs. There is no one-fits-all funding solution. The funding landscape needs to be diversified to be able to serve a wide variety of needs

and situations. Specific approaches that were identified for tackling the funding issue for SMEs include:

- Facilitating partnerships between enterprises and training developers to produce training with maximum relevance, share the cost and the profit; with a central role for the cluster organisations/industry associations as coordinators;
- Procuring specific online learning materials for enterprises from a certain sector or value chain by industrial associations and other professional bodies;
- Training enterprises to develop bespoke online courses themselves by means of accessible do-it-yourself strategies;
- Offering on-demand bespoke course development through government-funded initiatives;
- Creating lifelong learning and training accounts and e-portfolios for workers that would belong to workers and would be portable from job to job;
- Offering individual loans for adult learners to acquire/advance high-tech skills in a short reskilling or upskilling program;
- Exploring income sharing loans agreements and other alternative/complementary financial instruments.

For reaching out to the EU workforce, future initiatives should target supporting structures that have access to specific SME clusters/communities, namely industry associations and cluster organisations at the EU, national and regional levels. These supporting structures can play a central role in spreading the relevant information among specific enterprises, as they are already in close contact with them. Furthermore, these structures can act as initiators and facilitators of specific (online) training-related activities of SMEs from the corresponding clusters/regions/sectors.

To this end, a pivotal role in promoting (online) training opportunities among SMEs belongs to cluster managers and their teams. Skills-related aspects should have a top priority in cluster policies. Specifically, cluster mechanisms could be effectively used for the following activities, as examples:

- Setting up local help-desks offering (free or subsidised) professional support and guidance for enterprises regarding the development and implementation of their learning strategies;
- Offering coaching services to SMEs for skills profiling and analysis;
- Organising free or subsidised external support to SMEs with identifying relevant learning resources;
- Providing a scheme for SMEs to benchmark their learning strategies and outcomes against similar organisations in their cluster;
- Facilitating partnerships between training providers and enterprises (including learners themselves) in order to develop relevant training etc.

To conclude, following a demand-led approach and serving a highly diversified market requires systems that support just-in-time just-for-me learning solutions for vast numbers of individual learners and groups. There is a need for learning ecosystems, catering the specific needs of individuals, groups, enterprises, value chains and clusters. Learning ecosystems and platforms augmented by artificial intelligence would need to facilitate access of learners to relevant personal learning solutions from any suitable sources. They would also need to include guidance, coaching, assistance, assessment, validation and certification of learning outcomes with developing personal learning and career paths in connection with attractive job opportunities during the whole professional career.

Glossary

For framing the scope and the context of this report, some key terms require clarification.

Europe

This term refers explicitly to the European Union and its Member States.

Online

In the context of online training, the term "online" here refers to the use of digital technology in a broader sense and it is not limited to web-based solutions (e.g. it also includes native apps, Virtual/Augmented reality (VR/AR) solutions, gamification etc.). It is similar to the terms "technology-enabled", "digital learning technology" and "educational technology".

Training

Training here refers to an organised activity aimed at conveying information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge or skill[4].

In this report, training and learning are used interchangeably. The term "training" here goes beyond the scope of formal learning activities, and also covers non-formal learning that may occur at the initiative of the individual, or happen as a by-product of other organised activities, whether or not the activities themselves have learning objectives[5]. Training may include on-the-job learning, mandatory certification, tutorials shared over blogs/forums and other non-traditional means that reflect the learning reality of modern SMEs.

Online Training

Online training here goes beyond the scope of similar terms such as Computer-Based Training (CBT), distance learning, or e-learning that take place on the Internet. Instead, it can be defined as training that is delivered, enabled or mediated using digital technology, associated with learning scenarios and interactive activities, for the explicit purpose of training, learning or development in organisations[6]. In this regard, the term "online training", as used in the context of this report, is similar to the term "Technology-Enhanced Learning" (TEL) (other identical concepts include Technology-Enabled Learning, Technology-Intensive Learning, Technology-Integrated Learning).

Online training here refers to a wide range of digital learning solutions related to bespoke and off-the-shelf e-learning, Massive Open Online Courses (MOOCs), Open Educational Resources (OER), video content, mobile learning (or m-learning), and more recently Virtual/Augmented reality (VR/AR), gamification, Artificial Intelligence (AI) solutions etc.

4 http://www.businessdictionary.com/definition/training.html
5 Based on OECD, Recognition of Non-formal and Informal Learning, see: http://www.oecd.org/edu/skills-beyond-school/recognitionofnon-formalandinformallearning-home.htm
6 Based on the definition from EU15 Ltd (2016) "SMEs & e-learning (SMEELEARN) – e-learning Best Practice Guide", Erasmus+ project nr. 2014-1-UK01-KA202-001610

The emphasis needs to be put not on the workforce training with a digital component, but rather on the fact that the world itself becomes increasingly digital and hence the workforce training should remain relevant in that context. In other words, "online training" is not a simple matter of digitising existing material and making it available online, but more fundamentally responding to the new opportunities and challenges made possible by digitalisation. Training that is relevant to the increasingly digital world will touch on digital/online topics in their learning content, and will also differ from traditional learning in terms of delivery media.

Lifelong learning

In this report, lifelong learning and continuous learning are used interchangeably. Lifelong learning refers to the ongoing, voluntary and self-motivated pursuit of knowledge[7] in the context of a rapidly changing environment with the possibility of some skills losing value and new skills gaining value over time. Continuous learning recognises that there is no longer a clear distinction between a place of learning (e.g. a school) and a place of application (e.g. a factory), but instead learning can happen anytime anywhere on a daily basis, whether or not it is in the form of formal, informal or self-directed learning.

Learning here refers specifically to the learning process from the point of view of an individual learner, and it may include not just the learning materials, but also the attitude, culture and environment of the learner. It should also be highlighted that learning may be sought for multiple personal and professional reasons, not just for the sake of improving economic opportunities. Learning may also help improve social inclusion, self-sufficiency and personal development.

Small and medium-sized enterprises (SMEs)

In line with the definition[8] used in the European Union, the current report defines SMEs as enterprises which employ less than 250 people and which have an annual turnover below 50 million EUR, and/or an annual balance sheet total not exceeding 43 million EUR. The current report focuses primarily on high-tech SMEs. SMEs represent a highly heterogeneous population. In terms of size, the report distinguishes between micro (up to 10 employees); small (10 - 50 employees); and medium (51 – 250 employees) enterprises.

The digital maturity of SMEs may considerably vary depending among others on the country/region/city they are based in, the value chains/sectors they participate in, their internal company culture and historical background etc. SMEs, and the workforce in general, are undergoing a bigger transformation driven by a wide range of technological, social, economic and political factors, and the topic of learning in a digital world needs to be addressed in this bigger context. While some SMEs may be traditional and slow-paced, others (particularly knowledge intensive start-ups) are highly dynamic and advanced when it comes to learning. Different SMEs have different learning requirements, associated with different technologies and different pedagogies. As such, the sheer diversity of SMEs suggests that there is no one size fits all policy approach and that a multi-pronged strategy should be employed to address the learning needs of SMEs.

7 Based on Department of Education and Science (2000) "Learning for Life: Paper on Adult Education", Dublin: Stationery Office

8 https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

Workforce transformation

The stated goal of this report is to propose a vision and related supporting actions aimed at increasing the capacity of industry, social partners, education and training providers and policy makers at all levels to shape successfully the workforce transformation in Europe. Here, the workforce transformation refers to the necessary response to the accelerating growth of productivity, information sharing, mobility and collaboration, evidenced by the rapid pace of technological advances and made possible by digitalisation and other related trends. In this rapidly changing environment, success goes to the most agile and innovative players. As such, the objective of the workforce transformation is to groom enterprises to be able to take full advantage of resources in the ecosystem and continuously evolve to be able to survive, succeed and keep growing.

Upskilling

The term “upskilling” here implies advancing existing skills in order to be able to do the current job better.

Reskilling

The term “reskilling” here refers to learning new skills for a new job.

1. INTRODUCTION

The Final Report[9] presents the key results of the initiative, and specifically covers the activities carried out in the period from October 2017 until May 2019. The report contains the fine-tuned results of the state-of-play analysis in the European Union (EU) with regard to the adoption of online training solutions by SMEs, particularly the ones active in high-tech domains. The report presents the description and in-depth analysis of the market and the policies and initiatives on online training for the workforce in specific EU Member States, as well as the vision and recommendations for implementation. The vision includes specific measures, roles and priorities at the EU and national levels for implementation towards 2030 and beyond. The report aims to support the orientation of the future actions in the field of online training, upskilling and reskilling of the European workforce at the EU and national levels.

1.1. Context and objectives

Enterprises of all sizes face challenges related to digital transformation and the associated technological and non-technological developments, including automation, Artificial Intelligence (AI), gig economy, ageing population etc., all of which define the future of work. Forward-looking enterprises start taking a proactive role in adapting to the requirements of the digital world[10]. Developing skills that meet the needs of the changing economy is crucial for company survival, and it is unavoidable for ensuring business success and growth. *Annex D* of this report aims to illustrate the types of new skills and competences that are expected to be vital for the digital workplace in the coming decade.

It is still uncertain how future skill requirements will look like and how jobs will be affected. However, it is certain that every single company will be affected. In order to anticipate change and be prepared, enterprises need to develop a new mind-set and embrace a culture of learning. There is a need for an environment where employees are continuously advancing their skills, where the pace of upskilling and reskilling is aligned with the pace of change in the 'outside' world, where workplace is recognised as a learning place, and where learning is viewed as investment rather than cost.

Developing a sustainable culture of learning represents a tough challenge on its own. It is particularly difficult for SMEs, having to deal with severe budget constraints, limited capacity, fierce competition for talent and extreme time pressure. There is a need for new models, solutions and approaches that would match the realities of modern SMEs and that would enable them to ensure continuous upskilling/reskilling of their employees. Online training solutions offer promising opportunities in this respect.

SMEs could use online training as a more cost-effective and efficient way to educate staff. Online training is also associated with high levels of flexibility and easy access, which are also of key importance for small enterprises. Online training here refers to a wide range of digital learning solutions related to bespoke and off-the-shelf e-

9 This document represents the **Final Report** for the "Promoting Online Training Opportunities for the Workforce in Europe" initiative (contract Nr. EASME/COSME/2017/001; hereafter "Online Training" initiative), prepared by PwC EU Services (hereafter "PwC") for the Executive Agency for Small and Medium-sized Enterprises (hereafter "EASME") and the Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (hereafter "DG GROW") of the European Commission (hereafter "the Commission"). The service contract was carried out by PwC EU Services with support of the European Distance and E-Learning Network (EDEN) and Espace Mendès France (EMF).

10 Tham M. (2019) "Why A Digital Learning Strategy Is Crucial For Success", eLearning Industry, published on 11 April 2019, see: https://elearningindustry.com/digital-learning-strategy-crucial-success

learning, including video content, mobile learning (or m-learning), MOOCs, and more recently virtual/augmented reality, gamification, AI solutions etc. Online training here also includes Open Educational Resources (OER). *Annex B* of this report provides a detailed overview of digital learning technologies and their maturity.

Text box 1-1: Key benefits of online training

Some **key advantages**[11] that online training brings to workforce training include:

- **Flexibility**: online training materials may be made accessible to the workforce throughout the day. This makes it possible for employees to learn the subject at their own pace and in comfortable settings.
    - Fast learners may complete their training sooner and this enhances productivity.
    - Given that present day employees work out of different time zones, a learning tool that is available 24/7 makes it possible for the employers to offer staff training without a constraint on resources.
- **Improved Pedagogy**: studies have shown that *gamification* enhances learner engagement and improves retention.
    - Online training also helps with the use of *personalised* study materials and interactive formats. From the perspective of the employer, they may now reliably use learning tools to match competencies with the learning goals achieved by the employee.
- **Enhanced Collaboration and Reach**: it is possible to gain instant reach to staff and trainers from all parts of the world.
    - Online training enables teams from various geographies to collaborate on problem-solving challenges in real-time. It is a win-win for the employer and the staff undergoing training.
- **Reduced Waste & Cost-Effectiveness**: businesses no longer have to spend on commutation, and classroom & infrastructure rentals. Trainer costs are typically one-time since the same material may be reused for multiple batches of learners. Since all materials are in electronic format, paper consumption is significantly reduced.
- **Suitability for digitally savvy learners**: there is an increasing population of employees in the workforce who have grown up around the internet and modern technologies[12]. These employees are highly familiar with these tools and use them in both personal and professional contexts daily. As such, they are also aware of non-traditional learning via digital media.
    - With online training, the knowledge is always available at the employee's disposal – this gives them better access to subjects they are interested in and not necessarily those that would benefit them at work. Not only does this benefit the

11 Based on K. Venkatesiah (2015) "Top 5 Benefits Of Using eLearning Tools For Staff Training", published in eLearning Industry on 14 January 2015, see: https://elearningindustry.com/benefits-of-using-elearning-tools-for-staff-training

12 https://cloudblogs.microsoft.com/industry-blog/en-gb/cross-industry/2019/06/07/how-to-recruit-digital-savvy-generations/

learner, but is also a promising human resource asset to ensure *employee retention*.

- Businesses that enable access to valuable e-learning subjects to their staff enjoy better loyalty from such employees who have a *greater sense of accomplishment* at their workplace.

- **Scalability**: online training enables employers to quickly create and communicate new policies, training, ideas and concepts. It also allows achieving a great degree of coverage of the target audience, and ensures that the message is communicated in a consistent fashion. This allows all learners to receive the same training[13].

- **High Learning Retention**: *blended learning approaches* result in a higher knowledge retention rate. It also helps refresh and update the learning materials whenever needed[14].

Despite all the benefits of online training, **its adoption by European SMEs happens at a slow pace**. The key barriers for adoption among others include lack of motivation of learners, lack of knowledge about the opportunities offered by online training, lack of commitment of senior management and lack of good HR development policy[15]. At the same time, the consulted stakeholders suggest that technology increasingly becomes a "second-order problem". Small enterprises are now uniting into clusters, the role of trade unions starts decreasing. The mind-set of today's start-ups is completely different from small enterprises from a few years ago. The role of learning providers is changing, with centralised top-down approaches shifting towards decentralised bottom-up learning. Learners themselves become increasingly engaged in generating knowledge, with the growing importance of peer-to-peer learning. **Many of the approaches and solutions for online training that exist today do not reflect the learning realities and needs of modern SMEs**.

Therefore, there is a need for a good understanding of how SMEs could be convinced about the benefits of online training and how they could successfully take up these new systems, which would, in turn, help them survive in this rapidly transforming world. An exploration of SME needs and effective approaches should be performed (e.g. compliance with General Data Protection Regulation (GDPR), learning together with their potential customers etc.), including the ways how these needs could be met by online training solutions.

To this end, EASME and DG GROW of the European Commission have launched the Online Training initiative. This initiative aimed **to explore the role of online training in tackling the skills-related challenges in Europe, with a particular focus on high-tech SMEs**. It implied performing an extensive state-of-play analysis, developing a vision and formulating recommendations for supporting measures. Examples of questions it aimed to address included the following:

- What exactly needs to be done and by whom to stimulate the uptake of online training in Europe?

- How should the funding of online training-related initiatives be organised?

13 https://www.learningpool.com/resources/advantages-of-e-learning/
14 *Ibid*.
15 Roy, A. (2015) "Barriers to e-Learning in SMEs—Are they Still There?", E-Learning-Instructional Design, Organizational Strategy and Management, InTech

- How can online training best complement other (more traditional) forms of training?

- What are the most promising ways of reaching out to the workforce, to engage them into online training?

The outcome of this initiative will support the future EU policy making regarding online training.

1.1.1. General objective

The **general objective** of this initiative was to identify successful approaches to deliver new skills related to high technologies, based on online education and training tools, and to foster the uptake of good practices.

The initiative specifically aimed **to identify key trends, developments and best practices in the field of online training for the workforce with a particular focus on the needs of SMEs**. Another important goal was **to identify key stakeholders and experts and bring them together** in order to jointly identify key challenges, develop a shared vision and solutions and share and scale-up best practices.

The ultimate ambition was **to better anticipate and manage change and to ensure collectively that individuals can be upskilled/reskilled regularly to acquire the right skills at the right time at affordable conditions** with a view to face the significant challenges of the impact of digital and key enabling technologies on employment and the future of work.

The initiative aimed **to identify specific actions and measures that would allow online training to "take off"** and be ready to address the considerable skills challenge which is predicted, especially when it comes to SMEs. It is important to help enterprises and individuals to make proper choices regarding reskilling/upskilling issues. There is also a need to identify appropriate funding and brokerage mechanisms to share and exchange solutions.

The main **target group** of the initiative refers to enterprises, especially **SMEs**. The initiative aimed to specifically target professionals, managers, leaders and entrepreneurs in SMEs (including start-ups and scale-ups) that would benefit from online training to acquire and/or update their skills. This was done in the context of the transformations generated by Advanced Technologies.

The results aimed to inform policy makers and social partners about effective policies, partnerships, and initiatives on online training for the workforce. To this end, the initiative aimed to offer key stakeholders the relevant strategic intelligence, as well as serve as a source of inspiration and impetus for further action.

1.1.2. Specific objectives

The specific objectives of this initiative were as follows:

- ***Objective 1:*** **collecting through desk research the latest information and data** with a view to provide a clear, well-structured and comprehensive description

of the state-of-the-art concerning online training opportunities for the workforce and SMEs in Europe[16];

- ***Objective 2:*** performing an **in-depth analysis** and getting **feedback** on the findings (via online surveys and interviews) from key stakeholders and public authorities and gathering their views;

- ***Objective 3:*** **assessing and better understanding** in which ways existing policies and on-going initiatives could be enhanced and scaled up to improve the availability, quality and affordability of online training for the benefit of the workforce and SMEs;

- ***Objective 4:*** **identifying, documenting and supporting the uptake of best practices**; proposing the setting-up of dedicated exchanges and cooperation mechanisms that could contribute to facilitate large-scale adoption of best practices and the management of change; promoting networks, partnerships and greater cooperation;

- ***Objective 5:*** **identifying and proposing concrete measures** to stimulate innovation in pedagogies (including online learning and training design and assessment) and better use of online technologies for education and training;

- ***Objective 6:*** **proposing adaptation and localisation strategies** to leverage the full potential of online training while addressing the dimensions related to diversity, equity and accessibility (diverse languages, cultures, pedagogies and infrastructures etc.);

- ***Objective 7:*** **elaborating a vision** with all relevant stakeholders[17] (public and private) for a long-term agenda and a roadmap. It includes specific measures, roles and priorities at the EU and national levels for implementation towards 2030 and beyond;

- ***Objective 8:*** **preparing and delivering an interim report** presenting the results of the analysis and the state-of-play in Europe, as well as, a vision;

- ***Objective 9:*** **documenting best practices**, i.e. the most relevant policies and initiatives at the EU and national levels;

- ***Objective 10:*** **preparing and delivering a final report**, including the state-of-play, a vision, roadmap, best practices and recommendations. This report aims to feed into the orientation of future actions in this field at the EU and national levels;

- ***Objective 11:*** producing a high-quality brochure for the **dissemination** of results.

1.1.3. Stakeholder engagement

The inputs for the analysis in the context of this initiative were collected with an **active engagement of all key stakeholder groups**. The latter refer to industry professionals and hands-on practitioners, including course developers, publishers and users, as well as supporting organisations and policy makers, with a shared interest in technology-

16 This objective implied reviewing the relevant information to constitute an initial solid basis of evidence and prepare the collection of new material

17 Engaging a broader ecosystem of stakeholders and potential beneficiaries is crucial for generating ideas and validating the vision and proposals for action

enhanced learning. Data collection and analysis were based on six high-level expert workshops, sixty in-depth expert interviews, two pan-European online surveys and an additional stakeholder consultation via direct email and phone contacts. These efforts were complemented by extensive desk-research. Below we specifically highlight the outcomes of each of the expert workshops.

The first expert workshop – held in Brussels on 20 March 2018 - focussed on the **key challenges and solutions** for promoting online training among SMEs in Europe. One of the key conclusions of the workshop was that the existing policies and programmes have been mainly supply-oriented, while there is a clear need for demand-oriented initiatives. The latter imply initiatives aiming at raising awareness of SMEs regarding the benefits and opportunities of online training and increasing their motivation to use it.

The second expert workshop – held in Genova on 18 June 2018 - aimed to address the abovementioned need for a paradigm shift, and specifically to elaborate on a **demand-led strategy** for promoting online training among SMEs in Europe. The workshop featured good practice examples of existing demand-oriented initiatives and addressed the corresponding implications for the vision and specific necessary support measures. During this workshop, the topic of personalisation of online training for SMEs was raised, as one of the key points of attention.

The third expert workshop – held in Brussels on 2 October 2018 - aimed to further explore in detail how European SMEs can be best supported with the **personalisation** of their online training experiences, and specifically what role education/training providers and policy makers should play in this process. During the workshop, it was emphasised that there is a need to develop a “value proposition of learning” that would outline the key benefits that both employees and employers would get from learning. Due to heterogeneity of SMEs, there is a need to adopt a sectoral/clustered approach. Special attention needs to be paid to assisting learners with the development of their learning strategies and the ability of learners to articulate the desired learning outcomes.

The fourth expert workshop – held in Berlin on 5 December 2018 – aimed to further address specific support measures **to stimulate the uptake** of online training by SMEs in Europe. The notion of a learning ecosystem was highlighted as being of key importance (e.g. a need to shift from a notion of ego-based towards eco-based learning, a need for a holistic approach when designing policy measures, a need to acknowledge the roles of all key stakeholder groups and how they are interrelated etc.). It highlighted a need to see online training as part of a bigger picture, and a need to develop suggestions for support measures with a good understanding of how these online training solutions fit this bigger picture and are interrelated with other processes within SMEs and outside.

The fifth expert workshop – held in Brussels on 12 February 2019 - specifically addressed the notion of **the learning ecosystem** and the need for a holistic approach when tackling the learning-related issues of SMEs. It was concluded that learners themselves become increasingly engaged in generating knowledge, with the growing importance of peer-to-peer learning. There is wealth of existing competencies that are not visible to employer or community. The availability of public funding creates a dependency culture, which is opposite to entrepreneurial culture and hampers sustainability. Thematic networks represent a promising option. These networks, however, should not have an EU-funded project form, but should instead have a self-sustaining funding mechanism.

The sixth expert workshop – held in Brussels on 2 April 2019 - aimed to collect inputs for policy makers and practitioners on the effective measures for promoting online training among SMEs, i.e. the **measures that reflect how SMEs operate and learn**, and that would truly support SMEs with their learning journey. It was concluded that there is a

need for personal learning options and batching learning into small chunks for easy pick-up-and-learn outcomes, i.e. just-in-time and just-for-me learning; a mechanism for recognising new competences and certification; mentorship programmes; peer-to-peer learning mechanisms within and between enterprises; and support with skills profiling and analysis.

The final conference took place in Brussels on 4 June 2019. It brought together policy makers, education & training providers, practitioners, and supporting organisations from all over Europe and beyond, to share promising solutions, best practices and policy measures. During the conference, it was emphasised that SMEs represent a highly diverse population, and future policymaking needs to respect these differences. A four-dimensional vision was presented, tailored to the needs of both employers and employees, as well as addressing both intrinsic and extrinsic motivation of these target groups. The presented top priority measures among others included establishing and facilitating communities of practice; developing platforms for portable personal learning accounts; setting up multi-stakeholder collaboration platforms for anticipating skill needs and exchanging experiences; as well as providing spaces for experimentation and innovation for online training developers and practitioners. A pivotal role in promoting (online) training opportunities among SMEs belongs to cluster organisations.

The key conclusions of the workshops and the final conference are incorporated into the analysis throughout the report.

1.1.4. Project design

The tasks of this initiative were grouped into three Work Packages (WPs) corresponding to the two main phases of 12 months each (see Figure 1-1).

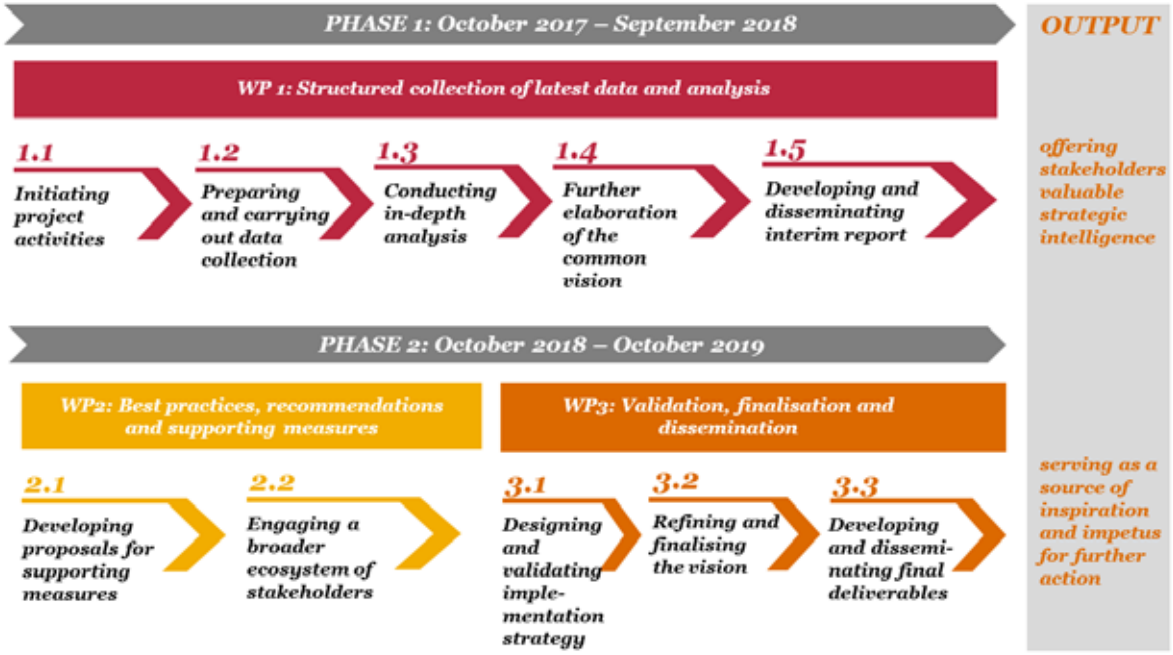

FIGURE 1-1: Project design

The **first phase** was dedicated to the collection and the analysis of the latest information and data based on desk research, online surveys, workshops, interviews of key stakeholders. The interim report presented the results of this analysis, including the state-of-play in the EU and a vision on the promotion of online training opportunities for the workforce in Europe. The objective of the first phase was to achieve a better

understanding of the context and the status quo regarding the adoption of online training by SMEs in Europe. Special attention was paid to identifying the key challenges and barriers, as well as good practice examples. The collected analytical base then served as a platform for developing specific measures and recommendations during the second phase of the initiative.

The **second phase** concentrated on systemising best practices, engaging a broader ecosystem of stakeholders, elaborating recommendations and proposing concrete supporting measures, based on the knowledge base accumulated during the first phase. The final report aims to provide a basis for future actions at the EU and national levels in this field.

1.2. Report structure

The Final Report is structured as follows. *Chapter 2* provides an updated state-of-play description of the online training market in Europe. It includes the analysis of market drivers, trends and dynamics. It also addresses the issue of availability, quality and affordability of online training for SMEs in Europe. The results of the analysis of the popularity of online training among SMEs in different EU Member States are provided. Finally, the chapter also elaborates on key players and cooperation mechanisms. *Chapter 3* presents the updated state-of-play descriptions of relevant initiatives, strategies and publications. It also addresses the main adaptation and localisation strategies. The topic of development costs and funding models is examined. This chapter also contains the analysis of the latest innovations in pedagogies, the criteria for good online training for SMEs and the main conditions to be fulfilled for a massive take-up of online training by SMEs. *Chapter 4* presents the vision and top priority measures, and it is based on the outcomes of stakeholder consultation. The vision includes specific measures, roles and priorities at the EU and national levels for implementation towards 2030 and beyond. Finally, *Chapter 5* provides the overall recommendations with regard to appropriate funding mechanisms, relation with the more traditional forms of training and promising ways of reaching out to the workforce.

Annex A contains a list of stakeholders that have been consulted by means of expert workshops and in-depth interviews.

Annex B provides an overview of Digital Learning Technologies and their maturity.

Annex C addresses the State of play of online training in specific Member States.

Finally, *Annex D* aims to illustrate the types of new skills and competences that are expected to be vital for the digital workplace in the coming decade.

2. STATE-OF-PLAY DESCRIPTION OF ONLINE TRAINING MARKET IN EUROPE

The current chapter provides a state-of-play description of the online training market in Europe. It specifically addresses the key market drivers, trends and dynamics, as well as a topic of availability, quality and affordability of online training for SMEs. The chapter also covers the analysis of the adoption rate of online training among SMEs in different EU Member States. Finally, it addresses the key players and cooperation mechanisms.

2.1. Market drivers, trends and dynamics

This sub-section addresses the key trends on the online training market, including key drivers and dynamics.

2.1.1. Market size and growth rate

Reporting on the market statistics of online training-related activities is a challenging exercise. The challenges stem, first of all, from the use of different terms (e.g. online training, e-learning, computer-based training, technology-enhanced learning etc.) and corresponding definitions by different data sources. Secondly, terms like “e-learning” and “computer-based training” become increasingly outdated. Thirdly, some market analyses cover the whole population of users (including academia and corporate world), while others focus only on specific segments (with hardly any sources reporting explicitly on the situation for SMEs), which makes it problematic to compare data from different sources. Furthermore, the existing analyses may often present only part of the picture, as many learning providers do not specifically advertise themselves as online training providers, even though some of their offerings may include digital/online delivery media. As a result, the statistics referenced below are of illustrative rather than conclusive nature.

According to Statistics MRC, the global e-learning market is estimated[18] to grow at **a CAGR** (Compound Annual Growth Rate) **of around 9.5%** over the period 2017-2026. The global e-learning market accounted for 176 billion USD (157 billion EUR) in 2017 and is expected to reach approximately 398 billion USD (355 billion EUR) by 2026[19]. The growth can be explained by the growing demand for flexibility in learning, low cost, easy accessibility, and the increased effectiveness of animated learning. Furthermore, escalation in number of internet users and a growing access to broadband in combination with an increasing use of smartphones are also actively supporting the market growth[20].

The corporate e-learning sector is estimated to grow the fastest over the forecast period, boosted by the demand for cost- and time- effective solutions[21]. There is a growing demand for content covering compliance and IT management, as well as industry-related courses. On the other hand, factors such as change management, technology obsolescence and vendor-developer partnerships are stated to be major restraints hindering the growth of the global e-learning market[22].

18 This estimate refers to both academic e-learning and corporate e-learning. Depending on technology, market is segmented into Learning Management System (LMS), mobile e-learning, application simulation tool, rapid e-learning, podcasts, learning content management system, virtual classroom knowledge management system and other technologies.

19 See: https://www.globenewswire.com/news-release/2019/01/30/1707624/0/en/Global-E-Learning-Market-Outlook-Report-2018-Market-is-Expected-to-Grow-from-176-12-Billion-in-2017-to-Reach-398-15-Billion-by-2026.html

20 See: https://www.researchandmarkets.com/research/pqwzjc/global_elearning?w=12

21 *Ibid*.

22 *Ibid.*

Based on the research by Technavio, the e-learning market in Europe is forecasted to grow at a CAGR close to 15% during the period 2019-2023[23]. This figure, however, refers to both academic and corporate e-learning. No publicly available data was identified on the actual or forecasted e-learning market size specifically for Europe and specifically for corporate e-learning (let alone for SMEs). **The overall EU corporate training market is forecasted to grow at a CAGR of 9.06% between 2018 – 2022[24]**. However, this figure includes all types of corporate training, and not exclusively online training.

The corporate training market (which is much broader than online training alone) in Europe **is one of the most dynamic markets** due to the presence of multiple training solution providers and training professionals. The market is also more fragmented and specialised than in other global regions, and players are designing solutions for specific requirements like problem-solving, behaviour-developing skills, and other non-technical skills[25]. The analysists also predict that the corporate training market in Europe will soon be enlarged by new players and providers, and that it will see a rise in training organisations that deal with specific industries[26]. Market analysts predict that the rise of demand for continuous learning in Europe will increase the adoption of different learning methodologies and products. However, factors related to change management, technology obsolescence and vendor-developer partnerships are major restraints that are hindering the growth of this market[27].

According to Ambient Insight, **the self-paced e-learning market size in Western Europe was around 8 billion USD (6.8 billion EUR) in 2016, while the Eastern Europe market was around 1 billion USD (0.85 billion EUR)**[28]. However, this figure represents only part of the total online training market in Europe. The key reason for market growth in Europe can be linked to the **increasing adoption of these solutions by SMEs**[29].

No exact figures were found for the actual or forecasted online training market size specifically for European SMEs. Moreover, due to the limitations described earlier, it would be challenging to identify high-confidence patterns to underpin strategic decisions. As such, no firm conclusions can be made regarding the extent to which this growth can be attributed to the growing adoption of online training solutions by SMEs. While there is some indication that this adoption is increasing, it is unclear how fast it is happening and what the future forecast looks like. Therefore, future research efforts need to be allocated to exploring the market size and trends explicitly for online training in SMEs.

2.1.2. Key trends in online training

The learning landscape today looks completely different than it did five years ago. Modern learners expect content (and the learning approach overall) to be short and personalised and are more committed to their learning goals[30]. These trends indicate the need for change for both content and technology in the learning space. The need now exists for learning solution providers to visualise what has not been seen before and

23 https://www.businesswire.com/news/home/20190107005412/en/E-learning-Market-Europe-2019-2023%C2%A0-15-CAGR-Projection
24 Based on market research by Technavio, see: https://www.researchandmarkets.com/reports/4581824/corporate-training-market-in-europe-2018-2022
25 https://www.docebo.com/blog/elearning-eu-industry-based-training/
26 *Ibid*.
27 *Ibid*.
28 *Ibid*.
29 *Ibid*.
30 Basu S. (2017) "5 Technology-Enabled Learning Trends In 2017", published in eLearning Industry on 15 February 2017, see: https://elearningindustry.com/5-technology-enabled-learning-trends-2017

formulate **solutions that blend modern learning with traditional and personalised learning experiences** and bring these at par with contemporary mobile applications and just-in-time learning methods[31].

The technology-enabled learning trends that will have a significant impact on the learning ecosystem in the workplace include the following.

Trend 1: Traditional e-learning is in steep decline

The anticipated growth of the overall online training market does *not* stem from the "traditional e-learning". According to the study by Ambient Insight Research (2016)[32], the global CAGR for *self-paced e-learning* products is clearly *negative*, at -6.4 percent over the next five years[33]. Self-paced e-learning products include online courses, managed education services, managed training, e-books and learning management systems.

One of the key drawbacks of the traditional e-learning approach is that it often relies on massive amounts of information, while not offering a mechanism for guiding learners further along the learning journey. Learning and Development managers need to completely rethink their approach to training. They need a solution that **focuses on the learners themselves** – what they want, how they behave and what they can contribute[34].

No publicly available figures were found on the trends in the adoption of traditional e-learning specifically for European SMEs.

Trend 2: The growing need for micro-learning

Learners expect content that is consistent with the new format of digital learning, namely short, relevant, contextualised, and personalised, on their mobile devices. While most learning leaders identify with this trend, not many of them actually apply micro-learning. That is because micro-learning solutions require design and technology, which most existing platforms, authoring tools, and processes do not fully support. **Most organisations today are dealing with challenges in technology infrastructure and established design best practices that prevent them from adopting micro-learning quickly**[35].

Micro-learning goes beyond content, and makes it possible to learn on-the-go in small specific bursts. To this end, micro-learning offers small businesses an opportunity to approach employee training in a whole new way[36]. However, small enterprises may need support with exploring the available micro-learning programs and strategies.

Trend 3: Rapid growth in mobile learning

31 Basu S. (2017) "5 Technology-Enabled Learning Trends In 2017", published in eLearning Industry on 15 February 2017, see: https://elearningindustry.com/5-technology-enabled-learning-trends-2017
32 http://www.ambientinsight.com/Default.aspx
33 Chang R. (2016) "Global E-Learning Market in Steep Decline, Report Says", published in Campus Technology on 9 January 2016, see: https://campustechnology.com/articles/2016/09/01/global-elearning-market-in-steep-decline.aspx
34 Denny J. (2017) "Traditional eLearning Is Dead…", published in eLearning Industry on 21 February 2017, see: https://elearningindustry.com/traditional-elearning-is-dead
35 Basu S. (2017) "5 Technology-Enabled Learning Trends In 2017", published in eLearning Industry on 15 February 2017, see: https://elearningindustry.com/5-technology-enabled-learning-trends-2017
36 Emerson M. (2015) "How to Handle Employee Training in Your Small Business", published on 10 November 2015, see: https://succeedasyourownboss.com/how-to-handle-employee-training-in-your-small-business/

Mobile learning or m-learning also suggests to be a suitable option for SMEs. Most people have access to at least a smartphone, and people often have multiple mobile devices. With an audience supplying their own hardware, the cost of implementing m-learning programs becomes more affordable than other alternatives. Furthermore, m-learning also allows employees to feel an extra level of responsibility for their training, since their training modules are literally always in their hands[37].

There is a common misconception that m-learning is only relevant for large enterprises. However, "the mobile app revolution" is suggested to have an especially powerful impact on small businesses, as it helps these enterprises reduce expensive, redundant processes and makes them leaner and more cost-efficient. Some apps offer free versions to small business owners to help them better train their employees[38].

Trend 4: The rise of real-world learning

Apart from making learning engaging, there is a need to bring learners closer to the "real world". Virtual/Augmented Reality (VR/AR), as it has the ability to close infrastructure gaps, will have an increasing impact on how organisations can achieve that[39]. Some enterprises are now using VR/AR technologies to increase sales effectiveness, educate customers, and establish brand recall. Different VR/AR cases and requirements are expected to emerge over several other areas in the coming years[40].

Small businesses can now also leverage on VR/AR solutions to advance experiences of their customers. Due to the initially high cost of the relevant equipment, these technologies were not always affordable to SMEs. However, as the technologies become more mature, the cost of the equipment will continue dropping further[41].

Trend 5: The effectiveness of gamification

Gamification has proved to be an effective strategy for employee engagement. A vast majority of learning teams use gamification as a component of their digital learning strategy. The use of gamification in learning solutions is expected to grow in the coming years[42].

While many of the enterprises adopting gamification are large enterprises, it is also suitable for small businesses and start-ups. Gamification has a good fit with the unique office culture of start-ups[43]. One of the main reasons why small businesses hesitate to explore gamification is the fear that these systems will be expensive, and difficult to introduce. However, the gamification market is becoming more specialised every day, leading to more affordable "turn-key" gamification solutions that are also feasible for SMEs[44].

Trend 6: Increasing role of social learning

37 Balls A. (2017) "Why Use Mobile Learning for a Multigenerational Workforce", published on AllenComm on 30 November 2017, see: https://www.allencomm.com/blog/2017/11/mobile-learning-workforce/
38 *Ibid*.
39 Basu S. (2017) "5 Technology-Enabled Learning Trends In 2017", published in eLearning Industry on 15 February 2017, see: https://elearningindustry.com/5-technology-enabled-learning-trends-2017
40 *Ibid*.
41 My Smart Gadget (2016) "Virtual reality for small business", published on 16 September 2016, see: https://mysmartgadget.com/virtual-reality-for-small-business/
42 *Ibid*.
43 Watson Z. (2014) "5 Gamification Companies for Small Businesses", published on Technology Advice on 26 March 2014, see: https://technologyadvice.com/blog/marketing/gamification-for-small-businesses/
44 *Ibid*.

Social learning theory suggests that learning is a cognitive process that can occur in a social context even purely through observation of behaviour of others in real world contexts[45]. In modern workplaces, collaboration is becoming a mainstream tool to engage employees, enable for smarter decision-making and enhanced business outcomes. Collaborative networks are shortening the time-to-business and cutting costs to drive employee engagement and transparency. **Social learning** has a clear role to play as learning teams build and deploy the modern learning technology in the organisation[46]. In fact, since teams are working so collaboratively, the opportunities for on-the-job social learning are only increased due to exposure.

As an example, the Design Sprint method is now used routinely as a standard innovation process in many enterprises[47]. The method involves bringing together small teams of 5-7 people, preferably with different profiles and skillsets, to rapidly ideate innovative ideas in just 4-5 days, ending with a real world prototype that can be tested with real end-users on the last day. Not only do these teams deal with open-ended problems using creative ideation methods, each member of the team also brings their unique way of thinking and working into the collaborative design process, resulting in a solution that is more holistic than if a homogenous team had designed it. For example, a typical Design Sprint might consist of a designer, a subject-matter expert, a key decision-maker, a customer needs champion and a facilitator[48]. Each of these profiles bring a unique perspective and this diversity is valuable to all members of the team within a social learning context.

If a company has an online forum board where learners post their questions or concerns, an effective strategy could be to move that over to a **social media platform** where they can engage in a more lively and educational discussion with their peers. It is also possible to bring discussions to blogs, and virtual meeting sites. If there were certain topics that seems to be actively discussed amongst the learners, it would be advisable to make that a feed or post on a dedicated social media page[49].

At the same time, despite the ability of online training solutions to reach large numbers of trainees at once, effective pedagogy might require smaller “classrooms” with more teacher-student feedback[50].

Trend 7: Learning Engagement Systems and personalised / personal learning

The digital learning field is moving into the direction of creating “**Learning Engagement Systems**”, i.e. solutions that use profile data about learners, their personalities, their habits, goals and feedback from others. The objective is to drive personalised learning and provide coaching and connections to help keep workers connected with their ambitions and their personal development priorities (enabled by AI)[51].

Specifically, a distinction needs to be emphasised between **personalised and personal learning**. While personalised learning implies some degree of customisation, essentially

45 https://en.wikipedia.org/wiki/Social_learning_theory
46 Basu S. (2017) “5 Technology-Enabled Learning Trends In 2017”, published in eLearning Industry on 15 February 2017, see: https://elearningindustry.com/5-technology-enabled-learning-trends-2017
47 https://ajsmart.com/design-sprint-2-0/
48 https://www.invisionapp.com/inside-design/assembling-design-sprint-team/
49 Pappas C. (2014) “8 Top Tips to Create an Effective Social Learning Strategy”, published in eLearning Industry on 28 July 2014, see: https://elearningindustry.com/8-top-tips-create-effective-social-learning-strategy
50 Cooper S. (2016), “Why meaningful feedback is so important for online learning”, published August 2016, see: https://elearningindustry.com/meaningful-feedback-online-learning
51 Fosway Group (2017) “Digital Learning Realities 2017: Part 1 -Organisation, Headcount, Budget and Investment”, in association with learning technologies, May 2017

all learners get the same experience[52]. In case of personal learning, the role of the training system is not to provide, but to *support* learning, while the decisions about what to learn, how to learn, and where to learn are made outside the training system, by the individual learners themselves[53]. Personalised learning can be compared to choosing from a menu at a restaurant, while personal learning is comparable to shopping at a grocery store and cooking your own meal[54]. The notion of personal learning builds on the idea that if people are to become effective learners, they need to be able to learn on their own[55]. For that, they need to be able to find the resources they need, assemble their own curriculum, and follow their own learning path. In this case, education/training providers and policy makers can only facilitate this process, while keeping in mind that there are too many and too varied needs of individual learners.

The third expert workshop held in the context of the current initiative explicitly focused on the topic of personalisation of online training for SMEs. It was agreed by the stakeholders that personalisation of learning is vital for the adoption of online training solutions by enterprises of all sizes, and particularly small businesses. In case of personal learning, the control thus shifts from the teacher/instructor to the learner, with personal learning representing a culture and a mind-set[56]. However, this may not always be an optimal approach in a workplace learning setting. Employers may need their employees in specific job roles to learn specific skills to do their job better. A possible solution here could be to give employees an option to pick up a course of their choice when the employee completes a specific number of courses or modules, which are linked directly to their day-to-day job role[57].

Personal learning and personalised learning are two different approaches to learning. There is no one-size fits all approach for choosing an ideal learning strategy for organisations. Personalised learning powered by adaptive learning techniques and data-driven systems may lead to better-optimised and easier-to-control solutions for workplace learning. At the same time, personal learning promises to cultivate genuine interest in learning and thus is likely to lead to a higher impact of learning activities. The choice for the appropriate approach depends on a wide variety of factors including specific learning needs and objectives, available budgets, motivations of both employers and employees, etc. As highlighted above, both approaches can also coexist next to each other.

Besides technological developments changing the learning landscape, it is important to keep in mind also the relevant social transformations in the workforce. Examples of relevant topics include “gig economy”, the rising proportion of digital-savvy employees, aging workforce, a changing role of women in the workforce, greater calls for inclusion and diversity and growing proportion of immigrants in the economy among others. Furthermore, the developments with regard to recruitment practices and recognition need to be taken on board too (e.g. recruitment based on potential rather than qualifications;

52 Adaptive learning is a technique for providing personalised learning, which aims to provide efficient, effective, and customised learning paths to engage each learner. Adaptive learning systems use a data-driven approach to adjust the path and pace of learning, enabling the delivery of personalised learning at scale. More information see: https://library.educause.edu/resources/2017/1/7-things-you-should-know-about-adaptive-learning

53 Downes S. (2016) “Personal and Personalized Learning”, 17 February 2016, see: https://www.downes.ca/cgi-bin/page.cgi?post=65065

54 *Ibid*.

55 *Ibid*.

56 https://modernlearners.com/learning-is-personal-not-personalized/

57 Origin Learning (2018) “The Personal Versus Personalized Learning Debate”, published on 19 July 2018, see: https://medium.com/@Origin_Learning/the-personal-versus-personalized-learning-debate-9e259e2e0904

recruitment for access to people who can do the work rather than an ability to perform work directly; open badges; evolving role of employment agencies etc.).

Trend 8: Financially motivating and enabling learners to learn

Some governments offer financial support to workers who are undergoing training. For example, France introduced a policy on Personal Training Accounts (or compte personnel de formation – CPF) wherein all private sector employees receive up to 24 hours per year of time-credit (as per full-time basis) in their CPF to spend on training, even if they change jobs or have periods of unemployment[58]. These hours may be spent on accredited training programmes at the discretion of the individual and in case of insufficient time-credit for a particular course, the CPF may be supplemented by employer, learner, industry associations or the government. Similar policies have been implemented in Singapore[59] and Malta[60].

Some online training providers (e.g. BitDegree) are also experimenting with paying learners to learn using novel funding models enabled by blockchain technology[61]. Examples of such funding models include potential employers paying for training as part of a recruitment process and learners receiving compensation (in the form of tokens) upon successful completion of the course. Due to the inherent transparency of the underlying blockchain system, both learners and funders have clarity on how the funds have been used and to whom it has been awarded.

Trend 9: Open Educational Resources

Free platforms like YouTube[62], StackOverflow[63] and similar have many educational resources available on any given topic at various levels of difficulty, depending on the level of expertise of the learner. Though the content on these platforms does not come with any accreditation, they are easily accessible on demand, and usually their open nature allows learners to move to the sections that directly answer their questions rather than follow a structured time-consuming path to get the answers they need.

Video-based learning is especially rising in popularity. The numbers are clear – YouTube alone has over 1.9 billion monthly active users with learning content alone getting over 1 billion views per day, and the trends in internet traffic indicate that streaming video will form the majority of demand in the coming years[64]. From a more experiential perspective, there is an increasing body of data to suggest that visual elements in e-learning can significantly influence the uptake of new information[65]. Given the popularity and ease of uploading, finding and watching content on platforms like YouTube, sharing of educational resources becomes easier than ever before and can reach a massive audience.

58 Eurofound (2018) “France: Employers obligation to provide skill development plans or training”, August 2018, see: https://www.eurofound.europa.eu/observatories/emcc/erm/legislation/france-employers-obligation-to-provide-skill-development-plans-or-training

59 Woo P. (2018), “More than 285000 Singaporeans have used SkillsFuture Credit”, March 2018, see: https://www.straitstimes.com/forum/letters-in-print/more-than-285000-sporeans-have-used-skillsfuture-credit

60 Ministry for Education and Employment (2014), “Malta National Lifelong Learning Strategy 2020”, see: https://lifelonglearning.gov.mt/dbfile.aspx?id=37

61 BitDegree (2019), “What is the BitDegree Token?”, see: https://www.bitdegree.org/faq

62 https://www.youtube.com/

63 https://stackoverflow.com/

64 Simon J (2018), “3 reasons your learning videos need to be on YouTube”, see: https://www.techsmith.com/blog/youtube-for-learning-videos/

65 Gutierrez K (2014), “Studies confirm the power of visuals in e-learning”, published July 2014, see: https://www.shiftelearning.com/blog/bid/350326/studies-confirm-the-power-of-visuals-in-elearning

Additionally, many institutions, both large and small, private and public, are increasingly embracing the idea of open innovation – which can be defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively"[66]. While most examples of open innovation have shown high potential, this way of working is still not adopted in the mainstream[67]. This trend is however prevalent in high-tech sector, particularly in enterprises working with AI and advanced algorithms. Enterprises like Google[68], institutions like OpenAI[69], SMEs and even universities are eager to open up their proprietary code to the community. It allows them to attract talent in a competitive market and to accelerate the adoption of specific tools in the marketplace. Furthermore, it also serves as a means of speeding up their own innovation cycles, since the community is able to add to the codebase and demonstrate interesting use cases that the original creators may not even have thought of originally[70]. Open innovation is not just about various firms working together, it is also about internal teams working closely to fully take advantage of the abundance of new ideas[71].

2.1.3. Key dynamics within enterprises in Europe

According to Fosway Group report (2017)[72], enterprises constantly revisit their learning solutions. The latter are often transactional rather than strategic, and frequently have a short shelf life. More than 90% of analysed European enterprises expect their investment in digital learning platforms and content to increase or stay the same in the near future. Most expansion in digital learning courses comes from decreasing investment in traditional instructor-led training approaches. The pressure on Learning & Development (L&D) overall is often to reduce costs or deliver more with the same budget. **Despite the positive momentum in investment, however, the overall company budgets for digital learning tend to be relatively low[73]**.

Furthermore, enterprises tend to pay increasing attention to **measuring the impact of (online) training on business results**[74]. The direct impact of learning could be measured through surveys of both employees and their managers (e.g. a metric on the learning tools that are most effective for acquiring different types of knowledge; or a metric on return on performance from a specific learning program)[75]. Measuring learning effectiveness is a challenging key performance indicator, yet digital learning platforms often have built-in analytics to create a basis for that. The analytics allows enterprises to run reports on usage to see what is most effective and to dismiss those assets that are not being used. Ultimately, enterprises need to work towards connecting the learning

66 Chesbrough H (2011), "Everything you need to know about open innovation", published March 2011, see: https://www.forbes.com/sites/henrychesbrough/2011/03/21/everything-you-need-to-know-about-open-innovation/#6a4e195675f4

67 Deichmann D, Rozentale I and Barnhoorn R (2017), "Open Innovation generates great ideas, so why aren't companies adopting them?", published September 2017, see: https://hbr.org/2017/12/open-innovation-generates-great-ideas-so-why-arent-companies-adopting-them

68 http://about.google

69 https://openai.com

70 Dean S (2018), "Open Source AI for Everyone: Three Projects to Know", published May 2018, see: https://www.linuxfoundation.org/blog/2018/05/open-source-ai-for-everyone-three-projects-to-know/

71 Elmansy R (2016), "5 Successful Innovation Examples", see: https://www.designorate.com/successful-open-innovation-examples/

72 Fosway Group (2017) "Digital Learning Realities 2017: Part 1 -Organisation, Headcount, Budget and Investment", in association with learning technologies, May 2017

73 *Ibid*.

74 *Ibid*.

75 SAP (2016) "A New Model for Corporate Learning", SAP Service & Support Thought Leadership Inquiry Nr. 191, see: http://www.digitalistmag.com/files/2016/03/SAPTL47_192Learning_Inquiry.pdf

outcomes and business outcomes, such as attrition, employee engagement, and sales growth[76].

As partially highlighted above, the following **developments** can be observed within enterprises in Europe with regard to digital learning solutions[77]:

- The majority of analysed enterprises already uses **social and collaborative solutions** (social media platforms, blogs and fora, virtual meeting sites etc.)[78]. Employees in most workplaces use **messaging platforms**, official or informal, to communicate with their co-workers[79].
    - Formal messaging platforms may include, for example, Skype, Facebook Workplace, Google Hangouts or Slack, whereas informal messengers such as WhatsApp and Telegram are also popular.
    - These platforms support informality, convenience and asynchronous communication, and there might be ways in which these benefits could be incorporated into enterprises' learning strategy, to include peer feedback and discussion.
    - Many of these platforms increasingly offer support for integration of "chatbots", which also represents a promising paradigm for personalised learning support.
- While technology can be said to have become "a second-order problem", Internet access, access to modern devices and digital savviness is still not uniform across all European territories. There is a clear **digital divide,** and online training policies must reflect the range of digital maturity across the European Member States.
- **The use of MOOC style solutions is still a minority approach**, with around a third of analysed enterprises using these platforms. However, many online learning experiences still tend to be one-way information flows rather than employing "active learning methods", thus not unlocking the full potential of this medium.
- Despite or because of the flexibility expected from online training, there is a lack of clarity regarding when exactly employees should complete their training – during the workday or in their own time such that daily productivity is not affected.
- **Mobile learning is in high demand** for learning platforms for European enterprises (almost 75% of analysed enterprises either already use or expect to use mobile learning features from learning platforms in the near future)[80]. The demand for micro-learning - wherein relevant information is dispensed in small chunks – is also growing.

76 SAP (2016) "A New Model for Corporate Learning", SAP Service & Support Thought Leadership Inquiry Nr. 191, see: http://www.digitalistmag.com/files/2016/03/SAPTL47_192Learning_Inquiry.pdf
77 Based on the findings of Fosway Group (2017) "Digital Learning Realities 2017: Part 2 –Trends, Drivers and Measures of success", in association with learning technologies, July 2017
78 *Ibid*.
79 Wessing T (2018), "Informal instant messaging at work: is Whatsapp causing a headache?", published December 2018, see: https://www.lexology.com/library/detail.aspx?g=e3bbaebb-7246-4fac-b1de-10d0e44ef938
80 Based on the findings of Fosway Group (2017) "Digital Learning Realities 2017: Part 2 –Trends, Drivers and Measures of success", in association with learning technologies, July 2017

- As highlighted above, the field is moving into the direction of creating "**Learning Engagement Systems**"[81]. Peer-to-peer sharing and content creation, iterative refinement of content and rapid learning loops are all potential benefits of Learning Engagement Systems[82].

- Traditional approaches still form the basis of the learning content market. The latter is **dominated by off-the-shelf content** (for 81% of analysed enterprises, it is the most commonly used approach)[83]. Many enterprises do not have a comprehensive learning strategy behind their online training efforts, and their attempts to implement learning tend to be fragmentary and only when the need becomes urgent. SMEs generally do not invest in creating/purchasing customised content, and rather pick from the suppliers that offer the most relevant training at acceptable price.

- **Video** becomes increasingly popular as a digital learning solution and covers all forms (user generated, bespoke or off-the-shelf). In many instances, YouTube has become the reference model for company's performance support learning[84].

- A combination of video, mobile and user generated learning is **shifting the learning landscape towards capturing "real" organisational learning** rather than learning that is solely provided by the learning department[85].

- **Self-directed learning** (such as on YouTube or other open educational resources) becomes more commonplace; however, this type of learning is not formally recognised, even though employees learn and apply new skills and capabilities from such efforts.

- **Blending formal and informal training**, as well as offline and online training, is a historical trend that will continue[86].

- **Millennials** are increasingly entering the economy but they are reported to have different values, and are to a large extent, more ambivalent when it comes to professional motivations, critical of business ethics and not particularly loyal to their employers[87]. With regard to digital learning, millennials tend to be more digital-savvy, capable of finding relevant information easily on the internet and value learning beyond just certification[88].

2.1.4. Towards a new model for company learning

The main **drivers for learning transformation[89]** within enterprises include a need for creating a competitive advantage, closing the skills gap, and retaining and motivating

81 Based on the findings of Fosway Group (2017) "Digital Learning Realities 2017: Part 2 –Trends, Drivers and Measures of success", in association with learning technologies, July 2017
82 Rollins A (2018), "What you need to know about the Learning Engagement Platform", published October 2018, see: https://elearningindustry.com/learning-engagement-platform-what-need-know
83 Based on the findings of Fosway Group (2017) "Digital Learning Realities 2017: Part 2 –Trends, Drivers and Measures of success", in association with learning technologies, July 2017
84 Based on the findings of Fosway Group (2017) "Digital Learning Realities 2017: Part 2 –Trends, Drivers and Measures of success", in association with learning technologies, July 2017
85 *Ibid*.
86 SAP (2016) "A New Model for Corporate Learning", SAP Service & Support Thought Leadership Inquiry Nr. 191, see: http://www.digitalistmag.com/files/2016/03/SAPTL47_192Learning_Inquiry.pdf
87 Deloitte (2018), "The Deloitte Millennial Survey 2018", see: https://www2.deloitte.com/global/en/pages/about-deloitte/articles/millennialsurvey.html
88 Shift E-Learning (2019), "Training Millennials: 7 things you should do right now", published March 2019, see: https://www.shiftelearning.com/blog/training-millennials-elearning
89 In order to become learning organisations

new workforce. In moving towards accelerated, continuous learning, enterprises need to develop a culture of accountability and excitement around learning, and specifically[90]:

- Devote resources and efforts to understand skill gaps, customer needs, and employee shortfalls;
- Ensure that learning is specific to the individual and relates to specific business and career goals;
- Motivate and guide employees through the tools, helping them develop personalised plans, and monitor their progress;
- Ensure that learning is recognised by SMEs (e.g. with the use of Open Badges).

Consulted stakeholders often suggested that **enterprises should be relatively "hands-off" when it comes to employee learning**[91]. It is the responsibility of workers to learn and acquire the needed skills and competencies for their jobs, and it is important to monitor the outcomes and not "micromanage" the process they use for getting there.

Beyond responsibility, this view also recognises that workers will best know the problems they face in the context of work and thus would be best able to judge which learning content would enable them to solve these problems. Thus, **empowering workers to be decision-makers** when it comes to their own training paths may be a promising pathway to higher productivity.

Keeping the approach **learner-centric** is key because learning will be received by the learner, and increased productivity will delivered by the learner. Learner-centricity may begin with learners having a lifelong learning plan and/or a career plan aligned with the goals of the employer such that their mutual learning needs can be matched. As learners proceed along this plan, their accomplishments and certificates should be securely and transparently made available via e-portfolios and Open Badge passports.

Formal learning may range from accredited full-time courses to personalised on-demand micro-learning. Informal learning and peer recognition also be incorporated as badges or testimonials in these e-portfolios. Career coaches may help learners choose their next courses, and facilitate discussions between learners and employers.

Funding mechanisms like training credits or employer support may be unlocked conveniently to help the learner pursue the training they need. Training platforms might facilitate convenient learning depending on the context, and peer reflection, as well as teacher-learner feedback wherever possible. The exact form and pace of training needs to be dynamically tailored to the learner's needs and preferences. Ultimately, the base for effective learning should be the demonstrable effectiveness, relevance and benefit to the learner.

At the same time, **it is vital for enterprises to motivate their employees to learn** by setting a good example, and establishing a conducive learning culture. A company should view corporate learning not as an event, but as a set of **experiences**, including

90 SAP (2016) "A New Model for Corporate Learning", SAP Service & Support Thought Leadership Inquiry Nr. 191, see: http://www.digitalistmag.com/files/2016/03/SAPTL47_192Learning_Inquiry.pdf

91 Based on stakeholder interviews and workshop outcomes, confirmed also in SAP (2016) "A New Model for Corporate Learning", SAP Service & Support Thought Leadership Inquiry Nr. 191, see: http://www.digitalistmag.com/files/2016/03/SAPTL47_192Learning_Inquiry.pdf

classroom courses, online training, coaching, mentoring, and informal collaboration[92]. Introducing innovative learning tools and programmes that allow employees to study independently and experiment with new ideas is reported to be motivating, which can lead to higher engagement, productivity gains, and bottom-line benefits[93]. In some cases, learning may not just be individual but also collective.

In case of SMEs, that typically do not have human resources dedicated to the topic of employee learning, there is a clear need for straightforward, accessible and affordable solutions to address the points above. **Personal learning, social learning** and **mobile learning** prove to be particularly promising in this respect. Digital coaching, gamification, badges and other feedback mechanisms allow learning to become more personalised, whereas the autonomy to self-determine the exact courses or even chunks of learning they need, allows learners to make their learning more personal. Social media allows enterprises to access up to date information as is needed, collaborate with external expertise and widen their skills base. Social elements in learning systems are also key domains for manifesting recognition mechanisms, both online and offline – e.g. employee of the month prizes or "expert" badges. Mobile learning enables just in time learning allowing SMEs to be responsive and flexible to emerging needs[94].

In addition, special attention needs to be paid to the role of a **learning ecosystem**. The efforts of multiple stakeholders need to converge to result in successful learning outcomes – from employees and training providers, to vertical/horizontal value chains and institutional regulation. All actors within the ecosystem should benefit from a clear "value proposition of learning". Learning ecosystems also allow enterprises (and learners) to share best practices and learn from each other faster. For example, peer-sharing and crowd-curation of learning content would work well if there is a critical mass of users. Having a tight ecosystem also benefits training providers, who are able to share the state-of-the-art best practices and offer value-add services to customise content in ways relevant to particular value chains. Ecosystems also bring together enterprises and institutions across domains – such as SMEs and large enterprises, technology enterprises, universities and industry associations - in fruitful constructive collaborations.

Finally, skills and competencies are often associated exclusively with individuals, while they are likely to be strongly related also to a collective dimension. It is often not enough for enterprises to focus on improving the skills of specific individuals, as performance improvement approaches need to be applied to the whole teams, organisations and even value chains. For that, new learning practices are required, fostering collective learning and leading to collective change. Collaborative online learning activities promise to be effective in this respect[95], including game- and simulation-based approaches.

2.2. Availability, quality and affordability of online training for SMEs

The current sub-section addresses the topic of availability, quality and affordability of online training for SMEs.

92 SAP Service & Support Thought Leadership Inquiry Nr. 191, see: http://www.digitalistmag.com/files/2016/03/SAPTL47_192Learning_Inquiry.pdf

93 *Ibid*.

94 Brien, E. O., and Hamburg, I. (2014) "Supporting sustainable strategies for SMEs through training, cooperation and mentoring", Higher education studies, 4(2)

95 Higley M. (2018) "Reasons Why Collaborative Online Learning Activities are Effective", eLearning Industry, published on 27 January 2018, see: https://elearningindustry.com/collaborative-online-learning-activities-reasons-effective

2.2.1. Availability of online training for SMEs

SMEs are in general reported to be restricted in the efficient use of different forms of learning and technology for learning and in adequate management learning approaches[96].Data across OECD countries show that **SMEs participate 50% less in training activities overall than large firms**[97]. The key reasons for this difference include a lack of critical mass within the firm enabling them to afford (both financial costs and the cost of employee's time) and access formal training opportunities[98].

When it comes to training in general, SMEs typically face the following challenges[99]:

- **High cost/too expensive to provide training** - associated with the costs of hiring external training providers; universities typically do not offer short courses and are more suited for larger enterprises; courses offered by public institutions are often too broad/basic, teachers lack industrial experience;

- **Impossible to interrupt[100] production time/lack of time** – due to company size, employees are constantly needed to maintain production and service; in order to allow an employee time off work to carry out training, there is an increase in the workload of other employees or there is a resulting reduction in product output;

- **Too difficult to identify suitable training providers or lack of training providers/ programmes** – it is often difficult for SMEs to assess the quality of the available training programmes, or, in some cases, there is a lack of awareness that training opportunities exist. Some SMEs are highly specialised, and in their case, there is a lack of training programmes that suits their needs.

The most popular learning in SMEs is **informal** one[101], and the integration with formal strategic training is often not planned[102]. SMEs are more inclined to participate in knowledge-intensive activities as a way of learning new techniques or new ways to operate. This includes learning by interacting with consultants, suppliers or clients; or attending conferences, meetings or internal activities such as quality control activities[103]. Access to mentors (often outside the business) can be important here, as are informal networks[104]. These activities, however, do not carry formal qualifications or standard

96 Hamburg, I. (2015) "Improving e-Learning in SMEs through cloud computing and scenarios", E-learning-instructional design, organizational strategy and management, InTech
97 OECD (2013) "Skills Development and Training in SMEs", OECD publishing
98 *Ibid*.
99 *Ibid*.
100 At the same time, the need to interrupt working processes is eliminated with the use of Electronic Performance Support Systems (EPSS) that represent an alternative to training. EPSS are integrated into the work processes, and are there to support rather than interrupt those.
101 Admiraal and Lockhorst (2009) cited in EU15 Ltd et al. (2015) "European-wide e-Learning Recognition Review Report", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project); see also Saunders, M. N., Gray, D. E., & Goregaokar, H. (2014) "SME innovation and learning: the role of networks and crisis events", European Journal of Training and Development, 38(1/2), pp. 136-149; and Hamburg, I. (2015) "Improving e-Learning in SMEs through cloud computing and scenarios", E-learning-instructional design, organizational strategy and management, InTech
102 EU15 Ltd et al. (2015) "European-wide e-Learning Recognition Review Report", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project)
103 EU15 Ltd et al. (2015) "European-wide e-Learning Recognition Review Report", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project)
104 Saunders, M. N., Gray, D. E., & Goregaokar, H. (2014) "SME innovation and learning: the role of networks and crisis events", European Journal of Training and Development, 38(1/2), pp. 136-149.

training certificates[105]. Most enterprises, however, focus on and recognise only formal learning programs, thereby losing valuable opportunities[106].

There is a need to recognise the role of accessibility of SMEs to online training by emphasising multiple ways in which online training can be accessed using latest technologies including smartphones, iOS and Android apps[107].

According to the consulted stakeholders, there is too often a false dichotomy between "learning" and "work", as if these activities are separate from one another. In some cases, even a typical client project might be planned and approached as a learning opportunity to consciously act on and improve certain metrics. Informal training and micro-learning could be seen as learning within a project-based context. Although such projects come with tight deadlines, the benefit is that the learning is also immediately applied to work.

Peer-sharing and crowd-curation could also be enabled via digital platforms – thus enabling learning outcomes without high increase in costs. Similarly, creating an open sharing and active knowledge management culture within enterprises could contribute to extending the reach and value of training. For example, employees who have completed training could share their key insights with their peers regularly so that when one learns, everyone learns. Moreover, employees could be encouraged to share valuable information (like links to open educational resources) with each other – both within the firm and within the value chain – thus creating a crowd-curated list of resources and kick-starting a cross-domain discussion.

2.2.2. Quality of online training for SMEs

With SMEs coming from diverse backgrounds, a **"one-size-fits-all" approach is often not suitable[108]**. For enterprises, the challenge remains **how to develop and maintain a competitive ecosystem of suppliers around their digital learning projects** that stimulates to provide better levels of service and solution. There is a trend for some enterprises to look for unconventional suppliers[109].

The risks around selecting the right suppliers appear to be greatest when it comes to learning content. In areas such as gamification, business systems solutions, user generated content, serious games, MOOCs, OER, of-the-shelf performance support and virtual reality, enterprises are 60% likely to get merely an acceptable or poor quality solution[110].

Blended learning and mobile learning do not score significantly better[111]. Only in video content and bespoke content, the quality of the offer is reported to be generally acceptable[112]. Social learning and analytics are also associated with a high risk of low quality[113]. Only 10-15% of digital learning platforms are rated "very good"[114]. **Without**

105 EU15 Ltd et al. (2015) "European-wide e-Learning Recognition Review Report", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project)
106 Hamburg, I. (2015) "Improving e-Learning in SMEs through cloud computing and scenarios", E-learning-instructional design, organizational strategy and management, InTech
107 *Ibid*.
108 Mellett, S., and O'Brien, E. (2014) "Irish SMEs and e-learning implementation: The strategic innovative approach", British Journal of Educational Technology", 45(6), pp. 1001-1013
109 Fosway Group (2017) "Digital Learning Realities 2017: Part 3 –Impact and Satisfaction", in association with learning technologies, July 2017
110 *Ibid*.
111 *Ibid*.
112 Fosway Group (2017) "Digital Learning Realities 2017: Part 3 –Impact and Satisfaction", in association with learning technologies, July 2017
113 *Ibid*.
114 *Ibid*.

a proper approach, digital learning is between 50-70% likely to have a mediocre impact on an organisation[115].

It may not be possible to get a 100% match between company needs, learner preferences and course availability, especially since the more customised the course, the more expensive it is likely to be. However, techniques such as machine learning may provide benefits like improving searching and matching of available courses. SMEs should also leverage OER wherever possible, at least to preview content before making a sizeable investment. Special attention needs to be paid to assessing the relevance of the acquired skills to the actual job. Having a clear set of KPIs or learning outcomes would make selection and evaluation of courses much more constructive.

2.2.3. Affordability of online training for SMEs

SMEs are often reluctant to pay for staff training. In difficult times, training budgets are often the first to be reduced or fully removed. It can be explained by the fact that owners/managers of SMEs often do not have enough knowledge about the long-term value of training in sustaining competitive advantage and about suitable, efficient, and affordable learning solutions[116].

The investment required in order to develop personal/personalised online training platforms and courses is often too high for many SMEs (especially the ones with less than 10 employees)[117]. The most common solution adopted is the purchase of off-the-shelf e-learning courses, with the standardised content[118].

One of the approaches to tackle the abovementioned issue of affordability vs. personalisation for SMEs refers to **"do-it-yourself' (DIY) strategies**[119]. DIY online courses follow the micro-learning methodology. They are a mixtures of chunk size learning content (i.e. videos, tests and html5 e-learning lectures), structured in a pre-planned sequence. The creation of this type of content can be done by anyone. The investment needs with regard to time and money could vary, depending on the chosen educational methods and output formats.

DIY approach in online training allows SMEs to avoid the need to outsource course creation, opting for a "keep it simple" ways (which, in turn, saves more time for planning, focusing on the content, using templates, creating narrated presentation videos etc.). With DIY approach, money and time investment needs could be drastically reduced. Some initiatives already exist[120] that provide comprehensive support for the course creators,

115 Fosway Group (2017) "Digital Learning Realities 2017: Part 3 –Impact and Satisfaction", in association with learning technologies, July 2017

116 Hamburg, I. (2015) "Improving e-Learning in SMEs through cloud computing and scenarios", E-learning-instructional design, organizational strategy and management, InTech

117 EU15 Ltd et al. (2015) "European-wide e-Learning Recognition Review Report", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project); see also Mellett, S., and O'Brien, E. (2014) "Irish SMEs and e-learning implementation: The strategic innovative approach", British Journal of Educational Technology", 45(6), pp. 1001-1013

118 EU15 Ltd et al. (2015) "European-wide e-Learning Recognition Review Report", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project)

119 Based on the presentation of Ádám Bodor "The anatomy of online course creation and DIY (Do it yourself) strategies", Webuni (Hungary) during the second expert workshop on 18 June 2018 in Genova (Italy)

120 See, for example, Webuni. It has own online educational platform, which provides an opportunity for "knowledge owners" (Teachers, Professionals, Influencers, Training enterprises, SME's, Institutions, Corporations, Umbrella organisations, etc.) to create and publish their own-made online courses on an open online marketplace. Based on this course portfolio, Webuni has launched an isolated and filtered marketplace for SMEs, where they can find a shortlist of the available courses, which suit them. They can purchase the ready courses there for their employees getting bundle discounts on them, and get

and specifically online courses and templates, offline and online workshops and mentoring programs, technical infrastructure (local studio and the mobile course creation studio box) etc. However, these approaches should be treated with caution, as professional involvement, including coaching and mentoring, is often needed in order to ensure a high-quality training course.

Other relevant approaches include offering on-demand bespoke course development through government-funded initiatives, and procuring specific online learning materials for enterprises from a certain sector by industrial associations and other professional bodies.

Section 3.4 of the report addresses the associated development costs and various funding models.

2.3. Adoption rate of online training among SMEs in EU Member States

Our extensive desk-research did not identify any studies/initiatives that would quantitatively measure the adoption rate of online training explicitly among SMEs in different EU Member States. The results presented in this sub-section correspond to the analysis carried out in the context of the current initiative.

The background questionnaire of the Survey of Adult Skills by OECD Programme for the International Assessment of Adult Competencies (PIAAC)[121] allows drawing valuable insights with regard to the use of online education for training purposes. For this analysis, the raw, publicly available data on the PIAAC background survey questions were used separately for each country. The questionnaire includes information regarding the factors which influence the development and maintenance of skills such as education, social background, engagement with literacy and numeracy and ICTs, frequency of participation in trainings as well as information on outcomes which may be related to skills. The survey is conducted in over 40 economies and provides insights on key cognitive and workplace skills on individual level.

comprehensive support for the management of the whole process. More information see: https://webuni.hu/

121 The data can be found http://www.oecd.org/skills/piaac/

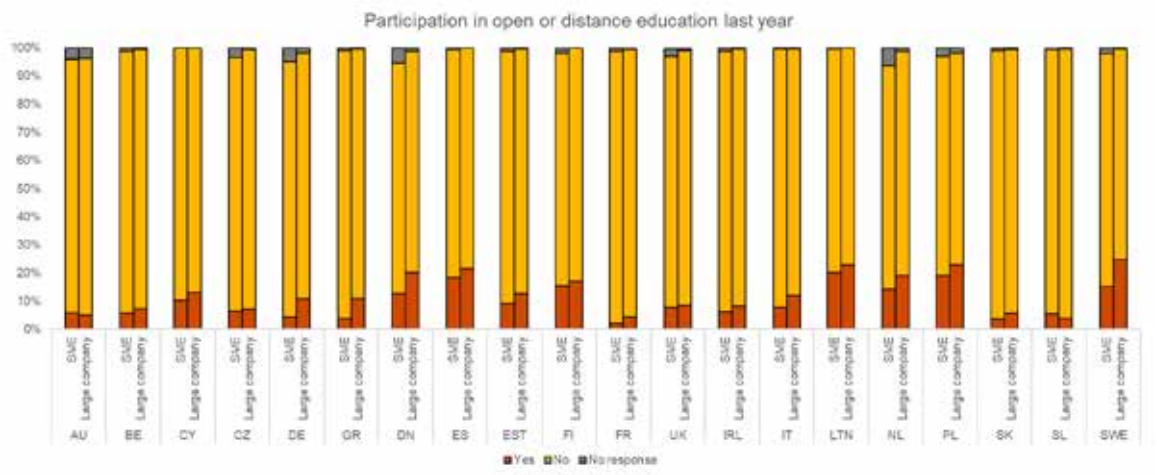

FIGURE 2-1: Participation in open or distance education among SMEs and large enterprises in different EU Member States last year[122]

As shown in Figure 2-1, the percentage of respondents working for SMEs and **participating in open or distance education is highly diverse across Europe**, varying between 2.1% (France) to 20.2% (Lithuania). Spain, Lithuania and Poland are the countries with the highest adoption rate of open or distance education among SMEs. Notably, the fraction of respondents who have participated in open or distance education is higher among those employed in large enterprises than that of SMEs, with the exception of Austria and Slovenia. The differences in participation rates in distance education between SMEs and large enterprises are particularly significant for countries such as France, Germany, Greece and Sweden.

When analysing the adoption rate, it is important to keep in mind that **SMEs represent a highly diverse population**. Our *qualitative* analysis suggests that the demand for online training solutions among SMEs varies per **sector**. SMEs that have a more high-tech orientation, in general tend to be more actively involved in online training. Within the sub-population of high-tech SMEs, ICT SMEs tend to be leading when it comes to the adoption of online training solutions. It did not prove to be possible to identify the relevant statistical data, however, to support this claim. At the same time, the PIAAC survey shows that **the adoption rate of online training solutions by SMEs varies per size**. Their size (here a distinction is made between micro (up to 10 employees); small (10 - 50 employees); and medium (50 – 250 employees) sizes) tends to positively correlate with SME use of online training, i.e. **larger SMEs are more likely to use and take the advantages of online training**. This trend holds for most of the analysed countries. The only two countries that demonstrate other kind of dynamics include Belgium and Cyprus (see Figure 2-2).

122 For Austria, Canada, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, the Netherlands, Poland, the Slovak Republic, Spain, Sweden – information was collected in the first round (2011-2012). For Greece, Lithuania and Slovenia- information was collected in the second round (2014-2015). Data for Hungary will be added to the database in November 2019.

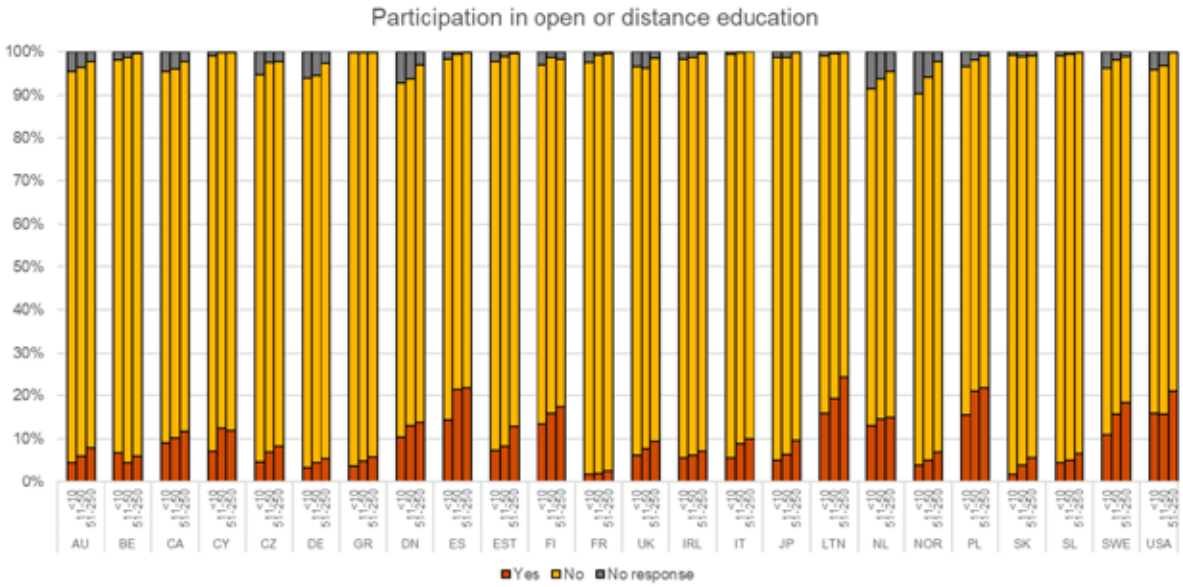

FIGURE 2-2: Participation in open or distance education among different types of SMEs in EU Member States last year[123]

The PIAAC survey also indicates that the engagement in training was mainly motivated by a desire "To do my job better/improve my career" and "To increase my knowledge/skills" regardless of SME size. Following this, the third most stated reason in all SME types across countries is "I was obliged to participate", indicating **a combination of intrinsic and extrinsic motivation among SME employees**. However, this survey question covers training in general, not online training specifically.

Based on in-depth interviews with Member State (MS) representatives, the research team able to *qualitatively* indicate an overall adoption rate of online training among European SMEs in 23 EU MS (see Figure 2-3). For that purpose, the research team interviewed national experts in technology-enhanced learning that were nominated by stakeholders as experts with a 'helicopter view' on the developments in their country. All analysed MS were clustered into three groups, namely 'high' (online training is a regular part of SME training activities), 'medium' (online training becomes increasingly popular among SMEs) and 'low' (SMEs hardly use online training solutions) based on expert judgement. This analysis should not be viewed as any kind of statistical exercise, and it is based purely on qualitative inputs of the consulted experts.

Ten analysed MS reported low popularity of online training among SMEs (namely CY, EL, HU, IE, IT, LV, MT, LT, PL, RO). Only one MS (SE) reported high popularity of online training among SMEs. The remaining MS (namely AT, BE, DE, EE, ES, FI, FR, HR, NL, PT, SI, UK) demonstrate medium popularity of online training. As highlighted above, to our knowledge, no quantitative studies exist so far, offering statistical data for this topic.

123 For Austria, Canada, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, the Netherlands, Poland, the Slovak Republic, Spain, Sweden – information was collected in the first round (2011-2012). For Greece, Lithuania and Slovenia- information was collected in the second round (2014-2015). Data for Hungary will be added to the database in November 2019.

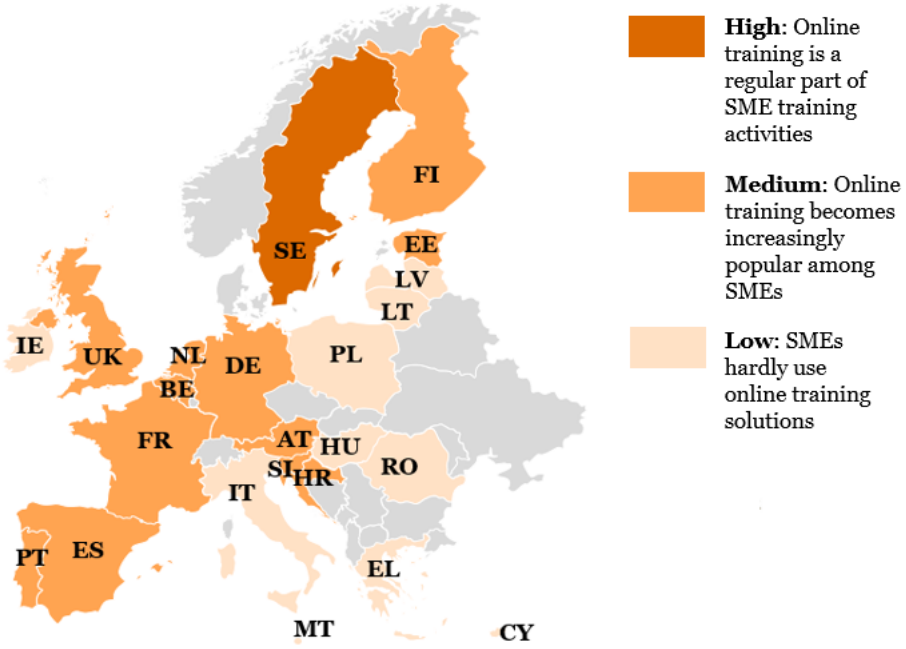

FIGURE 2-3: Popularity of online training solutions among SMEs in different EU Member States (based on *qualitative* analysis)

Related statistical data can be found in the **data on lifelong learning**, such as the one provided by Eurostat as percentage of the population aged 25 to 64 participating in education and training during the last four weeks (the latest data is available for 2013 and 2018; see Figure 2-4)[124]. The data suggests that the leading MS in lifelong learning in general are Sweden, Finland and Denmark, which is in line with our findings on the adoption of online training. On a European level, 11.1% of the population aged 25 to 64 participated in education or training, which is 0.4 percentage points higher than the 2013 figure.

124 See: http://ec.europa.eu/eurostat/statistics-explained/index.php/Adult_learning_statistics

	Total		Male		Female	
	2013	2018	2013	2018	2013	2018
EU	10.7	11.1	9.7	10.1	11.6	12.1
Belgium (*)	6.9	8.5	6.7	8.1	7.1	9.0
Bulgaria	2.0	2.5	1.9	2.4	2.1	2.6
Czechia	10.0	8.5	10.0	8.3	9.9	8.7
Denmark (*)	31.4	23.5	25.7	19.2	37.2	27.8
Germany	7.9	8.2	7.9	8.5	7.9	8.0
Estonia	12.6	19.7	9.8	16.2	15.3	23.2
Ireland (*)	7.6	12.5	7.2	10.3	7.9	14.6
Greece	3.2	4.5	3.3	4.5	3.1	4.5
Spain (*)	11.4	10.5	10.5	9.5	12.2	11.5
France (*)	17.8	18.6	15.5	15.9	20.0	21.0
Croatia	3.1	2.9	3.0	2.4	3.3	3.4
Italy	6.2	8.1	5.8	7.6	6.5	8.6
Cyprus	7.2	6.7	7.0	6.8	7.4	6.6
Latvia	6.8	6.7	5.1	4.8	8.2	8.4
Lithuania	5.9	6.6	5.2	4.9	6.5	8.3
Luxembourg (*)	14.6	18.0	14.0	17.6	15.2	18.4
Hungary (*)	3.2	6.0	3.1	5.6	3.2	6.4
Malta (*)	7.7	10.8	7.4	9.3	8.0	12.4
Netherlands	17.9	19.1	17.4	18.3	18.4	20.0
Austria	14.1	15.1	12.8	13.7	15.4	16.5
Poland (*)	4.3	5.7	3.9	5.1	4.9	6.3
Portugal	9.7	10.3	9.3	9.8	10.1	10.8
Romania	2.0	0.9	2.2	1.0	1.8	0.9
Slovenia	12.5	11.4	10.5	9.4	14.6	13.5
Slovakia	3.1	4.0	2.9	4.2	3.3	3.8
Finland	24.9	28.5	21.1	24.7	28.8	32.4
Sweden	28.4	29.2	21.5	22.4	35.5	36.1
United Kingdom	16.6	14.6	15.0	12.9	18.3	16.2
Iceland	26.3	21.5	22.9	18.3	29.8	25.0
Norway	20.8	19.7	19.2	17.5	22.4	22.1
Switzerland	29.3	31.6	30.0	32.4	28.7	30.9
Montenegro	2.8	3.2	2.7	3.3	2.8	3.0
North Macedonia	3.7	2.4	3.9	2.4	3.6	2.3
Serbia (*)	3.9	4.1	3.4	3.7	4.5	4.5
Turkey (*)	4.5	6.2	4.6	6.3	4.5	6.0

(*) Refer to the internet metadata file (http://ec.europa.eu/eurostat/cache/metadata/en/trng_lfs_4w0_esms.htm).
(*) Break in series.

FIGURE 2-4: Adult participation in lifelong learning, 2013 and 2018 as % of the population aged 25 to 64 participating in education and training in the last 4 weeks (source: Eurostat)

Eurostat also provides data on the participation rate in education and training in the last 12 months[125]. The latest survey, conducted between June 2016 and March 2017, shows that in 2016, 45.2% of Europeans aged 25 to 64 participated in education and training during the 12 months preceding the interview (see Figure 2-5). The survey further highlighted that **people aged 25 to 34 were far more likely to participate in education and training than older people** (aged 55-64), with participation rates being more than 20 percentage points higher. **Participation in education and training was also shown to be related to the level of educational achievement**, with significantly higher participation rates among the more educated. Sweden and Finland are also here among the high performing countries in lifelong learning, accompanied by the Netherlands and Austria.

125 See: http://ec.europa.eu/eurostat/statistics-explained/index.php/Adult_learning_statistics

	Type of training			All types of training						
				Sex		Age		Level of educational achievement (ISCED levels)		
	All	Formal (*)	Non-formal	Men	Women	Age 25–34	Age 55–64 (*)	Lower secondary or less (levels 0–2) (*)	Upper secondary & post-secondary (levels 3 and 4)	Tertiary (levels 5 and 6)
EU	45.2	5.8	42.7	45.0	45.5	53.7	32.9	24.0	41.3	65.8
Belgium	45.2	6.8	41.4	44.2	46.2	59.3	29.2	20.3	40.2	65.2
Bulgaria	24.6	2.9	22.5	24.5	24.7	29.6	14.7	7.6	22.3	38.2
Czechia	46.1	2.5	44.6	49.5	42.6	51.9	29.1	16.2	42.5	66.5
Denmark	50.4	13.5	43.8	48.3	52.6	61.0	37.0	31.6	43.8	66.9
Germany	52.0	3.5	50.2	51.8	52.2	57.4	43.9	27.4	48.7	68.6
Estonia	44.0	6.2	41.2	37.0	50.7	52.9	30.4	23.5	35.4	60.6
Ireland	53.9	8.6	49.7	53.6	54.1	63.5	40.3	28.0	46.4	69.6
Greece	16.7	3.7	14.0	15.9	17.5	20.9	5.9	3.0	16.0	30.9
Spain	43.4	9.8	39.1	44.0	42.9	55.6	29.1	23.8	42.7	63.8
France	51.3	3.4	50.0	48.7	53.8	61.1	35.1	25.1	47.4	72.1
Croatia	31.8	4.0	29.8	32.5	31.1	44.0	15.7	7.4	25.7	61.3
Italy	41.5	3.0	40.6	44.0	39.1	49.8	33.0	21.2	46.6	72.0
Cyprus	48.1	3.0	47.2	56.6	40.4	57.9	29.9	24.4	41.9	64.2
Latvia	47.5	4.4	45.7	42.7	51.9	56.9	34.1	26.7	39.2	65.9
Lithuania	27.9	2.4	26.5	23.5	31.9	36.1	19.2	:	15.8	46.4
Luxembourg	48.1	8.6	45.3	48.1	48.1	58.5	29.8	21.1	41.2	69.8
Hungary	55.7	7.3	52.5	58.7	52.7	63.2	38.2	41.6	53.9	67.3
Malta	36.3	7.2	33.8	36.7	35.7	48.5	19.8	24.3	40.3	65.6
Netherlands	64.1	9.0	61.5	64.7	63.5	73.9	51.4	38.3	63.3	81.2
Austria	59.9	6.2	58.4	61.1	58.8	69.3	41.3	31.3	57.1	77.6
Poland	25.5	4.4	22.9	25.2	25.7	33.8	13.4	5.4	16.9	48.1
Portugal	46.1	4.0	44.4	47.6	44.7	60.3	28.6	31.5	56.7	71.0
Romania	7.0	1.7	5.6	6.4	7.5	13.9	1.5	1.0	6.3	15.8
Slovenia	46.1	6.0	43.6	44.1	48.3	56.4	27.3	14.7	40.6	71.0
Slovakia	46.1	1.5	45.0	46.8	45.3	54.3	30.3	:	43.4	61.7
Finland	54.1	14.2	47.7	49.0	60.2	67.6	34.3	36.3	50.3	66.0
Sweden	63.8	13.8	56.5	59.5	68.2	69.7	54.7	45.1	59.4	79.5
United Kingdom	52.1	11.9	47.5	50.2	53.9	60.3	39.0	28.1	46.5	68.1
Norway	60.0	12.1	54.9	59.6	60.4	69.2	47.0	42.7	58.1	74.1
Switzerland	69.1	8.5	67.5	70.4	67.7	79.6	57.4	34.7	64.1	85.9
North Macedonia	12.7	4.0	10.4	13.5	11.9	20.6	5.4	1.0	10.3	36.3
Albania	9.2	1.7	8.2	8.8	9.5	17.3	3.5	2.0	7.0	32.3
Serbia	19.8	3.0	18.2	18.0	21.4	29.2	7.4	:	14.2	39.9
Turkey	20.9	5.0	17.8	24.9	17.0	31.3	6.5	11.4	28.7	49.9
Bosnia and Herzegovina	8.7	2.2	6.9	8.9	8.5	25.6	2.7	0.9	7.2	31.2

(*) Refer to the internet metadata file (http://ec.europa.eu/eurostat/cache/metadata/en/trng_aes_12m0_esms.htm).
(*) Slovakia and Albania: low reliability.
(*) Romania and Albania: low reliability.
(*) Greece, Croatia, Romania, North Macedonia, Albania and Bosnia and Herzegovina: low reliability.

FIGURE 2-5: Adult participation in lifelong learning, 2016, as % of the population aged 25 to 64 participating in education and training in the last 12 months (source: Eurostat)

In general, the **EU MS demonstrate different levels of maturity in using learning technologies**. This can be explained by the perceived business value of learning and technology-related factors. For example, Internet connectivity levels and costs significantly vary across the EU. Mobile phone and social media usage, as well as ownership patterns also vary greatly. Device access or familiarity is not seen as a significant problem in most territories, barring terrain like remote islands or mountainous regions. These factors have a direct impact on the maturity of the market of online training and learning technologies[126].

Based on interview findings, in many countries, high cost of investing in training is seen as a barrier, or enterprises expect too much for the price they are willing to pay. From their point of view, not only are they paying for the training of employees, they are also losing productive hours that the employee could have spent working. In some cases, enterprises are not even aware of the range and depth of training opportunities available, and even when they are, employers are not easily convinced of the relevance or quality of these training opportunities. Furthermore, local language was identified as a strong barrier in some countries like Croatia, Romania and France, especially in non high-tech sectors with older or lower-skilled workers.

In general, larger enterprises tend to have more structured approach to learning than smaller enterprises. Smaller enterprises from traditional sectors generally do not have

126 See: https://www.learninglight.com/marketing-elearning-company-europe/

the right mind-set about training and have only engaged with it in the context of economic crises and survival.

Employees are generally seen as motivated to take on trainings but often feel that their efforts will not be compensated or recognised formally. At the same time, employees are also not sure whether certification from online training is actually valued in the workplace. Meanwhile, experts reported that employers overwhelmingly fear that investing in training employees might be wasted if the employee leaves – which signals that the attitude of leadership is not conducive to training in general as they do not see the value that comes from such training. Some employers also do not have a learning strategy, which results in low commitment and confused efforts towards training.

Nordic countries are reported to be the most advanced and is a net exporter of online training solutions and learning technologies[127]. The United Kingdom (UK) is a vibrant market too. The German market is growing rapidly, and it is expected to become substantial in the next few years. France has seen a considerable growth, which has recently slowed down. Spain is recovering and is actively exporting its skills and solutions to South America. Eastern Europe, in turn, has substantially benefited from the EU structural funds, and much of the infrastructure is has been put in place that facilitates the adoption of online training solutions. Strong market growth is forecasted for these countries for years to come[128].

Annex C-1 offers a detailed overview of the situation in each of the analysed MS.

2.4. Key players and cooperation mechanisms

The digital learning market in Europe remains relatively immature. Single providers hardly ever take a lead in supporting the entire learning solutions portfolio. Most tend to be specialist providers, so it is difficult to purchase high quality solutions for all cases from one provider[129]. Examples of full-service providers operating in Europe (i.e. the providers offering online training content, learning platforms to deliver that content, and the advice & support needed to make those solutions work) include CrossKnowledge, Cornerstone on Demand, IMC, WillowDNA, SAP Successfactors, and Skillsoft[130]. Many of these providers, however, are headquartered outside the EU. A clear trend can be observed with regard to **preferred partnering between providers** (rather than trying to provide a whole set of digital learning solutions by one provider)[131].

While some countries like Germany, Finland and Sweden report that there is a healthy and diverse market of online training providers targeting all sectors, most Member States report an underdeveloped market for these players. When online training players do exist, they are either extensions of local universities (like Fun-MOOC in France, several UK universities), offerings by large software vendors (like Google Adwords training, or SAP training), initiatives by national employment agencies (such as Voka in Belgium) or standard public offerings on platforms like Udemy and Lynda. Overall, there are no significant local online providers in most Member States. In some cases, local providers if any tend to focus on older paradigms like LMS software that suit the needs of larger firms with more structured learning programs but do not serve the needs of small agile

127 See: https://www.learninglight.com/marketing-elearning-company-europe/
128 *Ibid*.
129 Fosway Group (2017) "Digital Learning Realities 2017: Part 1 - Organisation, Headcount, Budget and Investment", in association with learning technologies, May 2017
130 Srivastava A. (2019) "Full-Service eLearning Companies", Learning Light, see: https://www.learninglight.com/full-service-elearning-companies/
131 *Ibid*.

SMEs. Most SMEs are unlikely to invest in creating bespoke content, and this is not seen as a viable way forward. *Annex C-2* describes the situation regarding the key players in each of the analysed MS.

3. STATE-OF-PLAY DESCRIPTION OF RELEVANT INITIATIVES, STRATEGIES AND PUBLICATIONS

The current chapter presents the state-of-play description of the identified policy initiatives and best practice examples. It also addresses the associated development costs and funding mechanisms, as well as the main adaptation and localisation strategies, and provides an overview of the latest scientific, policy and business publications. The chapter also includes the analysis of the latest innovations in pedagogies, as well as the criteria for good online training for SMEs. Finally, it covers the main conditions to be fulfilled for a massive take-up of online training by SMEs.

3.1. Overview of identified policy initiatives

Based on extensive desk-research, in-depth interviews with representatives of different EU Member States and six expert workshops, an overview of relevant policy initiatives was developed. Desk research focussed exclusively on the publicly available materials in English. Therefore, for the initiatives to be identified through desk-research, a reference in English was a necessary pre-condition. To this end, **the provided overview should by no means be treated as exhaustive. It rather has an indicative and illustrative nature, and aims to offer a general picture of the state-of-play regarding the relevant policy initiatives in Europe**. Table 3-1 provides an overview of the identified initiatives, including data on coordinating organisations, type, coverage, objectives and target groups. The Table does not aim to present examples of specific learning platforms aggregating online training offer in specific Member States.

As can be seen from the Table, relevant policy initiatives were identified not for all EU Member States. In most cases, it can be explained by the fact that such initiatives simply do not exist in those countries, as was often confirmed during in-depth interviews.

Our analysis suggests that **there are few initiatives focusing explicitly on promoting online training for SMEs**. Multiple identified initiatives target broader public going beyond enterprises and including also educational providers, and working individuals in general.

Most of the identified initiatives have national focus. It can be explained by the fact that the search for the relevant initiatives was performed primarily from the national perspective. The overall population of relevant initiatives contains also diverse activities at the EU level, as well as multiple regional and local initiatives and projects, that fall beyond the scope of the current analysis, but still need to be considered for the overall understanding of the current state-of-play.

The identified initiatives **pursue multiple objectives** including promotion and awareness raising, dissemination of good practices, offering guidance and practical support, training and consultancy services, developing and maintaining an ecosystem of providers and users, offering training materials, providing financial support for upskilling etc. The most popular objective refers to promotion and awareness raising of lifelong learning in general and online training in particular.

Many identified initiatives do not explicitly focus on online training, and instead emphasise the importance of lifelong learning combining different delivery mechanisms (i.e. online and offline learning). Stakeholders suggest that this may be the most effective way to approach it, as online training should not be positioned as a goal in itself, but rather represents means for continuous upskilling in the context of lifelong learning.

The final column of Table 3-1 addresses the **results** of the identified initiatives. It indicates whether the initiative has already been completed, is ongoing or has not yet been launched. Most of the identified initiatives are ongoing. For the initiatives that have already been completed, we aimed to look for the evidence of a formal evaluation and the analysis of achieved results. In most cases, it was not possible for the project team to identify such evidence. This does not immediately indicate that the formal evaluation has not been performed for those initiatives, but can also stem from the fact that the search was performed in English, while the evaluation results may be available only in a local language or those may not be published on the Internet. In any case, hindered access to such information or its complete absence indicate a clear need for a higher transparency and systemisation of lessons learned, and a more rigorous assessment of impacts achieved by the relevant initiatives. Future research efforts need to be devoted to this issue.

TABLE 3-1: Overview of identified initiatives

Nr	Country	Title	Type	Coordinator	Coverage	Objectives	Target group	Results
1.	Belgium	**Self-diagnosis Tool of Digital Maturity**	Awareness raising, identification of needs, training	Agency for Business and Innovation, the Digital Agency, the Union of middle classes	Regional (Wallonia)	Raise awareness and support traders in digital transformation. Develop an online digital maturity tool for self-assessment.	Enterprises	429 participants from 325 enterprises have attended awareness sessions. The online self-assessment tool has been used 328 times[132].
2.	Croatia	**Framework for promoting lifelong learning and adult education**	Policy, awareness raising and promotion	The Agency for VET and Adult Education	National (Croatia)	Raising awareness of the need for lifelong learning	Working population	Ongoing initiative – a survey was conducted with 2369 individuals to inform the development of a strategic framework for the promotion of lifelong learning between 2017-2021[133].
3.	Germany	**Digitale Medien in der beruflichen Bildung**	Funding	Bundesministerium für Bildung und Forschung	National (Germany)	Pilots, awareness raising, dissemination of good practices	Consortia, including universities, SMEs	Ongoing initiative – the BMBF will promote and fund various vocational education and training programs with more than 25 million EUR per year from 2017 onwards[134].
4.	Germany	**Open Educational Resources**	Promotion	BIBB – Bundesinstitut für Berufsbildung	National (Germany)	Raising awareness	Chief learning officers in SMEs and content developers	Completed – Wikimedia Germany completed a report on Mapping Open Educational Resources, including a research phase, a dialogue phase and ending with a public symposium to develop practice-oriented solutions to advance the creation,

132 https://ec.europa.eu/digital-single-market/en/content/outils-dautodiagnostic-de-maturite-numerique-self-diagnosis-tools-digital-maturity
133 CEDEFOP (2018), Croatia: New framework for promoting lifelong learning and adult education, see: http://www.cedefop.europa.eu/en/news-and-press/news/croatia-new-framework-promoting-lifelong-learning-and-adult-education
134 Bundesministerium für Bildung und Forschung (2018), Digital media in vocational education, see: https://www.bmbf.de/de/digitale-medien-in-der-bildung-1380.html

Nr	Country	Title	Type	Coordinator	Coverage	Objectives	Target group	Results
								dissemination and use of OERs in Germany[135].
5.	Germany	**BMBF Roadshow – Digital Media in everyday use of VET**	Promotion	BIBB – Bundesinstitut für Berufsbildung	National (Germany)	Communication campaign, platform for assistance and guidance etc.	Enterprises, SMEs	Ongoing initiative – the roadshow consists of user workshops in various cities across Germany, where digital concepts for vocational education and training are shared with participants in interactive workshops where they can try it themselves[136].
6.	Finland	**ChangeLearning Alliance**	Community of practice	Context Learning Finland Ltd., Universal Learning Systems (Ireland)	EU/global	Training and consultancy services and networking opportunities with a focus on technology-enhanced learning	Online training developers and client enterprises	Ongoing - ChangeLearning is an alliance of leading enterprises providing added value to quality training and strategic organizational development consultancy services[137].
7.	Finland	**DIGILE Digital Services Program (2012-2015)**	Networking and collaboration	Finnish Funding Agency for Technology and Innovation (TEKES)	National (Finland)	To bring together services enablers and platforms to rapidly launch, expand and ensure maintenance of new services including educational solutions	online training providers, academic institutions	Completed – Digile presented 35 demos from its “Digital Services” program in end-2014[138].
8.	Finland	**Learning Solutions**	Networking and collaboration	Finnish Funding Agency for	National (Finland)	Developing an ecosystem of	online training providers,	Completed – Tekes (Finnish Funding Agency for

135 C. Rupprecht (2016), Framework for Open Educational Resources (OER) published in Germany and project “Mapping OER” completed, see: https://blog.wikimedia.de/2016/03/11/praxisrahmen-fuer-open-educational-resources-oer-in-deutschland-veroeffentlicht-und-projekt-mapping-oer-abgeschlossen/

136 BMBF (2018), BMBF-Roadshow: Digitale Medien im Ausbildungsalltag, see: https://www.qualifizierungdigital.de/

137 ChangeLearning Alliance (n.d.), ChangeLearning Alliance, see: https://www.linkedin.com/company/changelearning-alliance/. ChangeLearning has recently joined forces with xEdu to provide opportunities for collaboration and learning on workplace learning related matters, specifically targeted to SMEs. xEdu runs a global accelerator program with participation from all continents. One of the specific outcomes of this partnership is the Master Class series of seminars.

138 DIGILE (2014), Digile Digital Services program presents 35 demos, see: https://www.slideshare.net/digile/digile-3-review

Nr	Country	Title	Type	Coordinator	Coverage	Objectives	Target group	Results
		Programme (2011-2015)		Technology and Innovation (TEKES)		online training providers and fostering joint development of learning solutions, establishing networks	academic institutions	Innovation) wrapped up the program by sharing 25+ success stories[139].
9.	France	**PIX**[140]	Training and measurement	Groupement d'intérêt public "Pix"	National (France)	A public platform to assess digital skills of students and workers; with the aim of reinforcing digital skills and valuing learning outcomes on data management, communication and collaboration, content creation, security issues, digital environments,	Enterprises, as well as pupils and students	Ongoing initiative; for the whole platform, 278 944 users, 38930 certifications, more than 1 000 users per day. No specific data for enterprises yet.
10.	Hungary	**Grow with Google Hungary**	Training	Google	EU/global	Promoting and developing digital skills through online and offline lectures, free tools and digital training materials[141]	SMEs, broader public	Ongoing initiative – Google Hungary offers free courses, tools and personal consulting opportunities – some specifically catering to SMEs via a Digital Workshop Online Course and other consultations. Some success stories available onsite.

139 Tekes Programmes and Campaigns (2015), Learning Solutions Programme Success Stories, see: https://www.slideshare.net/Tekesslide/learning-solutions-programme-success-stories

140 See: https://pix.fr/qui-sommes-nous

141 Google's free thematic workshop programme, which was launched in 2016, has reached over 35,000 SMEs. They held 100 workshops and 4,000 personal consultations in 26 cities in 2017, he said. In 2018, the programme hopes to reach a further 20,000 SMEs.

Nr	Country	Title	Type	Coordinator	Coverage	Objectives	Target group	Results
11.	Italy	**TRIO (Technology, Research, Innovation and Orientation)**	Promotion and awareness raising, training and certification	Regional government of Tuscany (co-financed by the European Union)	Regional (Tuscany region)	Offering free and accessible online learning materials	Citizens, public administrations and private organisations	Could not find information on the results of this initiative.
12.	Italy	**Digitalisation Voucher for Italian SMEs**	Funding	Italian Ministry of Economic Development	National (Italy)	Encourage enterprises to internationalise, grow digitalise their operations	SMEs	12,765 projects have been funded in the digital skills training domain, aggregating to nearly 44 million EUR invested
13.	Latvia	**Improvement of the professional competence of the workforce (2010-2013)**	Promotion and awareness raising, training and certification	State Education Development Agency (co-financed by the European Union)	National (Latvia)	Increasing the competitiveness of the workforce and improving labour productivity	Employed individuals	Completed – The State Education Development Agency together with 4 partners cooperated to establish a qualitative vocational education system that functions continuously and corresponds to the needs of the economic sectors by setting up 12 sectoral expert councils, researching sectoral qualification structures for provisioning vocational education and finally, based on the results of sectoral research, VET programmes were restructures to fit newly developed occupational standards and professional qualifications[142].
14.	Lithuania	**Kompetencijos LT**	Funding/grants for training	The Lithuanian Ministry of Economy	National (Lithuania)	Supporting enterprises financially with training their employees	SMEs	Ongoing initiative – implementation plan approved and financing plan still subject to public comments phase[143].

142 CEDEFOP (2013), Latvia: 14 sectors have been explored to improve initial vocational education content, see: http://www.cedefop.europa.eu/en/news-and-press/news/latvia-14-sectors-have-been-explored-improve-initial-vocational-education

143 Lietuvos Respublikos ukio ministerija (2018), Kompetencijos LT, see: https://ukmin.lrv.lt/lt/veiklos-sritys/es-parama/2014-2020-m/kompetencijos-lt

Nr	Country	Title	Type	Coordinator	Coverage	Objectives	Target group	Results
16.	Malta	**Get Qualified**	Funding	Ministry of Education and Employment	National (Malta)	Financial support for upskilling when required courses are not available locally	Working individuals	Ongoing initiative – students of all levels are granted tax credits for the achievement of qualifications and certifications required by industry[144].
17.	Malta	**MyJourney**	Promotion and awareness raising	The Ministry of Education and Employment	National (Malta)	Ensuring inclusive education and promoting lifelong learning	Secondary education students	Ongoing initiative – MyJourney allows secondary school students to blend core academics with academic/applied/vocational subjects in a personalised and inclusive learning environment to reach their full potential[145].
18.	Poland	**PARP Academy**	Promotion and awareness raising, training and certification	Polish Agency for Enterprise Development (co-financed by the European Union)	National (Poland)	Promotion of online training among SMEs, offering actual training and certification	SMEs, large enterprises, people aiming to start businesses, e-trainers	Ongoing initiative – The Polish Agency for Enterprise Development (PARP) hosts the PARP Academy educational portal for SMEs providing free online training[146]. The Academy began with just 2 e-learnings in 2006 and by 2012, had impacted more than 150,000 participants. Since 2012, all trainings have been updated with currently 104 e+m-learnings and multiple "knowledge pills".
19.	Portugal	**360° Panorama e-Learning Portugal**	Promotion and awareness raising, quality standards	TecMinho – University of Minho Interface	International (Portugal and Portuguese	Stimulating e-learning implementation for public and private sectors; e-	e-learning trainers and practitioners from public and private sectors	Ongoing initiative – The Panorama E-learning Observatory aims to promote e-learning in Portugal and the flexibility

144 The Ministry of Education and Employment (2018), Get Qualified 2017 – 2020, see: https://education.gov.mt/en/education/myscholarship/get-qualified/pages/default.aspx#
145 Ministry of Education and Employment (2018), Equitable quality education for all, see: http://www.myjourney.edu.mt/
146 Akademia PARP (2018), O Akademii PARP, see: http://www.akademiaparp.gov.pl/o-akademii-parp.html

Nr	Country	Title	Type	Coordinator	Coverage	Objectives	Target group	Results
					Speaking Countries)	learning quality framework		in Lifelong Learning. Since 2002, they have published 81 reports and 35 multi-year programmes aimed at various sectors[147].
20.	Portugal	**INCoDe.2030**	Promotion of digital competences	Fundação para a Ciência e a Tecnologia, I.P. – FCT (commissioned by Portuguese government)	National (Portugal)	Raising the digital competencies of Portuguese citizens by engaging a broad range of stakeholders	General population	Not yet implemented – The Portugal INCoDe.2030 initiative addresses the concept of digital competences in a broad manner – including basic digital literacy, research, communication, content creation, designing digital solutions, integration of interdisciplinary knowledge and data analysis, use of AI, advanced instrumentation, communication networks and development of cyber-physical systems.
21.	Portugal	**Training e-trainers**	Quality standards, training	IEFP – Institute of Employment and Professional Training and TecMinho – University of Minho Interface	National (Portugal)	Professionalisation and certification of e-trainers: Digital Edu Competences for online educators; e-trainers course Referential	e-trainers from public and private sectors	Unable to find information about the results of this initiative.
22.	Slovenia	**Slovenian Digital Coalition - digitalna.si**	Policy	The Government of the Republic of Slovenia	National (Slovenia)	Improving e-skills, better integrating ICT in education and lifelong learning for inclusion in the digital society	Broader public	Not yet implemented – The Slovenian Digital Coalition intends to harmonise the digital transformation of Slovenia according to the Digital Slovenia 2020 strategic framework, in collaboration with stakeholders from trade &

147 Panorama E-Learning (2018), Quem Somos, see: http://www.panoramaelearning.pt/quem-somos/

Nr	Country	Title	Type	Coordinator	Coverage	Objectives	Target group	Results
								industry, research & development, civil society and public sector[148]. Currently the Next Generation Broadband Development Plan is in motion with the intention of providing as many households with broadband Internet access (at least 30-100 Mbps) by 2020[149].
23.	Spain	**State Foundation for Training and Employment FUNDAE (formerly Fundación Tripartita)**	Promotion, training (not explicitly focussed on online training), funding	The Ministry of Employment and Social Security	National (Spain)	Promoting digital competences, Training Program for the improvement and acquisition of digital and technological professional skills	Enterprises, particularly SMEs	Ongoing initiative – The State Foundation for Training and Employment (FUNDAE) oversees the Sistema de Formacion para el Empleo with the mission of training people for work and continuous re/upskilling[150]. This is achieved by providing subsidies for enterprises training their workers, and subsidized trainings for both employed and unemployed workers.
24.	United Kingdom	**AISAB.EU (Applied Innovation for Students and Business)**	Development of learning materials, coaching	University of Gloucestershire	EU	To develop the skills that support SME innovation by developing learning materials and toolkits to enhance innovation practices within SMEs	SMEs	Ongoing initiative – The AISAB project will help improve the level of innovation and its impact, especially in SMEs, by developing skills that support SME innovation from a higher educational institution context and

148 Digital Slovenia (2018), Digital Coalition, see: http://www.digitalna.si/digital-coalition-.html
149 Ministry of Public Administration (2018), Digital Slovenia 2020, see: http://www.mju.gov.si/si/delovna_podrocja/informacijska_druzba/digitalna_slovenija_2020/
150 Fundacion Estatal (2018), Sistema de Formacion para el Empleo, see: https://www.fundae.es/Con%C3%B3cenos/Pages/PFormaci%C3%B3nempleo.aspx

Nr	Country	Title	Type	Coordinator	Coverage	Objectives	Target group	Results
								through vocational educational training[151].

151 AISAB.EU (2018), Objectives, see: http://www.aisab.eu/node/21

3.1.1. Best practice examples

In order to extract best practice examples, a multi-dimensional benchmarking approach was used, and the identified policies/initiatives were compared along **five specific dimensions**:

1. **Impact**: What impact has a policy/initiative reached so far in terms of its effectiveness?

2. **Transferability**: To what extent is a policy/initiative transferable to other contexts (whether it is linked to specific framework conditions such as legislation, cultural aspects etc.)?

3. **Scalability**: What is the potential of a policy/initiative for extending its coverage to broader target groups?

4. **Adaptability**: To what extent are the results produced by a policy/initiative likely to be relevant for years to come?

5. **Innovativeness**: To what extent does a policy/initiative promote new ways of training?

As outlined in the previous sub-section, in general, a landscape of initiatives focussing explicitly on promoting and stimulating online training among SMEs in Europe is rather scarce. As a result, the project team faced a challenge of identifying a sufficient number of initiatives that strongly match the analysis criteria. The following initiatives formed the top three most promising examples:

- **Digital Media in Everyday Curriculum roadshow** (Germany);
- **PARP Academy** (Poland);
- **Panorama e-learning Observatory** (Portugal).

Below each of them is presented in more detail.

Digital Media in Everyday Curriculum roadshow (Germany)

The roadshow **"Digital Media in Everyday Curriculum"**[152] (Germany) presents nationwide digital concepts for vocational education and training. In interactive workshops, participants can learn about innovative tools and applications and try them out for themselves. In 2018, the roadshow stops in Koblenz, Wittenberge, Stuttgart, Munich, Hanover and Cologne. This initiative was launched by the Federal Ministry of Education and Research (BMBF). Its aim is to support training and specialist work with digital formats and to optimise the day-to-day training. The roadshow presents best practice case studies.

The Federal Institute for Vocational Education and Training (BIBB), which supports BMBF's funding measures, broadcasts the results of the projects and provides information on the potential of the concepts developed for educational practice. The events are aimed at training staff from enterprises, inter-company educational institutions, vocational schools and educational institutions from all over Germany. Interested vocational training

152 https://www.qualifizierungdigital.de/bmbf-roadshow-2018-digitale-medien-im-ausbildungsalltag-1600.php

officers are invited to get to know concrete application possibilities of selected media concepts. Since the kick-off event in June 2016, more than 550 trainers have made use of this offer.

The workshops, moderated by the developers of the practical concepts, offer an introduction to case-specific applications of digital media. They allow the participants, against the background of their individual operational tasks, to test their own media formats, reflect them and adapt them to their own needs. They also get in touch with the respective project managers of the pilot projects and can network with each other.

PARP Academy (Poland)

PARP Academy[153] (Poland) since 2006 is an educational portal for small and medium-sized enterprises enabling access to free online training. The aim of the portal is to popularise access to remote education (e-learning) among micro, small and medium enterprises and people planning to create their own business. The PARP Academy offer currently includes 94 interactive electronic trainings: 42 business e-learning trainings, 42 business m-learning trainings (for mobile devices: smartphones and tablets), five e-learning trainings and five m-learning trainings dedicated to trainers. The training topics are tailored to the needs of enterprises from the SME sector. Upon completion of a course, learners receive a certificate. It is also possible to develop training on demand.

At the PARP Academy, every participant who completes the training has the opportunity to set up his training community and become its Ambassador. The ambassador manages the training process in his/her community, proposes paths from over 250 PARP Academy training modules, schedules the schedule in which community participants receive automatic messages and reminders, invites their friends and colleagues, observes their progress, controls statements on forums etc.

Communities for trainers are special communities at the PARP Academy. They are used to improve their coaching skills and develop knowledge about the organisation, preparation and implementation of online training. The Academy offers ready e-learning and m-learning trainings for trainers, available through the training community, additionally also business training “Blended learning”, and rapid learning.

Panorama e-learning Observatory (Portugal)

The “**Panorama e-learning Observatory**”[154] (Portugal) aims to promote e-learning in Portugal and the flexibility in Lifelong Learning. It aims to record successful experiences, good innovative practices in Portugal for the use of e-learning, as well as to provide a set of tools useful in promoting this type of training. Specific activities include disseminating existing good practices in Portugal; sharing models for the design, implementation and evaluation of training projects in e-learning and b-learning; providing an e-learning legislation repository; providing a glossary of terms relevant to e-learning, contributing to their clarification; promoting the use of e-learning in the development of Lifelong Learning.

The creation of the “Panorama e-learning Observatory” stems from the project “Panorama e-Learning Portugal 2013”, a study promoted by TecMinho in partnership with Quaternaire Portugal within the framework of the POAT-FSE, to evaluate e- learning, contributing to the construction of a model of regulation.

153 http://www.akademiaparp.gov.pl/
154 http://www.panoramaelearning.pt/projetos/panorama-e-learning-portugal-360/

3.1.2. EU-level initiatives

On 25 September 2013, The European Commission has published a Communication **"Opening up Education: Innovative teaching and learning for all through new Technologies and Open Educational Resources"** (COM (2013) 654), which aims to set out a European agenda for stimulating high-quality, innovative ways of learning and teaching through new technologies and digital content. It specifically aims at stimulating innovative teaching and learning for all, modernising education and fostering Open Educational Resources (OER), interoperability, quality, licensing, certification, etc. Multiple specific activities have been initiated with a co-funding of Erasmus+ and Horizon 2020.

Examples of relevant initiatives by the European Commission include (the list is of illustrative nature and does aim to be exhaustive):

- **SME e-Learning Portal**[155]: the portal has been developed to ensure that innovative training practices are shared and made accessible to SME employees and managers throughout Europe and to emphasise the importance of e-learning and blended learning as accessible and economically viable alternatives to traditional and often costly training practices, and to ensure that e-learning training materials are accessible and fit for purpose.

- **HOME (Higher Education Online)**[156]: it is a European funded project, initiated and coordinated by EADTU. It was launched in 2014, with an aim to develop and strengthen an open network for European cooperation on open education, in general, and MOOCs, in particular.

- **Policy Forum on European MOOCs**[157]: it was organised in Brussels on 28 June 2016 by the European Association of Distance Teaching Universities (EADTU). The forum brought together policy makers from national governments and intergovernmental organisations, as well as higher educational institutions, MOOC platform- and service providers and other key stakeholders.

- **BizMOOC (MOOCs for the world of business)**[158]: launched on 1 January 2016 and funded by Erasmus+ Programme, BizMOOC project has an objective to enable European-wide exploitation of the potential of MOOCs for the world of business. So far, it has resulted in MOOC Book 1.0 and 2.0, and 3 pilot MOOCs.

- **Learning Layers (Scaling up Technologies for Informal Learning in SME Clusters)**[159]: the project develops technologies that support informal learning in the workplace. Its key focus is on SMEs within Regional Innovation Clusters. It aims to develop mobile and social technologies that unlock and enable peer production within and across SMEs.

- **TELL ME (Bring innovative learning methods to manufacturers)**[160]: it is a European-funded research project to improve training in the manufacturing domain, with a particular focus on SMEs[161].

155 http://www.sme-elearning.eu/
156 http://home.eadtu.eu/
157 https://ec.europa.eu/epale/en/content/policy-forum-european-moocs
158 http://bizmooc.eu/project/
159 http://learning-layers.eu/
160 http://www.tellme-ip.eu/#home
161 www.tellme-ip.eu/

- "**Certified European E-Tutor"**[162]: the project defined a comprehensive quality standard for the further education of VET teachers and trainers to becoming "e-tutors" and introduced a certification procedure, which supports the validation and recognition of e-learning qualifications in a transparent way at European level[163].

- **eLene4work**[164]: it strives to help students and new entrepreneurs develop soft skills often required by enterprises of all sizes and will help enterprises exploit the digital talents of young employees. The project proposes a strategic partnership with a goal to test and monitor the possibility offered by MOOCs and OER to address the demand for digital soft skills formally not taught at universities but desirable by most employers on the labour market.

- **t-MAIL**[165]: it aims to develop and test a mobile application supporting teachers, teacher educators and educational decision makers in implementing classroom practices that stimulate students' self-regulated learning (SRL). The project aims to address the needs of these different target groups by designing activities to support the development and testing of a mobile app. Materials will be available in English, German, French, Spanish, Dutch, and Macedonian.

- **Opening up Education: A Support Framework for Higher Education Institutions**[166]: the framework can be used as a tool by higher education staff to help them think through strategic decisions: pedagogical approaches, collaboration between individuals and institutions, recognition of non-formal learning and different ways of making content available;

- **OpenCases: Case Studies on Openness in Education**[167]: a review of literature on open education and nine in-depth case studies of higher education institutions;

- **OpenEducationEuropa.eu**[168]: a web platform run by the Commission, with an aim to share best practices on innovative education; a community for stakeholders involved or interested in digital, open and innovative education;

- **COMPASS ("Open Knowledge Technologies: Mapping and validating knowledge "Digital up-skilling platform for European young unemployed")**[169]**:** a digital learning platform to improve the digital skills of young unemployed Europeans. The goal of this project is to create a project-based learning platform to bridge the gap between the requirements of employers and the insufficient digital skills of young unemployed in order to increase their employability. The platform offers project-based digital literacy lessons, individual career mapping tools and an e-portfolio engine. The project was launched in December 2016, and has a duration of two years. The project is supported by DG CNECT and is part of the Digital and Skills Job Coalition.

162 Heuel E, Feldmann B (2013), "A new standardization and certification initiative in e-learning – The qualification standard "Certified European E-Tutor"", see: https://ieeexplore.ieee.org/document/6644383/references#references
163 http://www.cetutor.eu/
164 http://www.eden-online.org/eden_project/learning-to-learn-for-new-digital-soft-skills-for-employability-elene4work/
165 http://www.eden-online.org/eden_project/teacher-mobile-application-for-innovative-learning-t-mail/tmailproject.eu
166 https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/opening-education-support-framework-higher-education-institutions
167 https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/opencases-case-studies-openness-education
168 https://www.openeducationeuropa.eu/
169 https://www.compassdigitalskills.eu/public-page/view/about-project

- **Europass[170]:** it is an initiative of Directorate General for Education and Culture to increase transparency of qualification and mobility of citizens in Europe[171]. It aims to make a person's skills and qualifications clearly understood throughout Europe (including the European Union, European Economic Area and EU candidate countries). The five Europass documents are the Curriculum Vitae, Language Passport, Europass Mobility, Certificate Supplement, and Diploma Supplement, sharing a common brand name and logo[172]. Since 2012, individuals have been able to assemble all Europass documents in the European Skills Passport[173];

- **EXTRA^{sup}[174]**: an Erasmus+ project supporting the implementation of policy reforms linked to the European Higher Education Area. It is led by the French ministry for higher education, research and innovation (MESRI) and the international centre for pedagogical studies (CIEP). EXTRA^{sup} aims at gathering higher education stakeholders in France together with European experts to produce a methodological toolkit. The toolkit is meant for the higher education institutions, the teaching staff and the students willing to take steps towards the recognition and validation of the learning outcomes and competences developed by students in the framework of citizenship activities or personal involvement within their training programs.

- **Corship[175]**: an initiative that seeks to develop a joint language between corporates, start-ups and universities to exploit the potential of Corporate Entrepreneurship (CE) across sectors and industries. Corship is therefore piloting micro-credentials on CE and developing a MOOC on CE and a unique CE toolbox to facilitate collaboration between the three target groups.

- **Technical Innovation in Blended Learning (TIBL)[176]** is funded through Erasmus+ and aims at improving the quality of blended learning through face-to-face sessions combined with online work through training materials adapted to any type of digital device. The project develops modern technology enhanced training, and putting the learner in the centre of learning. The project addresses mainly the professional development of VET teachers and trainers, both at school as well as in work-based settings in SMEs.

- **European MOOC Consortium (EMC)[177]** aims to strengthen the credibility of MOOCs as a learning approach, to promote use of digital education and MOOCs within universities, make MOOCs a widely considered option for workers and employers seeking to close skills gaps. The initiative seeks to bundle and exchange experience, contribute to a framework for MOOCs and digital framework, develop collaboration models and projects, organising empowering seminars, develop assessment and recognitions schemes for MOOCs and promote accessibility and visibility of MOOCs.

170 https://europass.cedefop.europa.eu/
171 Decision 2241/2004/EC, Article 1
172 Decision 2241/2004/EC, Article 2
173 European Commission (18 December 2013), REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL: Evaluation of the Europass initiative: Second evaluation of the Decision of the European Parliament and the Council on a single Community framework for the transparency of qualifications and competences (Europass)
174 http://www.ciep.fr/en/europe-extrasup-reconnaissance-garantie-qualite-acquis-competences-extra-curriculaires-etudiants
175 https://www.corship.eu/project/
176 https://www.tibl-project.eu/web/ contract nr: 2017-1-ES01-KA202-038256
177 https://emc.eadtu.eu/

Examples of EU initiatives related specifically to the recognition aspect of online training include:

- **EUROPORTFOLIO**[178]: it is a not-for profit association developed with the support of European Commission as a central part of EPNET[179] project, dedicated to exploring how e-Portfolios and e-Portfolio related technologies and practices can help empower individuals, organisations and wider society. Euro-portfolio provides a network for those doing e-Portfolio and related work across Europe; to build the use of e-portfolios across communities, and to provide opportunities for future partnership working.

- **Badgecraft**[180]: a European platform which helps learners to organise all their achievements online and organisations to recognise learning by using Open Badges.

- **Open Badge Network (OBN)**[181]: it brought together organisations from across Europe to support the development of an Open Badge ecosystem, promoting the use of Open Badges to recognise non-formal and informal learning (Erasmus+ project, 2014-2017).

- Tailor-made badge recognition systems have also been designed for individual mobility activities within the **Erasmus+: Youth in Action initiative**[182].

- **MyLK My Lifelong Learning Management**[183]: it aims to create Dashboard for the automatic tracking of digital learning episodes of the individuals: learners, employees, professionals, whether the context of that learning is formal, non-formal, or informal. The main purpose is to help learners recognise what they have learnt; to facilitate gathering evidence of their learning and to present these in ways that are meaningful to the employers and other audiences.

- **ReOPEN – Recognition of Valid and Open Learning**[184]: the project (2016-2018) addressed the issues of recognition and validation of non-formal open learning. The project aimed to create innovative non-formal open learning examples and cases, as well as valid non-formal learning infrastructures to design and create open and innovative education for C-VET, lifelong learning and higher education organisations, as well as enterprises who will be consortium partners and also members of international networks;

- **Open Recognition Alliance**[185]: a not-for profit association developed with the support of the European Commission as a key outcome of the Erasmus+ MIRVA project, of the French *Badgeons la Normandie* initiative and of the Bologna Open Recognition Declaration aiming at promoting more open approaches to recognition of skills and individuals, communities and territories. The Open Recognition Alliance is at the origin of the international #OpenRecognition Week.

178 http://www.eportfolio.eu/about-us
179 https://epnet.europarl.europa.eu/
180 https://www.badgecraft.eu/
181 http://www.openbadgenetwork.com/
182 http://ec.europa.eu/youth/
183 http://mylk-project.info/about/
184 http://reopen.eu/
185 https://www.openrecognition.org/

- **Badge Wallet[186]:** Badge Wallet is an app to earn, store, manage and share digital Open Badges issued using Badgecraft.eu[187]. Badge Wallet is co-funded by the Erasmus+ Programme developed during the "Trusted Badge Systems" project.

The European Institute of Innovation and Technology (EIT) Digital[188] launched several online courses on the online learning platform Coursera.

Special attention needs to be paid to building synergies with the **New Skills Agenda[189]**, especially the **sectoral pilots foreseen in the Blueprint for sectoral cooperation on skills and the Digital Skills and Jobs Coalition**. Multiple (3) waves of sectoral pilots are foreseen in the coming period. The first kick-off meetings took place in December 2017 – January 2018. The activities of this initiative also need to be aligned with the **new Strategy on digital technologies and education** and with the **new Industrial Policy Strategy**.

Furthermore, the **Working Group on Digital Innovation Hubs (DIHs)**[190] was launched after the High-level governance meeting of the European platform of national initiatives on digitising industry to support the implementation of the Digitising European Industry initiative. The working group aims to bring together Digital Innovation Hubs representatives and other interested stakeholders to discuss experience with digital skills training for employees of SMEs; as well as learning content, catalogue of training materials and possible ways of sharing; and the next EU budget and future investments in Digital.

Finally, the Commission proposed to create a dedicated "**Digital Europe**"[191] programme and invest 9.2 billion EUR to align the next EU multi-financial framework 2021-2027 with increasing digital challenges. The programme among others aims to ensure that the current and future workforce will have the opportunity to easily acquire advanced digital skills through long-and short-term training courses and on-the-job traineeships, regardless of their Member State of residence. In the Digital Europe programme, the abovementioned Digital Innovation Hubs will carry out targeted programmes to help SMEs and public administrations to equip their personnel with the needed advanced skills to be able access the new opportunities offered by supercomputing, AI and cybersecurity[192].

3.2. Overview of the main adaptation and localisation strategies

The current section aims to address the **main strategies for adaptation and localisation of online training for SMEs**. The adaptation and localisation here refer to the process of adapting an online training product to a particular language, culture, and a desired local "look-and-feel". It goes beyond language translation and implies overall adaptation for the geographic region/context in which the product will be used[193].

Localisation of an online training course in its essence implies **making a course local**. Rather than purely translating information from one language to another, it needs to be adapted to the local context to more effectively convey the same meaning in the target

186 https://www.badgewallet.eu/en/
187 https://www.badgecraft.eu/
188 https://www.coursera.org/eitdigital
189 http://ec.europa.eu/social/main.jsp?catId=1223
190 https://ec.europa.eu/digital-single-market/en/news/fourth-meeting-working-group-digital-innovation-hubs
191 http://europa.eu/rapid/press-release_IP-18-4043_en.htm
192 http://europa.eu/rapid/press-release_IP-18-4043_en.htm
193 Based on Pandey A. (2015) "Top 10 Tips On eLearning Localization That Actually Add Value", eLearning industry, published on 22 September 2015, see: https://elearningindustry.com/top-10-elearning-localization-tips-add-value

group. The end goal of localisation is therefore to make content feel as if it was exclusively created for the specific target user group[194]. Creating and delivering localised learning content expands the number of languages an organisation speaks and enables being in multiple places at the same time. It also goes beyond language to address different market nuances[195].

SMEs become increasingly internationalised[196]. In order to be effective, **it is important for SMEs to localise their online learning content to create an interconnected workforce** that is not bound by geographic and cultural obstacles[197]. The topic of adaptation and localisation strategies in the context of SMEs can be addressed from two perspectives, namely from the perspective of SMEs establishing their operations abroad and from the perspective of SMEs localised in one geographic area and having employees with different nationalities and ethnic backgrounds. The applicable adaptation and localisation strategies for each perspective depend on the possibilities of an SME in terms of available resources.

The following localisation strategies are suggested to be effective for ensuring a world-class online training[198]. In their essence, these strategies imply customising the existing bespoke training course even further, to better match it with the background of the target audience.

Incorporating cultural and associated contextual nuances

Besides text, the online training course contains numerous other elements that need to be considered when adapting it for another language and context. Elements such as colours, gestures, symbols, and humour invoke a particular idea or feeling in people, depending on their country of origin and context. Since each of these elements has a connotation that is tailored to the local context, it is essential for it to be adequately modified to suit the target group.

Using Appropriate graphics

Images have to be culturally appropriate and acceptable to the target audience. To enable this, the images used in the original course must be interchangeable. It is recommended to avoid using symbolic images and gestures as those might mean something entirely different in other countries. The images must be neutral by excluding religious symbols, and any other region-specific references.

Adding local flavours

While keeping the original content neutral, it is recommended to add locale flavours and culture-specific subtleties while localising the online training course. A possible option could be adding a region-specific scenario or using local names and places that can

194 Habeeb Omer A. (2017) “5 Most Effective eLearning Localization Strategies”, eLearning industry, published on 18 September 2017, see: https://elearningindustry.com/5-effective-elearning-localization-strategies

195 Paul J. (2017) “How Global Enterprises Can Localize Corporate Learning Content”, published on 3 August 2017 on D2L, see: https://www.d2l.com/enterprise/blog/localize-online-learning-content/

196 David B (2016) “SMEs; Localisation vs. Internationalisation: A Critical Review of Theoretical Frameworks and Business Strategy”, Journal of Entrepreneurship & Organization Management, 5:191

197 Adapted based on Paul J. (2017) “How Global Enterprises Can Localize Corporate Learning Content”, published on 3 August 2017 on D2L, see: https://www.d2l.com/enterprise/blog/localize-online-learning-content/

198 Based on Habeeb Omer A. (2017) “5 Most Effective eLearning Localization Strategies”, eLearning industry, published on 18 September 2017, see: https://elearningindustry.com/5-effective-elearning-localization-strategies

amplify interest of the local audience. These allow foreign learners to connect with the learning program, often resulting in better transfer of knowledge.

Using international formats

It is also recommended to use internationally accepted formats for units of time, currency, and measurements. It allows avoiding confusion for the new learners and assures they gain accurate knowledge. It is vital to maintain consistency across all geographies to create a flawless understanding among global users. The latter is particularly relevant for enterprises having their workforce located in different countries.

Hiring professionals

Making online training ready for another country/context is an extensive and time-consuming process. To this end, it is recommended to hire professionals. Professional native translators (who also need to be subject matter experts) possess the skills required to incorporate appropriate cultural variations and terminology into the translated version. At the same time, they also possess the necessary technical skills to make sure that the meaning of the course is not lost in translation.

The abovementioned strategies, however, are associated with additional costs that many SMEs cannot afford (lacking resources to develop the initial bespoke online training course in the first place, let alone the localised version(s) of it, has been reported as one of the key barriers for SMEs not to use online training) [199]. To this end, there is a need to look for alternative (more affordable) strategies that would still ensure a better interconnectedness of the workforce with different geographical and cultural backgrounds.

One of such alternative strategies here could refer to the use of Universal Design for Learning (UDL), calling for ensuring[200]:

- Multiple means of representation to give learners various ways of acquiring information and knowledge,
- Multiple means of expression to provide learners alternatives for demonstrating what they know, and
- Multiple means of engagement to tap into learners' interests, challenge them appropriately, and motivate them to learn.

In this respect, the notion of **social learning** can be mobilised, implying active interaction of the workforce with peers, teammates and managers while following a “non-localised” course. Rather than aiming to adapt and localise the course explicitly, the adaptation and localisation would be performed in a tacit form by the employees themselves through exchanges of feedback and experiences with others. No specific resources would need to be additionally allocated for this approach except the need to provide the employees with an opportunity to have such an exchange of feedback and experiences regarding the course. This exchange can occur via already existing online tools (e.g. company chats, fora and similar) or in a physical setting, if the employees are geographically located in one place.

199 Roy, A. (2015) “Barriers to e-Learning in SMEs—Are they Still There?”, E-Learning-Instructional Design, Organizational Strategy and Management, InTech

200 Orkwis, R, & McLane, K (1998). A curriculum every student can use: Design principles for student access. ERIC/OSEP Topical Brief No. ED423654. Reston, VA: ERIC/OSEP Special Project

3.3. Overview of the latest scientific, policy and business publications

The current section provides an overview of the latest scientific, policy and business publications.

3.3.1. Relevant scientific publications

An extensive screening of scientific publications was performed based on their relevance to the topic of online training in enterprises, with a particular focus on SMEs. The topic of online training was addressed in a broader sense and included a wide range of solutions for technology-enhanced learning (including bespoke and off-the-shelf e-learning, video content, mobile learning, MOOCs, OER, virtual reality, gamification etc.). The research team aimed at selecting the *most recent* publications on the topic (not older than 2013), with focus on the opportunities, challenges and solutions in the context of online training in enterprises and particularly SMEs.

Identifying relevant publications not older than 2013 for the topic of online training represents a challenging task. The term "online training" (and related terms like "e-learning", "computer-based training" etc.) become increasingly outdated, and the number of high-quality publications on these topics significantly decreased since early 2000s, when these topics were highly popular in the literature. Digitally-enhanced learning gradually shifted to learning in a digital world, with less emphasis on the digital/online medium of learning, as it become more a norm than a novelty. To this end, the research team extended the search terms to include publications referring to technology-enhanced learning and learning in a digital age. The search has been performed by means of Google Scholar, combined with the publications nominated by stakeholders in the course of this initiative.

The current overview by no means aimed to represent a comprehensive analysis of the scientific literature in the field, and was rather meant to illustrate some of the key publications.

Table 3-2 provides an overview of results. The selected publications are presented in the chronological order (starting from the most recent one).

TABLE 3-2: Overview of key scientific publications and key messages per publication

Nr	Publication
1.	Bouwman H., Nikou S. and de Reuver M. (2019), "Digitalization, business models and SMEs: How do business model innovation practices improve performance of digitalizing SMEs?", Telecommunications Policy
2.	Moldovan L. (2019), "State-of-the-art analysis on the knowledge and skills gap on the topic of Industry 4.0 and the requirements for Work-Based Learning", Procedia Manufacturing, 32, pp. 294-301
3.	Attwell G. (2018) "E-Learning at the Workplace", Handbook of Vocational Education and Training, pp.1-25
4.	Giotopoulos I. et al. (2017), "What drives ICT adoption by SMEs? Evidence from a large-scale survey in Greece", Journal of Business Research, 81, pp. 60-69
5.	Keeble D. (2017), "Collective learning processes in European high-technology milieux", High-technology clusters, networking and collective learning in Europe, pp. 199-229, Routledge
6.	Lara F.J. and Salas-Vallina A. (2017), "Managerial competencies, innovation and engagement in SMEs: the mediating role of organizational learning", Journal of Business Research, 79, pp. 152-160
7.	Landers R. N., & Armstrong M. B. (2017), "Enhancing instructional outcomes with gamification: An empirical test of the Technology-Enhanced Training Effectiveness Model", Computers in human behaviour, 71, pp. 499-507.

Nr	Publication
8.	Assante D. et al. (2016), "The use of cloud computing in SMEs", Procedia Computer Science, 83, pp. 1207-1212
9.	Chang, V. (2016) "Review and discussion: E-learning for academia and industry", International Journal of Information Management, 36(3), pp. 476-485.
10.	Hamburg I. and Vladut F. (2016), "PBL – problem based learning for enterprises and clusters", Transportation Research Procedia, 18, pp. 419-425
11.	Sanchez-Gordon, S., and Luján-Mora, S. (2015) "An ecosystem for corporate training with accessible MOOCs and OERs", MOOCs, Innovation and Technology in Education (MITE), 2015 IEEE 3rd International Conference, pp. 123-128
12.	Batalla-Busquets J. M., and Martínez-Argüelles M. J. (2014) "Determining factors in online training in enterprises", The International Journal of Management Education, 12(2), pp. 68-79
13.	Brien E. O., and Hamburg I. (2014) "Supporting sustainable strategies for SMEs through training, cooperation and mentoring", Higher education studies, 4(2)
14.	Hamburg I., and O'Brien E. (2014) "Using strategic learning for achieving growth in SMEs", Journal of information technology and application in education 3, no. 2 (2014), pp. 77-83
15.	Mellett S., and O'Brien E. (2014) "Irish SMEs and e-learning implementation: The strategic innovative approach", British Journal of Educational Technology", 45(6), pp. 1001-1013
16.	Saunders, M. N., Gray, D. E., & Goregaokar, H. (2014) "SME innovation and learning: the role of networks and crisis events", European Journal of Training and Development, 38(1/2), pp. 136-149.
17.	Hamburg I., Brien, E. O. & Engert S. (2013) "Engaging SMEs in cooperation and new forms of learning", Computer and information science, 7(1), 1.
18.	Love J. and Ganotakis P. (2013), "Learning by exporting: lessons from high technology SMEs", International Business Review 22(1), pp. 1-17
19.	Martin-Rojas R., Garcia-Morales V. and Bolivar-Ramos M. (2013), "Influence of technological support, skills and competencies, and learning on corporate entrepreneurship in European technology firms", Technovation 33(12), pp. 417-430
20.	Purcarea I., Espinosa M. and Apetrei A. (2013), "Innovation and knowledge creation: perspectives on the SME sector", Management Decision 51(5), pp. 1096-1107

3.3.2. Relevant policy and business publications

Additionally, an extensive screening of business and policy publications was performed. The identification of the relevant sources was done by means of expert consultation and targeted desk-research. Also here, the research team aimed at selecting the *most recent* publications on the topic (not older than 2013), with focus on the opportunities, challenges and solutions in the context of online training in enterprises. The challenges related to the search of the relevant scientific publications (as highlighted above) were also relevant in the context of policy and business publications. After an extensive search, the research team selected **a sample of business and policy publications** having a high relevance to the issue in question. The sampling was again performed following a pragmatic approach and identifying illustrative publications that explicitly address the topic in question.

Table 3-3 provides an overview of results. The selected publications are presented in the chronological order (starting from the most recent one).

TABLE 3-3: Overview of key business and policy publications

Nr	Publication
1.	Bogdan, R., Holotescu, C., Andone, D., & Grosseck, G. (2017) "How MOOCs are being used for corporate training?", eLearning & Software for Education 2
2.	Guha S. (2018) "AI Chatbots In eLearning: Trends Embracing Across Digital Landscape", eLearning Industry, published on 19 February 2018
3.	Fosway Group (2017) "Digital Learning Realities 2017: Part 1 -Organisation, Headcount, Budget and Investment", in association with learning technologies, May 2017

Nr	Publication
4.	Fosway Group (2017) "Digital Learning Realities 2017: Part 2 –Trends, Drivers and Measures of success", in association with learning technologies, July 2017
5.	Fosway Group (2017) "Digital Learning Realities 2017: Part 3 –Impact and Satisfaction", in association with learning technologies, July 2017
6.	JRC (2017) "Policy approaches to open education: Case studies from 28 EU Member States", JRC Technical Report
7.	PwC (2017) "A decade of digital: Keeping pace with transformation", 2017 Global Digital IQ® Survey: Emerging technology insights
8.	TeachOnline (2017) "Five Key Questions About the State of Online Learning", published on 15 March 2017
9.	Harward D. (2016) "Key Trends for 2017: Innovation in Educational Technology", Training Industry
10.	EU15 Ltd et al. (2015) "European-wide e-Learning Recognition Review Report", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project)
11.	OECD (2013) "Skills Development and Training in SMEs", OECD publishing
12.	Pappas C. (2018) "4 Best Practices to Create Online Training Courses With AR Tech", eLearning Industry, published on 23 February 2018
13.	Shank P. (2018) "Microlearning, Macrolearning. What Does Research Tell Us?", eLearning Industry, published on 19 February 2018
14.	Beutner, M., & Rüscher, F. A. (2017) "Acceptance of Mobile Learning at SMEs of the Service Sector", International Association for Development of the Information Society
15.	Pappas C. (2017) "8 Corporate eLearning Trends For 2017", eLearning Industry, published on 21 May 2017
16.	EU15 Ltd (2016) "SMEs & e-learning (SMEELEARN) – e-learning Best Practice Guide", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project)
17.	SAP (2016) "A New Model for Corporate Learning", SAP Service & Support Thought Leadership Inquiry Nr. 191201
18.	Mesquita A. (Ed.) (2015) "Furthering higher education possibilities through massive open online courses", IGI Global

3.4. Development costs and funding models

The current section addresses the topic of development costs and funding models for online training.

3.4.1. Development costs

Key **factors influencing the development costs** of online training include the following[202]:

- Instructional and outline design;
- Size of the application;
- Degree of templating (self-similarity within application);
- Media complexity;
- Data reporting and performance support functions;
- Embedding environment (including access control; authentication; central reporting and marking of assessments; status tracking; community support (e.g. forums); link to tutor via email);
- Degree of navigation and user interactivity;
- Standards compliance; and
- Usability testing.

Some **additional costs** that need to be taken into account when developing online training include **the cost of refining an online training solution** and **the cost of**

201 http://www.digitalistmag.com/files/2016/03/SAPTL47_192Learning_Inquiry.pdf
202 https://www.trainingzone.co.uk/develop/business/the-cost-of-developing-e-learning-feature

technology[203]. The cost of refining an online training solution implies the need for continuous iterations, feedback rounds and maintenance along the way, which requires extra time and investments. The cost of technology, in turn, refers to the fact that besides the initial signup costs of the LMS and authoring tools, fees for upgrades, licensing, storage, and support need to be taken into account.

The data of 2018 suggest that **1 hour of ready e-learning content takes 100-160 hours to produce**[204]. **1 hour of ready e-learning content costs 7580 - 24,449 EUR (16,015 EUR on average)**[205] **to produce** (if performed by skilled contractors, the costs can be lowered by up to 30%)[206]. A detailed overview of the online course development costs is provided in Table 3-4. Creating an online course is now approximately 12% cheaper than in June 2017[207].

The hour-based methodology, however, represents only a rough estimation tool for online training consumers. While it allows assigning budget to content development, it still does not guarantee that this content will address any of the business or learning objectives. It also does not take into consideration the complex reasoning behind why one type of training costs more than another, and it is based on the following assumptions[208]:

- All learners will take the same path through the content;
- The content has a pre-determined instructional density;
- The content aims to achieve the same kind of outcome for all learners.

TABLE 3-4: Online course development costs: team involvement estimates[209]

Nr	Team role	Involvement stage	Time (hours) / 1 course video hour	Hourly rate, EUR[210]	Total, EUR[211]
1.	**Course owner**	All	Individual	Individual	Individual
2.	**Subject matter expert**	Design	10-15	Individual	Individual
3.	**Project manager**	All	40-55	26-43	1024-2347
4.	**Instructional designer**	Design, Development	50-79	26-51	1280-4046
5.	**Marketer**	Analysis	30-40	26-60	768-2390
6.	**Lecturer**	Design, Development	53-84	17-43	905-3584
7.	**Psycholinguist**	Design, Development	20-35	17-51	341-1792

203 Andriotis N. (2017) "The hidden costs behind eLearning", published on 9 October 2017 on eLearning industry, see: https://elearningindustry.com/hidden-elearning-costs
204 https://raccoongang.com/blog/how-much-does-it-cost-create-online-course/
205 Converted from USD based on the conversion rate of 26 July 2018
206 *Ibid*.
207 A study by Karl Kapp and Robyn Defelice also demonstrated the timeframes for producing one hour of distance learning materials and showed that it takes 90-240 hours on average. Another research by Chapman Alliance conducted back in 2010 stated that an hour of eLearning costs ~8,552 EUR to produce. More information see: https://raccoongang.com/blog/how-much-does-it-cost-create-online-course/
208 https://www.trainingzone.co.uk/develop/business/the-cost-of-developing-e-learning-feature
209 From https://raccoongang.com/blog/how-much-does-it-cost-create-online-course/
210 Converted from USD based on the conversion rate of 26 July 2018
211 From https://raccoongang.com/blog/how-much-does-it-cost-create-online-course/

Nr	Team role	Involvement stage	Time (hours) / 1 course video hour	Hourly rate, EUR[210]	Total, EUR[211]
8.	**Graphic designer**	Development	59-86	26-43	1510-3669
9.	**Director**	Development	3-5	26-85	77-427
10.	**Video operator**	Development	3-5	13-26	38-128
11.	**Video editor**	Development	51-110	21-38	1088-4226
12.	**Content manager**	Implementation	32-43	17-43	546-1835
TOTAL					**7580-24449**

Table 3-4 refers to video-based online courses. However, SMEs generally do not develop video-based courses for their internal training purposes. At the same time, they may reuse and/or recombine existing video materials. Video production in SMEs is suggested to be relevant for customer training through, for example, YouTube (e.g. showing how the product is used, installed, or repaired). The cost structure for such uses is likely to be considerably different from the one presented in Table 3-4.

When developing an online training solution, the critical first step is to **fully understand the associated development costs and the decisions that will control those costs** in order to achieve the key training objectives, within budget[212].

3.4.2. Funding models

One of the key factors to any successful technology purchase and implementation is that the selected **funding model is sustainable**. Therefore, to achieve the goal of moving employee training to a new paradigm of learning, **investment in technology-enhanced learning cannot be a one-time effort**. There is a need to identify and prioritise the factors that make some technology implementations perform dramatically better than others, including the underlying funding models.

Examples of relevant **funding models** include the following:

- Government-backed loans;
- Bundled service agreements;
- Seed funding and micro-financing;
- Technology grants;
- Bonds and leasing;
- Bring Your Own Device Programs (BYOD);
- User fees etc.

Table 3-5 provides an analysis of the advantages and disadvantages of each of the relevant funding models, accompanied with the identified examples.

212 Andriotis N. (2017) "The hidden costs behind eLearning", published on 9 October 2017 on eLearning industry, see: https://elearningindustry.com/hidden-elearning-costs

TABLE 3-5: Funding models for online training

Nr	Funding model	Advantages	Disadvantages	Examples
1.	Public funding and public-private partnerships[213]			
1.1	National/EU upskilling/ reskilling initiatives	Broad programmes on improving productivity, qualifications, skills, employability Ideal for long-term cross-sector workforce development	Hard to measure granular success metrics for systematic improvement Requires large-scale funding Limitations on long-term forecasting certainty	The Digital Single Market includes an ICT innovation voucher scheme specifically targeted at SMEs, which provides a small credit line for these enterprises to innovate their existing business through ICT uptake[214]. Similarly, there is a new strategy to launch Digital Innovation Hubs in every EU region (especially Central and Eastern Europe) to minimise the digital divide in industries[215]. These DIHs act as a one-stop-shop - for technical universities, research institutes, large and small enterprises, and technology solution providers – to provide access to technology-testing, financing advice, market intelligence and networking opportunities.
1.2	Government-backed loans	low interest rates accessible criteria for eligibility flexible repayment schedule suitable for large technology purchases	Limited availability Dependent of existing policy frameworks and budgets	EU Funds like InnovFin Programme, Creative Europe etc.[216] Eurostars Programme for R&D performing SMEs to scale-up new products, processes, services[217]
1.3	Bundled service agreements	Competitive rates Involves a value chain of collaborative businesses suitable for first-time technology initiatives and individual/household device programmes	Possible lock-in with bundle providers Not suitable/flexible enough for organisations with existing infrastructure or alternative solutions	For example, the eSchool programme in Portugal made notebooks available to almost 700000 students and teachers by financing them by weaving them into licensing contracts between the state and 3G telecom operators[218]. Onyx One is a platform designed by Onyx Online Learning (BE); it provides not only an LMS for

213 Intel Education Technology Advisor. (2012). Funding models for eLearning in Education. Retrieved from https://www.intel.co.uk/content/dam/www/public/us/en/documents/white-papers/education-technology-advisor-elearning-funding-paper.pdf

214 European Commission. (n.d.). Digital Single Market Policy - ICT innovation voucher scheme for regions. Retrieved August 25, 2018, from https://ec.europa.eu/digital-single-market/en/ict-innovation-vouchers-scheme-regions

215 European Commission. (n.d.). Pan-European network of Digital Innovation Hubs (DIHs). Retrieved August 25, 2018, from https://ec.europa.eu/digital-single-market/en/digital-innovation-hubs

216 EUROPA. (n.d.). Your Europe - Access to finance. Retrieved August 25, 2018, from https://europa.eu/youreurope/business/funding-grants/access-to-finance/index_en.htm

217 Eurostars. (n.d.). Start your Eurostars project. Retrieved August 25, 2018, from https://www.eurostars-eureka.eu/start-your-eurostars-project

218 Simoes, G. (n.d.). The Portuguese E-inclusion strategy and the emphasis on education. Retrieved from http://www.ocg.at/sites/ocg.at/files/AAL-F09/files/s12-simoes.pdf

Nr	Funding model	Advantages	Disadvantages	Examples
				manufacturing enterprises, but also a contract management system for contractors and suppliers[219].
1.4	Seed funding and micro-financing	Low/no interest loans for affordable technology financing Suitable for individual/household device programmes	Funding amounts are usually small Not suitable for large-scale initiatives	European Progress Microfinance Facility by the European Investment Fund[220]. The European Angels Fund organised by the EIF for seed, early or growth stage innovative enterprises[221]
2.	Technology grants			
2.1	Public grants	Supported by legislative institutions Suitable for substantial technology improvements Ideal for one-time/short-term funding needs	Need for extensive accountability Requires research and business case with demonstrable gains Political will and commitment may not be reliable Variable requirements throughout the year	In France, almost a third of the funding for the FUN (France Universite Numerique) platform was allocated to financing filming equipment at the disposal of institutions to create MOOC content[222]
2.2	Private grants	Simple eligibility requirements Smaller funding amounts and limited number of grants Suitable for technology pilots and innovation initiatives	Limited regulation and documentation Application process might be lengthy but without guaranteed success	BNP Paribas as part of the EIB Group has executed the first synthetic securitisation deal for supporting French SMEs (almost 25-basis-point reduction in interest rates)[223]
3.	Bonds and leasing[224]			
3.1	Technology bonds	Long-term financing option Ideal for large initial expenditures Fosters community buy-in and participation	Requires a large publicity campaign to secure support Unsuitable for parties with little/no political influence	Luxembourg offers a Fit4Digital program (worth 5000 euros) to help SMEs assess their ICT needs and most promising areas for digitisation[225]
3.2	Leasing	Long-term tax-exempt financing solution Ideal for keeping technology up to date Flexible repayment No long-term debts	Technology equipment must be returned after lease period No long-term capital	Enterprises like PEAC Finance providing end-to-end financing for digitalisation-related leasing[226]

219 Kao, T. (n.d.). European, simple and efficient LMS and e-learning platform for GMP. Retrieved August 25, 2018, from https://www.onyxonlinelearning.com/en/european-lms-and-e-learning-platform-for-gmp/

220 European Investment Fund. (2018). European Progress Microfinance Facility. Retrieved August 25, 2018, from http://www.eif.org/what_we_do/microfinance/progress/index.htm

221 European Investment Fund. (2018). European Angels Fund (EAF). Retrieved August 21, 2018, from http://www.eif.org/what_we_do/equity/eaf/index.htm

222 Oui, M. (2014). MOOC: 88,000 registered on the FUN platform and new funding in sight. Retrieved August 25, 2018, from https://www.letudiant.fr/educpros/actualite/numerique-moocs-88-000-inscrits-sur-la-plateforme-fun.html

223 Bernard, O. (2018). Orrick Advises BNP Paribas on First Synthetic Securitisation Deal to Support French SMEs and Midcap Firms Under Juncker Plan. Retrieved August 25, 2018, from https://www.orrick.com/News/2018/02/Orrick-Advises-BNP-Paribas-on-First-Synthetic-Securitisation-Deal

224 Intel Education Technology Advisor. (2012). Funding models for eLearning in Education. Retrieved from https://www.intel.co.uk/content/dam/www/public/us/en/documents/white-papers/education-technology-advisor-elearning-funding-paper.pdf

225 Chambre des Métiers. (n.d.). Financement. Retrieved August 25, 2018, from https://www.cdm.lu/entreprise/ehandwierk/debuter-dans-le-digital/financement

226 PEAC Finance. (n.d.). Business to Business lender focused on supporting SMEs. Retrieved August 25, 2018, from https://peacfinance.com/

Nr	Funding model	Advantages	Disadvantages	Examples
			Yearly budget changes might affect funding	
3.3	Universal Service Funds	Suitable for developing regions/nations Suitable for building general infrastructure and resources for boosting economic activity (e.g. affordable broadband, reducing Digital Divide)	Geographic scale becomes a challenge Lack of appropriate education and other infrastructure affects time/impact of programme	A 2016 European Parliament briefing makes a case for broadband (internet) as a universal service[227]
4.	Individual Funding[228]			
4.1	Bring Your Own Device Programs (BYOD)	Allows for immediate technology integration Funding sources required for infrastructure and professional service offerings only	Requires accessibility across range of devices and connection varieties Not ideal for low-income households as the pressure to obtain suitable technology is transferred to them	European Association of ERASMUS Coordinators offers training programmes for educators and HR in enterprises to develop BYOD implementation as an eligibility requirement in Key Action 1 of European Development Plan[229]
4.2	User fees	Shared responsibility between organisation and individuals Ideal for 1:1 technology initiatives	Limited to affluent organisations Not ideal for low-income regions/ households	Alison Edgar is a training provider with online training specifically for SMEs (individuals and teams)[230]
5.	Financial incentives for employee development			
5.1	Hours/learning costs compensation	Giving employees the initiative to pick training offers that suit their interest and needs Minimises administrative effort to recompense workers Usually concurrent with a BYOD scheme	Hard to track employee engagement Hard to gauge trust in credentials of learning offers	Personal Activity Account, France[231]
5.2	Corporate tax relief	Tax relief on employer expenditure on employee training Covers both cost of provision and opportunity (wage) costs Covers both corporates and self-employed	Administrative complexity and lengthy eligibility verification High rate of failure or non-completion More likely to benefit white collar workers than blue collar workers	Training Tax Allowance (Bildungsfreibetrag), Austria The Crédit Impôt Recherche (CIR) scheme in France[232]
6.	Emerging funding models			
6.1	Open Educational Resources	In combination with BYOD policies, OERs essentially push	Not guaranteed to find exact match of topics	Die Informationsstelle OER (OERinfo), Germany[233]

227 European Parliamentary Research Service. (2016). Broadband as a universal service. Retrieved August 25, 2018, from http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/581977/EPRS_BRI(2016)581977_EN.pdf

228 European Parliamentary Research Service. (2016). Broadband as a universal service. Retrieved August 25, 2018, from http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/581977/EPRS_BRI(2016)581977_EN.pdf

229 EAEC. (2018). Bring Your Own Device (BYOD): Active and autonomous learning strategies with mobile devices. Retrieved August 25, 2018, from http://courses.eaecnet.com/index.php?id=420

230 Edgar, A. (2018). I'm Alison Edgar, - The Entrepreneur's Godmother. Retrieved August 21, 2018, from https://alisonedgar.com/about-alison-edgar/

231 EPALE. (2017). The Personal Activity Account comes into force in France. Retrieved August 25, 2018, from https://ec.europa.eu/epale/en/content/personal-activity-account-comes-force-france

232 Gouvernement.fr. (2016). Le Crédit d'Impôt Recherche (CIR). Retrieved August 25, 2018, from https://www.gouvernement.fr/du-concret-pour-vous-le-cir

233 OERinfo (2018), Uber die iInformationsstelle OER, see: https://open-educational-resources.de/ueber-oerinfo/ueber-die-informationsstelle-oer/

Nr	Funding model	Advantages	Disadvantages	Examples
		investment in training to nearly zero	Takes time to find and curate available content	
6.2	Sharing/pooling training materials across enterprises	Enterprises can benefit from sharing training materials across ecosystem – thus increasing available options but minimizing costs It allows bigger enterprises and SMEs to form stronger ecosystems, especially within the same value chain Communities of practice can share best practices across enterprises	Enterprises are often reluctant to share resources due to fear of giving away "too much" to competitors	Could not find European examples. SABMiller's 4e Camino al Progreso Program[234] (Latin America)
6.3	Payback clauses	When an employer pays for employee training, a (partial or full) payback clause in the contract can be triggered if that employee terminates employment within the contractual retention period Additional clauses may also require employees to share insights and learnings with team members or document them for future use	In case of unforeseen but valid cases of exemption from payback clause, enterprises may suffer a loss	Payback clauses are regulated at different levels across EU member states – existing in most countries as nationally regulated or as collective agreements among social partners[235].
6.4	Free trainings offered by digital platform providers	Digital platform providers (such as Google Adwords, Asana, JIRA) may offer free trainings based around their products or services with the goal of recruiting new customers on their platforms	The non-zero risk of "lock-in" to certain platforms and inability to transfer data at a later time.	Grow with Google, (EU-wide)
6.5	Performance-based financing (PBF)	Innovative, results-oriented approach that incentivizes providers to ensure their trainings result in positive outcomes in terms of bottom line (or other metrics) Contracts can include a baseline and a variable incentive scheme depending on size and duration of impact	Hard for providers to guarantee outcomes since it may involve many external factors as well	Unable to find SME examples but PBF has been recognised as a valid model by the World Bank in some sectors like healthcare[236].
6.6	Crowdfunding	can be a fast way to raise finance with no upfront fees237	a need to put significant effort in building up interest	Unable to find SME examples. The model could still be suitable for

234 B. Jenkins (2015), Empowering Small Businesses in Corporate Value Chains: The Case of SABMiller's 4e Camino al Progreso Program, see: https://www.ab-inbev.com/content/dam/universaltemplate/ab-inbev/investors/sabmiller/reports/other-reports/the-case-of-sabmiller-s-4e-camino-al-progreso-program-2015.pdf

235 CEDEFOP (2012), Payback clauses in Europe: supporting company investment in training, see: http://www.cedefop.europa.eu/files/5523_en.pdf

236 World Bank Group (2014), Performance-Based Financing Toolkit, see: https://openknowledge.worldbank.org/handle/10986/17194

237 This and other advantages and disadvantages of crowdfunding from: https://www.nibusinessinfo.co.uk/content/advantages-and-disadvantages-crowdfunding

Nr	Funding model	Advantages	Disadvantages	Examples
		can be a valuable form of marketing and result in media attention often allows to get feedback and expert guidance on how to improve it an alternative finance option if getting bank loans or traditional funding is difficult	before the project launches – significant resources (money and/or time) may be required a risk of losing all collected funding if the target has not been met risk of copyright issues if the idea is not protected	SME branches (communities of SMEs). For example, Europeana's match funding call238 in collaboration with the crowdfunding platform Goteo uses this model for funding innovative educational projects.

3.5. Latest innovations in pedagogies

The current section aims to summarise the latest innovations in pedagogies. The following emerging pedagogies were identified in the field online training:

- **Learning through social media**[239]: social media platforms such as Twitter and Facebook offer a wide range of learning opportunities, to access expert advice, encounter challenges, defend opinions and amend ideas. An associated risk refers to the fact that these sites may present learners with inaccurate information, biased comments and hostile responses. Some organisations have set up social media specifically to offer learning opportunities. Learners are helped to share experiences, make connections, and link these with learning resources. Such projects typically need a skilled facilitator who takes on the tasks of filtering resources and engaging people. With such facilitators, social media projects can be running for many years.

- **Learning from the crowd**[240]: mobilising the crowd offers access to valuable sources of knowledge and opinion. Experts and amateurs exchange ideas, generate and discuss content, solve problems, vote for the best solutions, and raise funds. An example of the crowd in action is Wikipedia, the online encyclopaedia co-created and continually updated by the public. Possible applications of crowdsourcing in learning include collecting and curating learning resources, letting learners share and discuss their work online, and providing opinions and data for use in projects and research assignments. However, these approaches need to consider the quality and validity of the contributions that are made by the public.

- **Learning through games**[241]: the current pedagogy implies the use of serious games, gamification and game-infused learning. The focus can be on games designed for education, the use of game elements in workplace training, simulations such as flight trainers, or on social benefit. Learners can try out unfamiliar roles and contexts and make consequential decisions. This approach implies close collaboration between professional game designers, software engineers, and learning experts. Together, these groups could develop game engines based on effective pedagogy, employing learning analytics to adapt game experiences to players' educational goals and actions.

238 https://pro.europeana.eu/post/three-innovative-educational-projects-are-launching-their-crowdfunding-campaigns-get-involved
239 The Open University (2016) "Innovating Pedagogy 2016: Exploring new forms of teaching, learning and assessment to guide educators and policy makers", see: https://iet.open.ac.uk/file/innovating_pedagogy_2016.pdf
240 *Ibid*.
241 *Ibid*.

- **Formative analytics**[242]: most of the current applications of learning analytics track time spent on online learning, or performance on an assessment. By identifying who may be at risk of failing a test, summative learning analytics provide insight into performance of learners and who needs support. Formative analytics, in turn, support learners to reflect on what they have learned, what can be improved, which goals can be achieved, and how they should move forward. By providing *analytics for learning* rather than analytics of learning, formative analytics have the potential to empower each learner through timely, personalised, and automated feedback, including visualisations of potential learning paths.

- **Open textbooks**[243]: open textbooks refer to freely shareable and editable resources designed to operate in place of a specified textbook. Representing open educational resources (OER), they do not have copyright restrictions but operate with an open licence that enables everyone to reuse, remix, revise, redistribute and retain them. Open textbooks represent a dynamic resource that can be edited and amended by learners as part of their learning process. Open textbooks can be seen as part of a broader move towards 'open pedagogy', which emphasises open content and open practices. The term "textbook" is used loosely here, and content may range from images and documents to podcasts and videos.

- **Immersive learning**[244]: immersive learning can enable learners to experience a situation as if they were there, deploying their knowledge and resources to solve a problem or practise a skill. It implies integrating vision, sound, movement, spatial awareness, and even touch. Traditionally, immersion requires learners to act out scenarios or take part in simulated reality. By using technologies such as virtual and augmented reality (VR/AR), 3D screens or handheld devices, learners can experience immersive learning in a classroom, at home, or outdoors. This enables them to explore possibilities that would be difficult, dangerous, or impossible to simulate in real life.

- **Learner-led analytics**[245]: learning analytics make use of the data generated during learning activity in order to enhance learning and teaching. They often focus on how educators and training providers can help learners to pass a test, a module, or earn a degree. Learner-led analytics, in turn, not only invite learners to reflect on the feedback they receive but also encourage them to set their own learning goals. Learner-led analytics put learners in the driving seat. Learners can decide which goals and ambitions they want to achieve, and which types and forms of learning analytic they want to use to achieve those targets. The analytics then support learners with reaching their goals.

- **Collaborative learning**[246]: while earlier, online learning options typically targeted individual learners, newer forms of online training engage entire teams of people to work together collaboratively. These teams may be in the same room at the same time or working from multiple locations asynchronously – all variations

242 The Open University (2016) "Innovating Pedagogy 2016: Exploring new forms of teaching, learning and assessment to guide educators and policy makers", see: https://iet.open.ac.uk/file/innovating_pedagogy_2016.pdf

243 The Open University (2016) "Innovating Pedagogy 2016: Exploring new forms of teaching, learning and assessment to guide educators and policy makers", see: https://iet.open.ac.uk/file/innovating_pedagogy_2016.pdf

244 *Ibid*.

245 *Ibid*.

246 Higley M (2018), "Reasons why collaborative online learning activities are effective", published January 2018, see: https://elearningindustry.com/collaborative-online-learning-activities-reasons-effective

possible depending on the nature of the task. Teams are able to use modern collaboration tools like, for example, GSuite, Slack, Skype, wikis and/or Dropbox to discuss and deliver their final outcomes.

- **Rapid prototyping**: the term "rapid prototyping" is gaining new usage as a means of testing innovative ideas with real users as quickly as possible so that minimum time and effort is spent on solutions that do not interest/help users. This method may not teach teams a new concept, but it does teach them to work with limited time and resources to ideate and develop a prototype, and the prototypes are applied to real-world users to get real-world feedback.

In addition, **blockchain for learning**[247] explores how blockchain technology could be applied to education, shifting from central records of learner's performance held by educators and training providers to a more decentralised model in which achievements are recorded by a wider range of participants. A blockchain could be used as a permanent shared record of intellectual achievement. While blockchain technology opens new possibilities for trading educational reputation as a currency, it also poses significant risks of treating learning as a commodity and is associated with negative environmental impact. Alternative approaches offering similar solutions with higher flexibility refer to Open Badges, Verifiable Claims, Public Key Infrastructures (PKI), distributed databases, as well as DID (Decentralised Identifier) resolver methods.

3.6. Criteria for good online training for SMEs

In order to identify the criteria that would form the base for good online training experience, SMEs first need to perform an analysis of specific needs and objectives of learning. It is a continuous and iterative process that is likely to require revisions of the initially set needs and objectives in the course of the development of online training. Based on the research conducted within SMEELEARN project[248], the **key criteria** of a good online training course for SMEs generally include the following:

- Detailed analysis;
- Structured content;
- Interactive content;
- Assessment opportunities;
- Enjoyable and fun activities;
- Achievable milestones;
- Visually stimulating;
- 24/7 accessibility;
- Real-life case studies;
- Blended learning;
- Audio input;
- Training room based;
- Reporting facilities;
- Time to think – low pressure learning environment;
- Certification; and
- Accreditation.

247 Higley M (2018), "Reasons why collaborative online learning activities are effective", published January 2018, see: https://elearningindustry.com/collaborative-online-learning-activities-reasons-effective

248 EU15 Ltd (2016) "SMEs & e-learning (SMEELEARN) – e-learning Best Practice Guide", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project)

More information on specific criteria and the overall online training design process can be found in the "E-learning best practice guide"[249] that was developed specifically for SMEs.

In order **to maximise the impact of online training within SMEs**, the following aspects need to be taken into account[250]:

- Setting clear goals for how learning solutions should impact key target audiences in terms of learning results[251];
- Establishing clear company's talent management processes and aligning online training with these processes;
- Outlining a proactive strategy and the tactics that show how the company's learning infrastructure and learning ecosystem enable on boarding, talent development, performance management, and career planning;
- Prioritising learning activities including new systems, new products, new processes, organisation change and audiences with tangible performance goals;
- Organising an independent review of the learning approach and solutions to get a fresh perspective on where the company can make the most significant improvements.

3.7. Main conditions for a massive take-up of online training by SMEs

The current sub-section addresses the main conditions to be fulfilled for a massive take-up of online training by SMEs in Europe. Based on desk-research, in-depth interviews with the representatives of different MS and six expert workshops, the following conditions were identified:

- **Raising awareness among SMEs** about the opportunities offered by online training and specific benefits of it for both employers and employees (AT, CY, ES, FI, IT, LV, PL, PT, SI). SMEs also need to be informed that there is plenty of off-the-shelf material directly available for use (e.g. MOOCs, OER). As a result, there is often no need to develop tailor-made courses (bespoke e-learning), for which SMEs may not have sufficient resources.
    - There is a need for combining different channels, such as local mass media and social media, conferences (where HR managers of larger enterprises and CEOs of small enterprises would be invited to hear about the opportunities and benefits of online training), direct meetings with enterprises, roadshows etc.
    - It should be coordinated at different levels, by government in combination with industry associations and education & training providers.
    - There is a need to share real-life examples of enterprises that already successfully use online training.

249 EU15 Ltd (2016) "SMEs & e-learning (SMEELEARN) – e-learning Best Practice Guide", Erasmus+ project nr. 2014-1-UK01-KA202-001610 (SMEELEARN project)
250 Fosway Group (2017) "Digital Learning Realities 2017: Part 3 –Impact and Satisfaction", in association with learning technologies, July 2017
251 There is also a need to define how the transfer of learning will be measured

- **Providing SMEs with knowledge and skills to implement online training for business needs** (ES, FI, FR, IT, PL, PT). The key target audience refers to HR professionals and managers that carry responsibility for training in their own operations (e.g. safety managers, sales managers/directors, product managers or CEOs of small enterprises)[252].

    - An important way to promote the use of online training and to improve its quality is the targeted and systematic **training of teachers and trainers** according to uniform quality standards[253].

    - **"Online training on online training"** needs to be developed and actively disseminated among enterprises. This training needs to be available in the local language to ensure a better reach of the audience. The European Commission could play a role in it by coordinating the development of such trainings for each MS in a local language.

    - There is a need for **practical guides with real-life examples** of online training implementation from all over Europe. It needs to be an 'agile' material that is regularly updated with new examples. This would allow sharing good practices among enterprises.

    - There is a need for **personalised platforms** that would take into account specific needs of enterprises and their employees. The European Commission could be an initiator of such platforms, which, in turn, could be shared by multiple enterprises across Europe. Such platforms could be organised as 'brokers of knowledge', with content being supplied by a wide range of providers under a common umbrella (similar to amazon.com or YouTube model). The quality of the content could be controlled by users themselves based on its popularity and user ratings.

- **Developing understanding of learning economics** (FI, PL). Enterprises, particularly SMEs, need to be convinced of the economic benefits of (online) training. It allows enterprises to see online training as an investment that generates increase in human and financial capital when implemented in a right way.

- **Creating networks among SMEs and developing joint Human Resource Development programmes** (AT, FI, PT, and SE). There is a need to bring together enterprises with a shared interest in developing online learning solutions. This field is too broad for a single company, and enterprises need to join forces. There is a need for collaborative networks with an explicit focus on enterprises[254] (in contrast to academic networks).

252 ChangeLearning Alliance has established a Corporate Digital Learning Design program, which addresses these issues and targets European enterprises. The program was designed in cooperation with some of the world's leading corporations that have utilised online training successfully. It applies a practical approach to online training development and management with the objective to improve the skills and capabilities of participating enterprises in online training provision.

253 This is the main goal of the project "Certified European E-Tutor" (CET) funded by the European Commission. The project defines a comprehensive quality standard for the further education of VET teachers and trainers to becoming "e-tutors" and introduces a certification procedure, which supports the validation and recognition of e-learning qualifications in a transparent way at European level.

254 Since 2012, ChangeLearning Alliance has worked closely with leading European enterprises to bring together online training professionals and experts to share knowledge and to foster cooperation between them. The ChangeLearning Corporate Network is already active in multiple EU regions (particularly in Finland and Ireland).

- These networks should operate at both national and international levels, as well as clustered around specific industries.

- These networks need to be based on the **community of practice** framework, which implies bringing knowledge workers together around a shared domain and providing them with an opportunity to share and create knowledge. The community members learn from each other both via organised and informal interactions as well as through their shared expertise. The community of practice helps the members to keep up with the advanced technology through knowledge sharing and learning processes. These areas are brought into practice by adapting and developing social, collaborative and informal learning.

- The key benefits of such networks would be sharing experiences and establishing partnerships between enterprises.

- Policy makers could help with facilitating the activities around setting up and coordinating the network.

- Shared **procurement** of online training by enterprises is not common in Europe. It is more often procured by professional associations. Public authorities could do pre-commercial procurement of course catalogues and creation of shareable resources on popular topics and competences.

· Developing schemes for **the assessment and recognition of online training** in the academic and business sectors (FR, HR, and RO). Multiple MS emphasise the importance of making visible and valuing learning that takes place outside formal education and training institutions.

  - Despite a number of initiatives and recommendations on the recognition of informal learning (e.g. European guidelines for validating non-formal and informal learning[255], CEDEFOP, 2015), there is a wide gap between the recognition of formal and informal or non-formal learning.

  - **There is a need for formal training organisations and policy makers to understand the importance of informal training for SMEs** and the potential that exists to develop a pathway for informal skills development to be recognised by qualifications[256]. Policy makers need to be aware of the local/regional SME context and the need for tailored skills development policies. There is a need for more policy dialogue with public, private and industry organisations.

  - Access to the recognition of informal learning is sporadic, and the outcome of recognition process is too often treated with suspicion[257]. Several EU initiatives have been launched to tackle this challenge (see sub-section 3.1.2.).

· **Encouraging the development and use of micro-credentials** through active collaboration between the academic sector and business (AT, MT). This concept refers to specialised mini-degrees offered by universities/spin-offs together with enterprises, which allow employees to earn a degree without a need to leave a

255 http://www.cedefop.europa.eu/en/publications-and-resources/publications/4054
256 OECD (2013) "Skills Development and Training in SMEs", OECD publishing
257 http://www.eportfolio.eu/community/projects/badge-europe

workplace. Learners can create their own curriculum by combining different micro-credentials to a full degree.

- **Encouraging pan-European, cross-sectoral collaboration between universities, enterprises, policy makers and supporting structures**, to allow more transferability, flexibility and permeability in the EU educational & training systems (AT, EL, IT, MT).
    - Without acting now there is a high risk that the relevance of European education & training providers will significantly decrease in the near future.
    - Some large US providers (e.g. Amazon, Google, and LinkedIn) already start offering their own credit systems in combination with high-quality online learning. These emerging education & training offers are likely to become strong competitors of the more traditional offer of the European providers.
    - Now, most enterprises are still not aware of these new options and trends. However, once enterprises start to accept emerging online degrees, a paradigm shift is likely to take place.
- **Developing measures aiming at quality assurance of the online training offer** (HR, PT, RO). Special attention needs to be paid to making sure that the available online training offer satisfies specific quality requirements. To this end, there is a need for a common agreement and framework for (pan-European) quality standards for online training solutions.
    - When it comes to developing an online training course, each company has its own process and courseware designers and developers around the world design courses in their own style and use their own standards. This may affect the quality of the online training course.
    - There are certain industry standards that can be used to maintain the consistency and quality of online training courses. These standards include Interface Standards, Compatibility and Interoperability Standards, Production Quality Standards and Instructional Design Standards[258].
    - Following the industry standards helps ensure the optimisation of production development time and thus results in the optimisation of cost. Without these standards, the online training course might lose its aesthetic sense and functionality[259].
- **Maximising pedagogical and learning relevance of online training**: it is a general misconception that online training courses offer no support for their learners. In fact, this belief prevents many individuals from enrolling, even if they are highly motivated to learn and have the time to do so.
    - To overcome this online training challenge, there is a need to have a solid **support system** in place for the learners. They can be offered a FAQ that can help them remedy any common issues, and email or instant message

258 Habeeb Omer A. (2016) “The 5 Types Of eLearning Interface Standards”, published in eLearning Industry on 24 October 2016, see: https://elearningindustry.com/elearning-interface-standards-5-types

259 *Ibid*.

support for more complicated questions or concerns. Another effective solution implies encouraging peer collaboration (e.g. via a forum)[260].

- For learners to become truly engaged in the overall online training process, they have to be aware of how the content is going to **translate in real world settings**. To tackle this online training challenge, it is possible to integrate simulations or online training scenarios that help the learner to see how they can apply the information they have learned in real life. The learners can also be offered real-world examples, or group collaboration projects that are based around problems or issues they might encounter regularly outside of the virtual classroom[261].

- **Introducing specific incentives for SMEs to use online training** (IT, LT, UK). Some of the consulted stakeholders emphasised that rather than making online training compulsory for enterprises, it would be more effective to make sure that enterprises truly desire to advance the skills of their employees and sincerely embrace the opportunities of online training. At the same time, it is also possible to incentivise SMEs to do so by offering compensation for SMEs to upskill their workers.

  - For example, an effective way to stimulate the uptake of e-learning could be to offer tax reduction to enterprises for using online training.

  - Another effective way could be to make reaccreditation compulsory (in the context of continuous professional development), with a prominent role for online training in it.

Additionally, the online training aspect could be embedded as a key requirement into existing and future EU and national funding programmes related to training. In essence, it would require part of the training to be conducted in an online form.

260 Pappas C. (2014) "Top 5 Most Common eLearning Challenges And How To Overcome Them", published in eLearning Industry on 5 November 2014, see: https://elearningindustry.com/5-common-elearning-challenges-overcome

261 *Ibid*.

4. VISION AND TOP PRIORITY MEASURES

The current chapter presents systemised inputs for a vision. The vision aims to include specific measures, roles and priorities at the EU and national levels for the implementation towards 2030. The development process implied active engagement of all relevant stakeholder groups.

4.1. Objectives and overall approach

The resulting vision and related supporting actions aim at increasing the capacity of industry, social partners, education and training providers and policy makers at all levels **to successfully shape the workforce transformation in Europe**.

4.1.1. Key principles of the vision

The vision and the corresponding supporting actions are based on the following key principles:

- **Shared**: the vision has to be driven and supported by all *key* stakeholder groups including industry, social partners, education and training providers, policy makers at all levels, and last but not least, learners themselves.
    - Rather than a product of the top-down approach, it needs to be the result of *stakeholder co-creation efforts* in order to ensure its maximum practical relevance and acceptance by the relevant publics.
- **Coherent and consistent**: the vision has to offer a common integrated approach with a view to promote successful approaches to deliver new skills related to high technologies, based on online education and training tools, and to foster the uptake of best practices. This approach would allow for the shift from sporadic fragmented activities towards a synergetic mix of directed actions at various levels (EU and MS), with a shared goal in mind.
- **Efficient**: the vision has to build on economically attractive solutions allowing for the optimal use of time, effort and cost.
- **International**: online training, industrial modernisation and digital transformation imply intensive cross-border cooperation. The ability to work in an international environment is one of the key required skills. The vision therefore has to be applicable to diverse cultural and geographical contexts and foster international cooperation.
- **Multi-level**: in order to tackle the identified skills challenges, actions need to be taken at various levels including the EU and MS (and if relevant, local multi-stakeholder initiatives). The vision therefore has to offer a strategic platform that can be further operationalised into specific action points at each of the abovementioned levels.
- **Covering various sectors and technologies**: the vision has to acknowledge the multidisciplinary nature of online training, smart industrial specialisation and

digital transformation, spreading across various sectors and technologies, embedded in an even broader palette of application areas. The vision has to pay special attention to the skills for Advanced Technologies.

- **Long-term oriented**: the vision has to be primarily of mid-term orientation towards 2030. The period of 5-10 years can still be viewed as a relatively short time period for the technology development trajectories, and the associated skills that need to be available.
    - The total length of the innovation cycle depends on the sector and the type of innovation, but for highly complex technologies, it often is 15 to 20 years long. Hence, they require a ***consistent multi-year programmatic approach***.
    - Therefore, the year 2030 should not be seen as the final destination point, but rather as an intermediate milestone in a much longer trajectory of the smart industrial specialisation and digital transformation and the upskilling of the workforce in Europe, the process that is likely to continue for decades to come.
- **Clarifying the current reality and justification for change**: the vision report has to provide an evidence-based explanation for the need to take action, i.e., it has to build on the empirical analysis of the current situation.
- **Ability to survive the changes of scope and timescales**: the vision has to set the general strategic orientation; however, it has to be *flexible* enough and allow for adjustments and future revisions.
    - *One of the key characteristics of the technology-based learning landscape is its high pace of change*. Consequently, developing a solid 'set-in-stone' vision would contradict the very nature of it. Instead, the research team aimed at capturing the key *directions* for development in the coming years, and operationalising them into a set of specific action points/support measures, with the scope and timescales that could be relatively easily adjusted, if necessary.
    - *Learning should always stay relevant within the broader societal context*. The increasing cost-competitiveness of AI and automation will have great impact on the future of work, and some tasks currently done by humans will be done by machines even as new job roles are created requiring new skills and capabilities. Migration, ethnical diversity, gender equality and other social inclusion issues will necessitate more inclusive employment and educational opportunities to maintain social cohesion. Commercial and industrial adjustments to meet urgent sustainability targets such as the United Nations (UN) Sustainable Development Goals (SDGs) will necessarily shift the environmental footprints of enterprises and their internal processes. Each of these, among many other trends, individually and in combination will trigger numerous changes in the economy and consequently increase the need for lifelong learning of skills and capabilities required for the new opportunities and challenges that are sure to arise.
- **Offering an opportunity to develop a detailed action plan from it**: as mentioned above, the vision has to be suitable for the operationalisation into a set

of specific action points for various relevant stakeholder groups at multiple levels (EC, MS). It will serve as a platform for an action plan, which, in turn, would represent a strategic platform for the upskilling of the European workforce through online training for years to come.

Furthermore, the vision does not aim to position online training as the only possible way to have training. In some cases, traditional training can still be needed or a blended learning format can be more appropriate. Online training should rather be viewed as one of the ways to organise the learning process, which may be most effective when combined with other forms of learning.

4.1.2. Approach for developing the vision

The **key steps** in developing a vision included the following:

- Developing a clear and unambiguous understanding of the current state (based on the extensive "state-of-play" analysis);
- Defining the desired end state;
- Conducting gap analysis (identifying the differences between the current state and the desired state and developing gap closure strategies);
- Prioritising (identifying the feasibility of proposed options and assessing their impact);
- Developing an optimal timescale for the identified actions;
- Based on the inputs from points 1-5, developing a roadmap (consolidating actions, priorities, timescale and desired results).

While developing the vision, the research team aimed at taking into consideration the *parallel ongoing efforts* at the EU and MS levels, as well as the activities of other relevant prominent organisations including UNESCO[262], OECD, and WEF.

The vision was developed in close consultation with the relevant stakeholder groups, and included the following sources:

- Extensive **desk-research** (policy reports, business publications, scientific papers, blogs etc.);
- Sixty in-depth **interviews** with the representatives of all key stakeholder groups (policy makers, practitioners, academic and industry professionals, course developers and users) from different Member States;
- Six expert **workshops**;
- **Two pan-European online surveys** (disseminated among practitioners, industry professionals and high-tech SMEs in the period of April – June 2018, and

262 For example, "Making sense of MOOCs, A Guide for Policy-Makers in Developing Countries" and by UNESCO (2016) and "Education 2030: Framework for action", see: http://www.uis.unesco.org/Education/Documents/incheon-framework-for-action-en.pdf

April - May 2019) with an objective to obtain stakeholder validation of the identified measures and to set priorities.

The collected knowledge base was systemised, clustered and translated into a wide range of possible solutions/measures aiming to stimulate the uptake of online training by enterprises (particularly high-tech SMEs) in Europe.

The first online survey aimed to obtain broader stakeholder validation of the initially identified measures. The online survey specifically aimed to detect the key initial priorities among the identified measures. The measures were structured around the key barriers that are reported[263] to inhibit the adoption of online training by the workforce in Europe. This barrier-based approach was deliberately chosen in order to preserve the link between the *solutions* that need to be introduced and the actual *problems* that need to be tackled. Structuring the identified measures around the barriers allowed for assessing the relevance and the anticipated impact of these measures on solving a specific barrier.

After additional desk-research, interviews with stakeholders and expert workshops, the identified measures were revised, and the second online survey was launched to validate them. The survey specifically aimed to detect the key priorities among the identified measures that could then be further developed into detailed proposals, including the responsible parties, planning, and key budget requirements.

4.2. Structure of the vision

The objective of the analysis was to identify promising ways for creating an environment that will encourage and support learning in SMEs, with a particular attention to the role of online training solutions. In essence, there is a need to change SME learning habits. To this end, in order to structure the collected measures in a holistic way, the **Habit Loop model** (by CUTESolutions[264]) was chosen as a base for the analytical framework (see Figure 4-1).

The following five steps represent the mechanisms of a habit changing behaviour, each with a corresponding analytic question:

(1) **Motor**: What are the most promising approaches for changing SME beliefs about the role of learning (among both employers and employees)?

(2) **Trigger**: How can SMEs identify skill gaps and determine their actual needs for learning?

(3) **Routine**: How should learning process in SMEs be organised? What tools/ technologies/approaches best suit the needs of SMEs?

(4) **Reinforcement**: How to make sure that what has been learned is applied in practice?

(5) **Environment**: What are the overall approaches towards developing and sustaining the learning culture of SMEs (e.g. empowering managers, building on formal learning etc.)?

263 Based on the inputs from desk-research, in-depth interviews and first expert workshop
264 https://www.cute.solutions/

The current analysis aimed to address the measures within each of these questions. The model represents a *continuous loop* (and thereby allows to treat learning as a continuous process rather than as separate events), and implies interactions and feedback mechanisms between its elements.

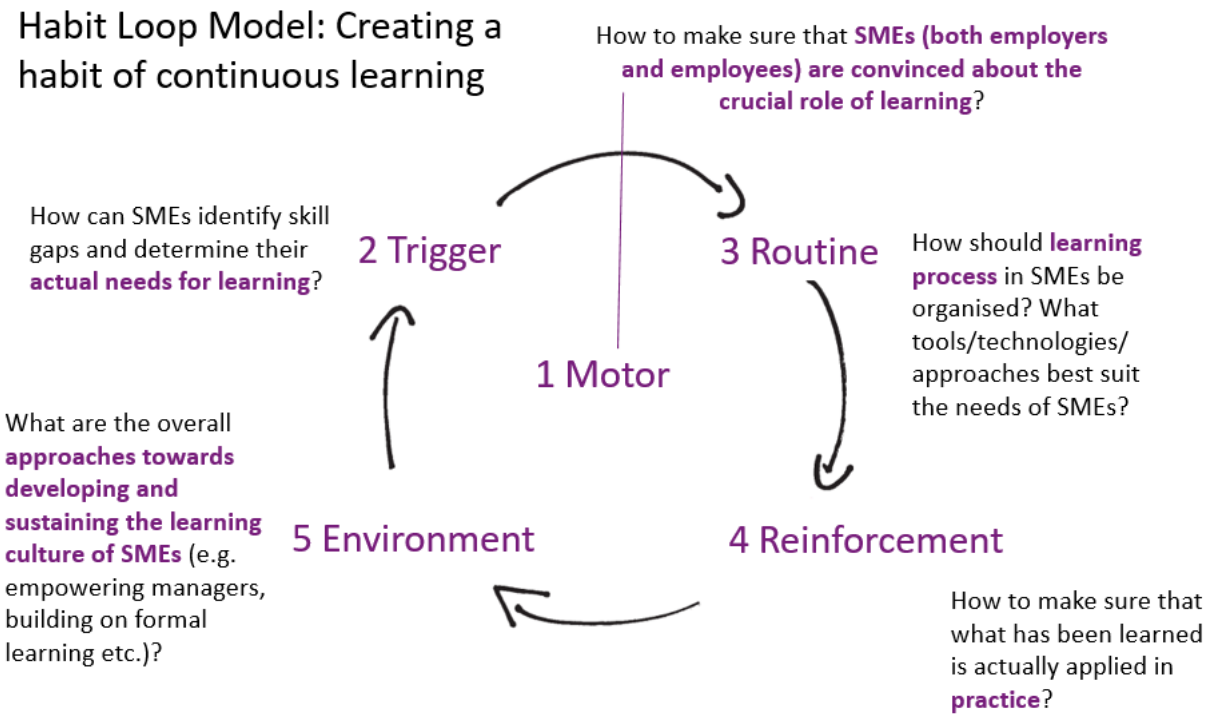

FIGURE 4-1: Habit Loop Model in the context of SME learning activities (based on the model by CUTESolutions)

The selected analytical framework acknowledges that **learning (within SMEs) is a complex and continuous process that needs to be approached holistically**. The framework allows for analysing the ***algorithm*** of why and how SMEs learn, and what needs to be done at each stage in order to sustain this learning process. This framework therefore considers **learning as a process rather than separate events**, and allows for systemising measures that lead towards developing and sustaining the overall learning culture within SMEs, in this case, with a particular attention to online training. Furthermore, the selected framework allows for plotting the activities/roles of multiple stakeholder groups at different levels, ranging from conceptual policy strategies to highly operational learning activities of specific enterprises and individuals. The abovementioned factors make the selected framework more appropriate for the analysis than its possible alternatives such as, for example, Universal Design for Learning (UDL)[265] or continuous improvement models[266] (e.g. Kaizen, Six Sigma, Perpetual beta, Total Quality Management (TQM) etc.). These models focus primarily on the third element of the Habit Loop framework, namely Routine or the organisation of the (learning) process, while a holistic approach requires sufficient attention also to the other elements of the SME

265 See, for example, https://www.understood.org/en/school-learning/for-educators/universal-design-for-learning/understanding-universal-design-for-learning

266 https://www.investorsinpeople.com/knowledge/continuous-improvement-models-four-great-options-for-you/

learning algorithm (namely creating interest, triggering the need, applying skills in practice and sustaining the learning culture). Other alternative approaches of structuring the identified measures around key barriers/challenges, stakeholder types and specific measure types were also considered, but those were abandoned, as they do not provide a **systemic understanding of the learning process within SMEs**, and thus would offer a more limited perspective.

4.3. Multi-dimensionality of the vision

Our analysis clearly showed that there is **no one best way** to tackle the identified challenges. The population of high-tech SMEs, let alone SMEs in general, is highly heterogeneous, demonstrating clear differences in terms of needs, opportunities and required approaches, depending on size, sector, cultural and demographic characteristics and other factors. To this end, in order to be specific enough, the vision needs to respect the abovementioned differences and cultivate a **diversity of approaches**. Therefore, the suggested vision is of multi-dimensional nature.

We have clustered the identified measures into four specific categories (strands) along the two axes, namely **target group** and **motivation**. These two indicators proved to be decisive in defining the philosophy of approaches. The target group here refers to the type of the audience that a specific measure is *primarily* aiming at. Within SMEs, the two distinctive groups include employers and employees. Focus on the target group signifies a demand-oriented nature of the approach. The two motivational categories include intrinsic and extrinsic motivation. Intrinsic motivation refers to engaging in a behaviour because it is personally rewarding and enjoyable[267]. Extrinsic motivation, in turn, implies performing an activity for earning a reward or avoiding punishment[268]. It is important to point out that motivation here should by no means be considered a personal characteristic. The model implies that the same person can be motivated in different ways (extrinsically or extrinsically) depending on the context. Rather than clustering individuals based on their personal characteristics, the model clusters measures based on the type of motivation these measures aim to work with.

As a result, four specific strands were formulated, as presented in Figure 4-2. Each of the strands has been assigned a certain colour.

- **Blue strand**: refers to industry leadership, and addresses the intrinsic motivation of employers. It includes all measures aiming to inspire employers, to share good practices with them and facilitate exchange of experiences to help business leaders that recognise the value of learning for their organisations.
- **Green strand**: puts employees in the driver's seat and aims at the intrinsic motivation of learners. It refers to all measures aiming to enable the learners themselves to define their learning pathway and organise their learning processes; it gives leaners full control of their learning journey.
- **Yellow strand**: builds on the fact that most enterprises are reluctant to allocate time and resources to staff training (including online training). It includes all measures aiming to reward employers for stimulating (online) training and/or punishing for not doing that. In essence, employers are accountable for promoting learning.

267 https://www.verywellmind.com/differences-between-extrinsic-and-intrinsic-motivation-2795384
268 *Ibid*.

- **Red strand**: builds on the fact that most people are reluctant to devote time and efforts to learn new skills and change their routines. It targets the extrinsic motivation of learners. It refers to all measures aiming to extrinsically motivate learners to engage in learning activities (including monetary rewards and non-monetary recognition). Employees are accountable for their learning.

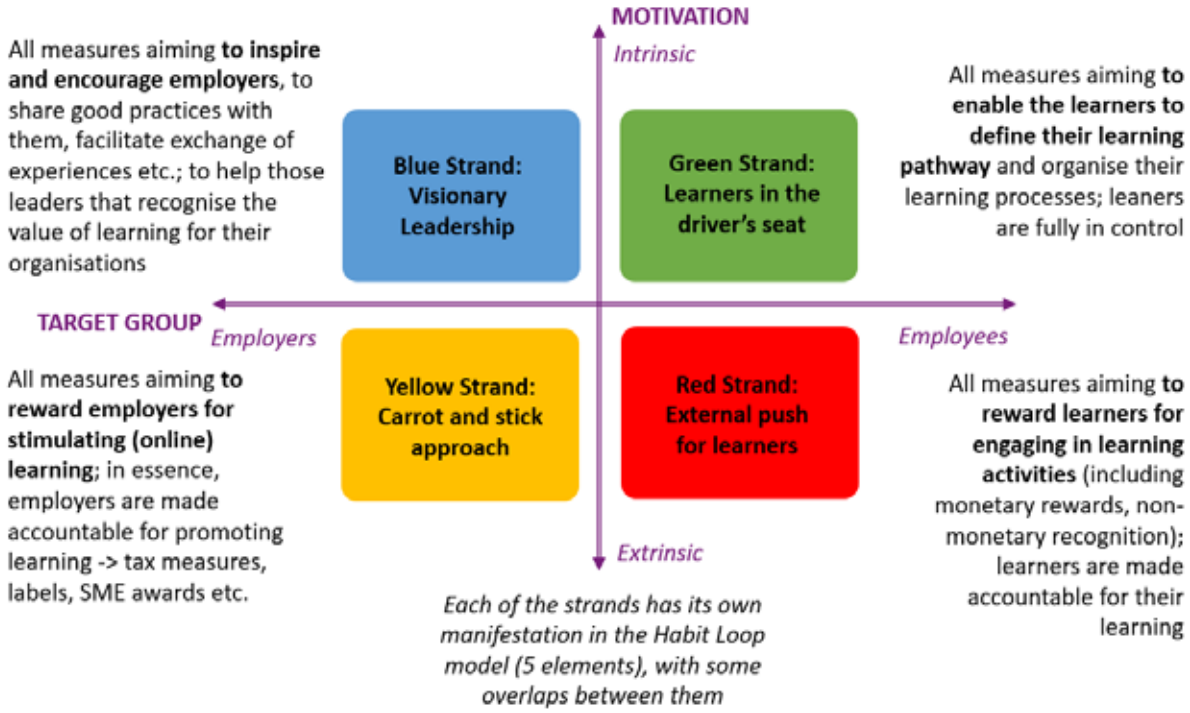

FIGURE 4-2: Typology of strands based on target group and motivation

These strands represent four distinctive philosophies of learning, each having its supporters and opponents. In practice, the elements of different strands can also be combined, for example, Blue and Green strands complement each other well conceptually; Yellow and Red strands also follow comparable principles.

All of the identified measures were clustered around these specific strands. Some of the identified measures belong to more than one strand, and there are measures that belong to all four strands simultaneously, i.e. they form the essential elements of an SME learning process, independent of the conceptual approach.

Each of the strands has its own manifestation in the Habit Loop model. The latter allows to plot the identified measures on the overall habit changing mechanism for SMEs in the context of learning, and consists of the following five main categories of measures:

- Measures aiming to change SME **beliefs** about the role of learning among both employers and employees, and increase their **motivation** to learn;
- Measures aiming to enable SMEs to identify **skill gaps** and determine their actual needs for learning;
- Measures aiming to support SMEs with the **organisation of their learning process**, including support with the selection/development of specific tools/technologies/content;

- Measures aiming to make sure that what has been learned is actually **recognised** and **applied in practice** (reinforcement measures); *and*

- Measures aiming to develop and sustain the **overall learning culture of SMEs** (i.e. to make learning part of company's routine).

The outcomes of this categorisation are presented in Table 4-1. In addition, a separate category was developed for measures of a general orientation that need to be tackled at the EU level. The table also contains the priority ranking assigned by the stakeholders to each of the measures. The measures highlighted in Italic are the ones that were assigned the highest priority within each of the elements of the Habit Loop model. These top priority measures form the key focus of the vision, and they will be addressed in detail in the remainder of this chapter.

TABLE 4-1: Structured overview of identified measures

Nr	Ranking Nr	Measure	Blue Strand: Visionary leadership	Green Strand: Learners in the driver's seat	Yellow Strand: Carrot and stick approach	Red Strand: External push for learners
1 MOTOR: Measures aiming to change SME beliefs about the role of learning, and increase their motivation to learn (focus on employers)						
1.1	3	Providing **online training opportunities to the SMEs' owners and managers** in relation to their needs as owners and managers, in order to have a first-hand experience of the benefits of online training				
1.2	6	Disseminating among enterprises overall information on the opportunities and **economic benefits** of online training; providing indexes or benchmarks of online training effectiveness				
1.3	5	Requiring training providers to have **learning outcome descriptions**, showing the relevance of online training to the day-to-day business in SMEs				
1.4	1	*Establishing **communities of practice for enterprises engaged** (or considering to get engaged) in online training, where good practices and experiences can be exchanged by enterprises themselves*	x	x		
1.5	4	Providing **practical guidelines** with real examples from all over Europe of how other enterprises successfully adopt online training				
1.6	8	Appointing external **"online training ambassadors"** (e.g. from economic development agencies) with an aim to promote online training solutions among enterprises and their employees				
1.7	2	Offering **tax reduction** to enterprises that stimulate learning culture and adopt online training				
1.8	7	Introducing pan-European **learning awards/labels** for SMEs actively engaged in learning				
1 MOTOR: Measures aiming to change SME beliefs about the role of learning, and increase their motivation to learn (focus on employees)						
1.9	1	*Developing platforms for **personal learning accounts/portfolios**, portable from job to job and ensuring recognition of acquired skills*		x		
1.10	4	Establishing **communities of practice**, where good practices and experiences can be exchanged by learners themselves within and across SMEs in a given sector				
1.11	5	**Rewarding** employees for learning in a monetary way				
1.12	2	**Encouraging** employees to identify their own development needs, within their occupation and in relation to their career plans				
1.13	1 [269]	***Recognising** the contribution of employee's learning to the organisational performance, e.g. increased responsibility, career progression, awards etc.*				x
1.14	6	Making learning more engaging by adopting the **latest advancements in technology**, including Artificial Intelligence, gamification, Augmented/Virtual Reality etc.				
1.15	4 [270]	**Making reaccreditation compulsory** in the context of continuous professional development, with a prominent role for online training in it				

269 Equal scores were collected by two measures
270 Equal scores were collected by two measures

Nr	Ranking Nr	Measure	Blue Strand: Visionary leadership	Green Strand: Learners in the driver's seat	Yellow Strand: Carrot and stick approach	Red Strand: External push for learners
1.16	3	Promoting company policies that **allocate specific time for learning** within working hours				
2 TRIGGER: Measures aiming to enable SMEs to identify skill gaps and determine their actual needs for learning						
2.1	2	Encouraging employees to **identify their own learning needs and those of their peers**				
2.2	6	Setting up local help desks offering free or subsidised professional **support and guidance** for enterprises regarding the development and implementation of learning strategies (mentorship programmes)				
2.3	1	*Setting up **collaboration platforms** (including small and large enterprises, training providers and support structures) with regard to anticipating skill needs for a certain sector, including dissemination of knowledge and sharing of good practices for identifying skill needs*	x			
2.4	5	Providing free or subsidised external support to SMEs for **skills profiling and analysis**				
2.5	3	Developing tools for employees to have their **personal learning environment** centred around the learning needs of each particular employee				
2.6	4	Introducing **learning contracts** that would need to be signed by both the employer and the employee, and that would set objectives for the professional development of that certain employee				
3 ROUTINE: Measures aiming to support SMEs with the organisation of their learning process, including support with the selection/development of specific tools/technologies/content						
3.1	3	Establishing **peer-to-peer learning** and **reflection** mechanisms within and between SMEs				
3.2	4	Providing free or subsidised external support to SMEs with **identifying relevant learning resources**				
3.3	1	*Developing tools for employees to have their **personal learning environment** centred around the learning needs of each particular employee*	x			
3.4	2	Developing **libraries of courses** pertinent to SMEs to train their employees in local language using online training tailored to the local context (a measure for economic development agencies or similar)				
3.5	5	Offering **on-demand bespoke course development** through government-funded initiatives				
4 REINFORCEMENT: Measures aiming to make sure that what has been learned is actually recognised						
4.1	3	Facilitating the **recording** of learning experiences to make it visible to the other employees				
4.2	4	Providing a scheme for SMEs to benchmark their learning policies and outcomes against similar organisations in their sector				
4.3	1	*Making **learning review** part of the regular employee and management review*			x	x
4.4	2	Adopting policies for the **recognition of informal learning** (e.g. peer review, Open Badges, open endorsement, etc.) at the branch/sector level				
4.5	1 [271]	*Facilitating access to the **recognition of prior learning and experience** programmes in partnership with formal education institutions and awarding bodies*				x
4 REINFORCEMENT: Measures aiming to make sure that what has been learned is actually applied in practice						

271 *Ibid*.

Nr	Ranking Nr	Measure	Blue Strand: Visionary leadership	Green Strand: Learners in the driver's seat	Yellow Strand: Carrot and stick approach	Red Strand: External push for learners
4.6	2	Providing employees with a "**learning passport**" where they can record new skills and get endorsement of peers and line managers when they have applied into practice the new learning				
4.7	4	Providing SMEs with a "**dashboard**" visualising in real time the state of learning progress of the employees, e.g. learning/applying/competent				
4.8	3	Explicitly including **the transfer of learning in the workplace as part of learning programmes** (e.g. asking learners to write a plan for transfer of learning, managers to review the impact of learning)				
4.9	1	*Developing **learning in real situation**, at the workplace, with the support of electronic performance support systems (EPSS)*	x			
4.10	2 [272]	Facilitating **partnerships** between training developers & providers and enterprises (including learners themselves) in order to develop relevant training				
5 ENVIRONMENT: Measures aiming to develop and sustain the overall learning culture of SMEs (i.e. to make learning part of company's routine)						
5.1	1	*Establishing **communities of practice** for enterprises engaged (or considering to get engaged) in online training, where good practices and experiences can be exchanged by enterprises/learners themselves*	x	x		
5.2	5	Assigning "**online training champions**" within organisations with an aim to promote online training solutions among employees and demonstrate their user-friendliness				
5.3	3	Making employees **accountable for their own learning** and integrating it into the performance evaluation processes				
5.4	4	Encouraging employees to come up with their **own learning initiatives in a bottom-up** way				
5.5	2	Defining a **framework** against which SMEs could benchmark their learning/training practices and get recognised for it (e.g. *Investors in People*)				
6 EU-LEVEL MEASURES: Measures that specifically need to be tackled at the EU level						
6.1	6	**Raising awareness among the Member State (MS) governments** of the opportunities and benefits of online training for enterprises, and particularly SMEs				
6.2	5	**Providing guidelines to the MS governments** for the development of targeted strategies, including templates and good practice examples				
6.3	3	**Facilitating the exchange of strategies and good practices among the MS governments** in relation to promotion of online training among enterprises				
6.4	4	**Providing funds to initiate discussions and promote exploratory projects** in the MS where promoting online training for SMEs has not yet been considered				
6.5	1	***Providing spaces for experimentation and innovation** at a collaborative level, i.e. online collaborative spaces for online training developers and practitioners, in which they can experiment and share good practices*	x	x		

272 Equal scores were collected by two measures

Nr	Ranking Nr	Measure	Blue Strand: Visionary leadership	Green Strand: Learners in the driver's seat	Yellow Strand: Carrot and stick approach	Red Strand: External push for learners
6.6	2	**Initiating and supporting multi-stakeholder knowledge alliances and thematic networks** aiming to share experience and expertise on online training, and creating a framework for structural collaboration on the joint development, delivery and use of online training for the EU labour market				
		TOTAL:	**27**	**23**	**27**	**25**
		TOTAL Priority:	**6**	**4**	**1**	**3**

As can be seen from the Table, when it comes to setting the top priorities, the outcome is formed by the **elements of all the four strands**, contributing to the abovementioned multi-dimensionality of the vision. The Blue strand clearly dominates stakeholder opinion. It signifies **the need to primarily target SME employers and to address their intrinsic motivation or genuine interest in adopting online training solutions for the needs of their firms**. It is followed by the Green and Red strands, with the first one putting learners in the driver's seat, and the second one considering learners to be generally reluctant to learn and building on their extrinsic motivation. Although these two strands contradict each other, they can and need to be applied in parallel, as each of them has its own target audience, and the measures that will work for the "Blue" target audience, will hardly work for the "Red" target audience (and the other way around). Finally, the Yellow strand, building on extrinsic motivation or rewards for employers, has gained the least support in stakeholder opinion. Nevertheless, with one measure included in the top priorities, it also forms part of the vision.

With regard to specific elements of the Habit Loop model, when asked which element would be most effective in stimulating the widespread adoption of online training by the workforce in Europe, the opinion of stakeholders clearly got divided. The "**Trigger**" element or enabling SMEs to identify skill gaps and determine their actual needs for learning got the leading position. However, the difference in scores with the remaining elements was not striking, and all of them received comparable support from the stakeholders. This outcome again confirms the importance of all the elements of the Habit Loop model, and the need for a holistic approach, ensuring the effective functionality of the full cycle.

4.4. Top priority measures

In the current sub-section, each of the identified top priority measures is addressed in more detail. Not all of them are explicitly related to online training. Our analysis clearly indicated a need to see online training as part of a bigger picture (i.e. overall learning ecosystem of SMEs or lack of it), and a need to develop suggestions for support measures with a good understanding of **how online training solutions fit the bigger picture** and are interrelated with other processes within SMEs and outside. The suggested measures thus contribute to the holistic approach to policy making.

Furthermore, the conducted analysis suggested that existing policies and programmes have been mainly supply-oriented, while there is a clear need for demand-oriented initiatives. The suggested top priority measures have a clear **demand orientation**, i.e. they aim to explicitly focus on the learners and their needs.

As outlined above, the following measures were selected based on stakeholder consultation:

- Establishing **communities of practice for enterprises** engaged (or considering to get engaged) in online training, where good practices and experiences can be exchanged by enterprises themselves (1 MOTOR employers and 5 ENVIRONMENT; Blue and Green strands);

- Developing platforms for **personal learning accounts / portfolios**, portable from job to job and ensuring recognition of acquired skills (1 MOTOR employees; Green strand);

- **Recognising the contribution of employee's learning** to the organisational performance, e.g. increased responsibility, career progression, awards etc. (1 MOTOR employees; Red strand);

- Setting up **collaboration platforms** (including small and large enterprises, training providers and support structures) with regard to anticipating skill needs for a certain sector, including dissemination of knowledge and sharing of good practices for identifying skill needs (2 TRIGGER; Blue strand);

- Developing tools for employees to have their **personal learning environment** centred around the learning needs of each particular employee (3 ROUTINE; Blue strand);

- Making **learning review** part of the regular employee and management review (4 REINFORCEMENT; Yellow and Red strands);

- Facilitating access to the **recognition of prior learning and experience** programmes in partnership with formal education institutions and awarding bodies (4 REINFORCEMENT; Red strand);

- Developing **learning in real situation**, at the workplace, with the support of electronic performance support systems (EPSS) (4 REINFORCEMENT; Blue strand);

- Providing **spaces for experimentation and innovation** at a collaborative level, i.e. online collaborative spaces for online training developers and practitioners, in which they can experiment and share good practices (six EU-level measures; Blue and Green strands).

4.4.1. Establishing Effective Communities of Practice (CoPs)

The analysis clearly indicated that for SMEs, exposure to (positive) experiences of other small enterprises serves as a powerful motivator for them to reconsider their approaches to learning (or to simply start paying attention to learning). Seeing what other enterprises do in similar contexts, how they approach learning and how they benefit from that, not only serves as a source of inspiration, but as an enabler of concrete action. Therefore, the potential of Communities of Practice (CoPs) for promoting online training should not be underestimated. While the concept of CoPs itself is not new, the way it needs to be approached may require some reconsideration, taking into account the latest technological and social developments and reflecting the learning realities of modern SMEs.

CoPs can be defined as organised groups of professionals who share the same interests in resolving issues, improving skills, and learning from each other's experiences[273]. The current measure implies establishing and facilitating such CoPs for enterprises engaged (or considering to get engaged) in online training, where good practices and experiences can be exchanged by enterprises themselves at the level of both employers and employees. CoPs can also be used to innovate and solve problems, to invent new

273 https://www.organisationalmastery.com/communities-of-practice/

practices, create new knowledge, define new territories, and develop a collective and strategic voice[274].

To be effective, CoPs need sustained interaction of their members. While some communities do self-organise, most communities need some facilitation to ensure that their members get high value for their time[275]. For SMEs, self-organisation could be particularly difficult, and the supporting structures such as cluster organisations and/or industry associations are well positioned to take on a facilitator role. Furthermore, one of the key challenges for CoPs is to make sure it is a 'safe' environment for competitors to collaborate; for that, enterprises need to be convinced that sharing information and collaboration has clear common benefits.

TABLE 4-2: #1 ESTABLISHING EFFECTIVE COMMUNITIES OF PRACTICE (CoPs)

#1 ESTABLISHING COMMUNITIES OF PRACTICE (CoPs)	
Subject	**Description**
Habit Loop element	1 MOTOR; 5 ENVIRONMENT
Short description	Establishing communities of practice for enterprises engaged (or considering to get engaged) in online training, where good practices and experiences can be exchanged by enterprises themselves
Target group	SME employers and employees
Leading stakeholder group for implementation	Cluster organisations and/or industry associations (i.e. organisations having access to large numbers of SMEs either from one country or from different countries, active in a specific domain), supported by professional consulting services
Other relevant stakeholder groups	Regional. national and European policy makers
Activities requiring dedicated budget	· Pan-European initiative to collect, systemise and disseminate information on establishing and maintaining effective CoPs for SMEs, including practical guidelines and best practice examples [European value added] (about 500K EUR with a duration of 2 years) · Regional/national funds for developing local communities of (learning) practice for SMEs from specific domains (about 200-500K EUR per pilot with a duration of 2 years) · European funds for developing pan-European communities of (learning) practice for SMEs from specific domains [European value added] (about 500K EUR per pilot with a duration of 2 years)
Time horizon	Mid-term (2-5 years)
Additional remarks	Before piloting the establishment of specific CoPs, it is crucial to identify the key success factors that make such CoPs effective in the context of *modern* SMEs, including the role of facilitators and possible self-sustaining funding mechanisms

274 https://wenger-trayner.com/introduction-to-communities-of-practice/
275 *Ibid*.

4.4.2. Developing platforms for portable personal learning portfolios/accounts

Previous generations of e-Portfolios have hardly been able to achieve what they were aiming for. **Open Badges**, however, have demonstrated their ability not just to achieve what e-Portfolios were initially meant for (i.e. making learning visible), but also to make all forms of learning visible (including formal, non-formal and informal learning) in a way that is more flexible, more reliable and with the ability to create the conditions for the emergence of innovative services.

While e-Portfolios have hardly been able to create a single associated service, Open Badges are opening the way to the development of a range of services, like communication (e.g. between the people sharing the same badges), co-design, cartography (display competencies on the map of a territory), pathways, endorsements, etc.

There are already some emerging projects from a range of initiatives, like Badgeons la Normandie[276] or B.O.A.T[277] (badges ouverts à tous) and Hpass[278], developed by open badge factory, where the objective is to make the competencies visible and discoverable and to create badge passports connected to shared competency frameworks and e-learning platforms.

The following actions need to be taken in order to further advance the notion of Open Badges:

- Recognising Open Badges as a universal currency to capture one's learning, experience or engagement; recognising Open Badges as the elementary building blocks of a new type of e-Portfolio.

- Facilitating the provision and adoption of **Personal Open Badge repositories**, e.g. as Experience Portfolios, to collect evidence of one's formal, non-formal and informal learning (there are already multiple free and open source platforms that are fully interoperable, from which people can choose). This could be part of a Personal Learning Account.

- Facilitating the provision and adoption of tools for SMEs based on Open Badges, to support their staff development (there are already some emerging tools, but they are still in their infancy; the achievements of large enterprises such as IBM with Open Badges could be scaled down for SMEs).

- Encouraging industry and service sectors to develop repositories of Open Badges to elicit the needs in competency and the actual learning provision, supporting the acquisition of those competencies — Open Badges can be made visible "pathways" connecting learning and assessment opportunities.

- Developing (public and private) services exploiting the data collected in Open Badges such as discovery to find people, competencies, resources etc. There are already some emerging projects from a range of initiatives, like *Badgeons la Normandie*, where the aim is to make the competencies visible and discoverable.

276 https://badgeonslanormandie.fr/
277 https://boat.openrecognition.org/
278 https://hpass.org/

TABLE 4-3: #2 DEVELOPING PLATFORMS FOR PORTABLE PERSONAL LEARNING PORTFOLIOS/ ACCOUNTS

#2 DEVELOPING PLATFORMS FOR PORTABLE PERSONAL LEARNING PORTFOLIOS/ACCOUNTS	
Subject	**Description**
Habit Loop element	1 MOTOR
Short description	Developing platforms for personal learning accounts/portfolios, portable from job to job and ensuring recognition of acquired skills. While it targets individual employees, the individual learning account/portfolio is a space of negotiation/communication with different stakeholders, for example, to find relevant learning opportunities and manage training funds allocated by employers, states or personal tax discount.
Target group	SME employees
Leading stakeholder group for implementation	Industry-lead bodies
Other relevant stakeholder groups	· IT providers, to provide the technology · Training providers · Public authorities, employer and employee representatives: individual learning account is a policy matter that involves public authorities with employer and employee representatives. · Active employee engagement
Activities requiring dedicated budget	· EU and national innovation funds to support the development of new types of portfolio technology (10M EUR). The objective is to elicit a potential market to IT sector and raise the awareness of SMEs about innovative solutions to address skill development and talent management. · EU and national funds for piloting developed solutions (1M EUR per country) [European value added]
Time horizon	Mid-term (2-5 years)
Additional remarks	Examples of relevant initiatives: · Extrasup (completed): http://www.extrasup.eu/ · Open badge passport (ongoing): https://openbadgepassport.com/ Badgeons la Normandie (ongoing): https://badgeonslanormandie.fr/ ongoing · BOAT (ongoing): https://boat.openrecognition.org/ · Hpass (ongoing): https://hpass.org/

4.4.3. Recognising the contribution of employee's learning to the organisational performance

Rewards and recognition programs are not only suitable for large enterprises - SME can massively benefit from them too, and specifically in the context of learning. Such

programs have proven effects on employee productivity and ultimately on company's profits[279].

In essence, the goal of employee recognition is to reinforce specific behaviours, practices, or activities that result in better performance and positive business results[280]. In the context of this analysis, recognition particularly aims at reinforcing employee engagement in learning activities and acknowledging the contribution of these learning activities into the organisational performance. This recognition can have both formal and informal nature, it can imply both monetary and non-monetary rewards. Employee recognition does not necessarily have to be associated with high budgetary requirements, which is particularly sensitive for SMEs. Proper employee recognition programs encourage employee engagement, lead to better business results, increase loyalty and retain the best talent, build a supportive work environment and encourage a sense of ownership in employees[281].

Many SMEs do not yet have employee recognition programs in place, let alone programs that explicitly aim at effective recognition of the learning efforts of employees. They could benefit from external support with the development of such programs, for example, in the form of detailed guidelines for an effective employee recognition program specifically for European SMEs. The guidelines need to contain the key conceptual principles, but also practical solutions for challenges, good practice examples and references to additional information sources. Ideally, such guidelines would need to be translated to all EU languages. Cluster organisations and/or industry associations are well positioned to massively disseminate the guidelines among the SME members of their networks and communities.

This measure complements other measures highlighted in this section. For example, the guidelines can also be disseminated via the dedicated CoPs and collaboration platforms.

TABLE 4-4: #3 DEVELOPING GUIDELINES FOR EFFECTIVE EMPLOYEE RECOGNITION PROGRAM FOR EUROPEAN SMEs

#3 DEVELOPING GUIDELINES FOR EFFECTIVE EMPLOYEE RECOGNITION FOR EUROPEAN SMEs	
Subject	**Description**
Habit Loop element	1 MOTOR
Short description	Developing and disseminating practical guidelines for an effective employee recognition program for European SMEs, to inspire and enable SME employers to reap the benefits of employee recognition for learning
Target group	SME employers
Leading stakeholder group for implementation	Dissemination to SMEs via cluster organisations and/or industry associations (i.e. organisations having access to large numbers of SMEs either from one country or from different countries, active in a specific domain)

279 https://www.power2motivate.com/news-blog/blog/when-do-you-offer-offer-rewards-and-recognition
280 https://www.efrontlearning.com/blog/2018/04/employee-recognition-workplace-benefits-ways.html
281 https://www.cleverism.com/how-to-recognize-reward-your-employees/

#3 DEVELOPING GUIDELINES FOR EFFECTIVE EMPLOYEE RECOGNITION FOR EUROPEAN SMEs	
Subject	**Description**
Other relevant stakeholder groups	European policy makers
Activities requiring dedicated budget	· Pan-European initiative to develop pan-European guidelines for effective employee recognition for learning specifically for SMEs, including the translation of guidelines to all EU languages and a dissemination strategy among the focal points in each MS/region [European value added] (about 200K EUR with a duration of 2 years)
Time horizon	Mid-term (2-5 years)

4.4.4. Setting up collaboration platforms for anticipating skill needs

It is vital for SMEs to be able to anticipate change in the skill needs, as only then will they be able to choose proper training. SMEs do not function in isolation, and the anticipation of skill needs can also hardly happen in isolation. In order to increase both the effectiveness and the efficiency of such anticipation efforts, there is need to join forces with all key stakeholder groups.

To this end, the current measure implies setting up collaboration platforms with regard to anticipating skill needs for a certain sector, including dissemination of knowledge and sharing of good practices for identifying skill needs, that would unite the efforts of small and large enterprises, training providers, support structures and policy makers. Furthermore, such platforms can be used not only for anticipating skill needs, but also for developing comprehensive sectoral skills strategies, including the development of concrete actions and priorities, jointly selecting or developing appropriate training solutions and jointly following this training in practice. A comparable model is already used by the Blueprint for Sectoral Cooperation on Skills[282].

The Blueprint in its essence provides a framework for strategic cooperation between key stakeholders such as enterprises, trade unions, research and training institutions and public authorities in a given economic sector. It implies industry-led partnerships that develop sectoral skills strategies and concrete actions, such as new or updated vocational education and training. The overall goal is to help foster new opportunities for investment, innovation, growth and jobs[283].

The pilot implementations of the Blueprint started in January 2018 in the following sectors: automotive, maritime technology, textile, clothing, leather and footwear, space and tourism. The second wave of implementation started in January 2019 and included construction, steel, additive manufacturing, and maritime shipping. The third wave is expected to be launched in January 2020, and the selected sectors include microelectronics, batteries for electro-mobility, defence technologies, energy value-chain

282 http://ec.europa.eu/growth/industry/policy/skills_en
283 https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8164&type=2&furtherPubs=yes

digitalisation, energy-intensive industries, and bio-economy (new technologies in agriculture)[284].

The pilots of the Blueprint have a pan-European coverage with clear benefits of cross-regional collaboration. At the same time, having a pan-European coverage puts at risk the inclusion of all relevant actors (in this case, the overall population of SMEs of a certain sector), as only a limited part of them is likely to be engaged in its activities. For a massive local coverage, similar activities could be initiated **at the level of clusters** (that also typically have a sectoral focus, but have a much broader reach to local enterprises). Such cluster-level pilots would complement the pan-European efforts of the Blueprint and could be used to further tailor the outputs of the Blueprint to the needs of cluster members/regions. Specifically, they would imply developing tailored skills forecasts for their regions, designing cluster skills strategies, selecting or developing appropriate (online) training solutions suitable for (or tailored to) the local context and evaluating the impact of skills strategies.

The abovementioned cluster-level pilots do not necessarily have to be limited to one cluster, and would benefit from joint collaboration with a few other clusters in the same sector, going though similar developments (e.g. 2-3 clusters in total per pilot, while increasing it to more clusters per pilot would lead to the risk of unmanageable scale and complexity).

TABLE 4-5: #4 SETTING UP CLUSTER-LEVEL COLLABORATION PLATFORMS FOR SKILLS

#4 SETTING UP CLUSTER-LEVEL COLLABORATION PLATFORMS FOR SKILLS	
Subject	**Description**
Habit Loop element	2 TRIGGER
Short description	Developing cluster-level pilots that would complement the pan-European efforts of the Blueprint, to further tailor the outputs of the Blueprint to the needs of cluster members/regions. Imply developing tailored skills forecasts for their clusters/regions, designing cluster skills strategies, selecting or developing appropriate (online) training solutions suitable for (or tailored to) the local context and evaluating the impact of cluster skills strategies
Target group	SME employers and employees
Leading stakeholder group for implementation	Cluster organisations, uniting efforts of all key stakeholder groups including small and large enterprises, trade unions, research and training institutions and public authorities in a given economic sector
Other relevant stakeholder groups	Regional, national and European policy makers
Activities requiring dedicated budget	· Regional/national funds for developing cluster pilots (about 500K EUR per pilot with a duration of 2 years) · European funds for developing cluster pilots, e.g. COSME European Cluster Excellence Programme (about 500K-1M EUR per pilot with a duration of 2 years), combining 2-3 clusters from the same sector [European value added]
Time horizon	Long-term (5-10 years)

284 http://ec.europa.eu/growth/industry/policy/skills_en

#4 SETTING UP CLUSTER-LEVEL COLLABORATION PLATFORMS FOR SKILLS	
Subject	**Description**
Additional remarks	The 2019 Erasmus+ call on forward-looking cooperation projects had a priority on extending self-reflection tools (SELFIE[285] and HEInnovate[286]) to new domains. If these tools could be extended for SME learning diagnostics, the results could have EU-level impact.

4.4.5. Developing tools for personal learning environment

Traditional management models and systems (e.g. Learning Management Systems) typically do not work for SMEs.

Personal Learning Environments (PLEs) refer to systems that help learners take control of and manage their own learning. They imply providing support for learners to set their own learning goals, managing their learning, managing both content and process, communicating with others in the process of learning, and thereby achieving learning goals. A PLE may be composed of one or more sub-systems; as such, it may be a desktop application, or composed of one or more web-based services[287]. PLEs are based on the idea that learning will take place in different contexts and situations and will not be provided by a single learning provider[288].

Even small and medium-sized enterprises can harness the power of personal learning environments to enhance each individual's learning experience and boost the achievement of business objectives through high-tech, machine-driven approaches allowing for smarter, customised learning and development[289]. Trying to develop and implement these solutions on their own though is likely to be perceived as being too costly or time consuming. Nonetheless, learning technology has changed the game[290]. By employing the latest technological solutions, uniting efforts and sharing cost, it can still be feasible for SMEs to have their PLEs. Also here, as particularly for smaller enterprises, cluster organisations and/or industry associations could play a prominent role in initiating and coordinating joint efforts for PLE development.

Specifically, there is a need to develop platforms that are dedicated to be learning resources for many enterprises (and specifically SMEs). Such platforms could be an attractive place for professional learning content/solutions developers to offer their content/solutions. Multiple initiatives have already been launched to develop specific frameworks and tools for PLEs, and those need to be further built on.

285 https://ec.europa.eu/education/schools-go-digital_en
286 https://heinnovate.eu/en
287 Based on the definition of Mark van Harmelen and PLE Wiki, http://edutechwiki.unige.ch/en/Personal_learning_environment
288 Attwell (2007) Personal Learning Environments-the future of eLearning? E-learning papers, 2(1), 1-8, cited in https://comtechp7.hypotheses.org/files/2016/10/Article_AdaptingPLE.pdf
289 Sharma A., Szostak B. (2018) "Adapting to Adaptive Learning", Chief Learning Officer, 10 January 2018, see: https://www.chieflearningofficer.com/2018/01/10/adapting-adaptive-learning/
290 Cooper S. (2016) "5 Reasons Why Every Small Business Needs A Learning Management System", in eLearning Industry, 4 May 2016 see: https://elearningindustry.com/5-reasons-every-small-business-needs-learning-management-system

TABLE 4-6: #5 DEVELOPING AND PROMOTING TOOLS FOR PERSONAL LEARNING ENVIRONMENT FOR SMEs

#5 DEVELOPING AND PROMOTING TOOLS FOR PERSONAL LEARNING ENVIRONMENT FOR SMEs	
Subject	**Description**
Habit Loop element	3 ROUTINE
Short description	Initiating and coordinating joint efforts for PLE development by employing the latest technological solutions, uniting efforts and sharing cost
Target group	SME employers and employees
Leading stakeholder group for implementation	Cluster organisations and/or industry associations (i.e. organisations having access to large numbers of SMEs either from one country or from different countries, active in a specific domain), supported by IT developers and professional consulting services
Other relevant stakeholder groups	Regional, national and European policy makers
Activities requiring dedicated budget	· Regional/national funds for developing and promoting PLE for local clusters of SMEs from specific domains (about 1M EUR per pilot with a duration of 2 years) · European funds for developing cluster pilots, e.g. COSME European Cluster Excellence Programme (about 1-2M EUR per pilot with a duration of 2 years), combining 2-3 clusters from the same sector [European value added]
Time horizon	Long-term (5-10 years)
Additional remarks	Examples of relevant initiatives to build on: · The Personal Learning Environment Framework from University of Aachen[291]; · ELGG Open source rapid development framework[292]; · The Role Project (Responsive Open Learning Environments), European Commission[293]

4.4.6. Introducing learning reviews

Existing research shows that learning and development accelerates individual and organisational performance[294] (see, for example, research by Brandon Hall Group[295] showing that the link between learning and performance improves performance 95% of the time). At the same time, enterprises, and particularly SMEs, often do not pay sufficient attention to analysing how exactly learning of employees contributes to the

291 http://learntech.rwth-aachen.de/cms/LearnTech/Forschung/Publikationen/~jiza/Details/?lidx=1&file=171362
292 http://edutechwiki.unige.ch/en/ELGG
293 http://www.role-project.eu/
294 https://www.pageuppeople.com/resource/why-learning-and-performance-should-be-joined-at-the-hip/
295 http://www.educton.com/wp-content/uploads/2016/06/Measuring-the-ROI-of-Informal-Learning-Educton.pdf

performance of their company. To this end, the current measure suggests offering SMEs guidelines for making learning review part of the regular employee performance review.

By having an integrated performance and learning process that identifies the employee's objectives and assigns relevant learning (formal or informal), employees are provided with clarity with regard to their contribution to the overall purpose and to ensuring their career progression[296]. Strengthening the link between performance and learning can also equip SME managers to become better development coaches. With a jointly agreed talent strategy in place, managers can identify strengths and weaknesses, initiate feedback and suggest relevant learning[297].

European SMEs would benefit from detailed guidelines showing how (online) training and performance processes can be integrated, and how to strengthen and trace the link between the two. The guidelines need to contain the key conceptual principles, but also practical solutions for challenges, good practice examples and references to additional information sources. Ideally, such guidelines would need to be translated to all EU languages. Also here, cluster organisations and/or industry associations are well positioned to massively disseminate the guidelines among the SME members of their networks and communities.

This measure complements other measures highlighted in this section. For example, the guidelines can also be disseminated via the dedicated CoPs and collaboration platforms. It is also closely linked to the measure #3 Developing guidelines for effective employee recognition program for European SMEs, as learning reviews should be directly linked with employee recognition. While in this document, the guidelines for learning reviews are presented as a separate measure, in practice, they could be combined with the guidelines for employee recognition programs.

296 https://www.pageuppeople.com/resource/why-learning-and-performance-should-be-joined-at-the-hip/
297 *Ibid*.

TABLE 4-7: #6 GUIDELINES FOR EFFECTIVE LEARNING REVIEWS

#6 GUIDELINES FOR EFFECTIVE LEARNING REVIEWS	
Subject	**Description**
Habit Loop element	4 REINFORCEMENT
Short description	Developing and disseminating practical guidelines for effective learning reviews for European SMEs, to inspire and enable SME employers to apply learning reviews in practice, for the benefits of both company and employees
Target group	SME employers
Leading stakeholder group for implementation	Dissemination to SMEs via cluster organisations and/or industry associations (i.e. organisations having access to large numbers of SMEs either from one country or from different countries, active in a specific domain)
Other relevant stakeholder groups	European policy makers
Activities requiring dedicated budget	· Pan-European initiative to develop pan-European guidelines for effective employee learning reviews specifically for SMEs, including the translation of guidelines to all EU languages and a dissemination strategy among the focal points in each MS/region [European value added] (about 200K EUR with a duration of 2 years)
Time horizon	Mid-term (2-5 years)

4.4.7. Facilitating the recognition of prior learning and experience

Recognition of prior learning (RPL) has a double function, namely *social* (recognition increases self-esteem and opens opportunities for career development), and *economical* (recognising the skills acquired through experience reduces the time to reach graduation).

In France, for example, the total number of recognitions of prior learning (in French "validation des acquis de l'expérience", VAE) remains modest (307,000 from 2002 to 2014), well below the originally set targets (60,000 per year)[298]. Since 2011, the number of VAE has fallen regularly. The challenge is not just to set-up a RPL system, but also to create the conditions for it to respond to the needs in a meaningful and feasible way.

To facilitate access to RPL, there is a need to:

- Reduce the bureaucratic burden associated with RPL;
- Reduce the costs for different stakeholders (candidates, employers awarding body, etc.);
- Make PRL the norm by creating a "recognition culture";
- Develop new agile approaches to RPL, by addressing the question of how all EU citizens can have access to RPL (today, it is not even 1%).

298 Libérer la vie - Comment mieux diplômer l'expérience - Terra Nova, see: http://tnova.fr/rapports/liberer-la-vie-comment-mieux-diplomer-l-experience

One option to improve access to RPL could be to move from a system that only recognises learning in relation to existing formal education curricula to recognising the actual learning that could be unique to each individual. This process could be facilitated by the systematic collection of evidence of learning and work experience, for example, by using Open Badges, which would provide a verifiable source of evidence in their portfolio of experience and learning. Instead of waiting for the need to get RPL to create an RPL portfolio, the collection of evidence of learning should become a 'normal' professional practice that could be instrumented, for example, during the (annual/monthly) performance reviews.

A possible way to reduce costs is to establish trust relationships between the organisations providing RPL, employers, professional bodies and associations to bridge the gap between informal recognition that takes place at the workplace, and the formal recognition taking place in formal institutions of education and awarding bodies. This could be achieved by establishing "**RPL Ambassadors**" within enterprises that could act as a bridge between informal recognition (e.g. endorse local recognitions) and formal recognition delivered by an official awarding body.

The vision could be the **establishment of an open recognition system** providing a seamless path between informal and formal recognition, with recognised agents of formal recognition systems (the RPL ambassadors) acting locally. They could also carry the role of "learning ambassadors" and "e-learning ambassadors".

TABLE 4-8: #7 FACILITATING THE RECOGNITION OF PRIOR LEARNING AND EXPERIENCE

#7 FACILITATING THE RECOGNITION OF PRIOR LEARNING AND EXPERIENCE	
Subject	**Description**
Habit Loop element	4 REINFORCEMENT
Short description	Facilitating access to the recognition of prior learning and experience programmes in partnership with formal education institutions and awarding bodies
Target group	SME employers together with awarding bodies and institutions of formal education
Leading stakeholder group for implementation	Professional bodies, trade unions and employee associations
Other relevant stakeholder groups	Institutions of formal education and awarding bodies
Activities requiring dedicated budget	· Pan-European initiative to develop RPL guidelines (this is in close relation with the issue of Personal Learning Account/Portfolio); (as a separate initiative, about 500K EUR with a duration of 2 years) [European value added] · Piloting the guidelines
Time horizon	Mid-term (2-5 years)
Additional remarks	Examples of relevant initiatives: · Extrasup (completed): http://www.extrasup.eu/

#7 FACILITATING THE RECOGNITION OF PRIOR LEARNING AND EXPERIENCE	
Subject	**Description**
	· Open badge passport (ongoing): https://openbadgepassport.com/ Badgeons la Normandie (ongoing): https://badgeonslanormandie.fr/ ongoing · BOAT (ongoing): https://boat.openrecognition.org/ · Hpass (ongoing): https://hpass.org/

4.4.8. Developing learning in real situation

When designing a training intervention, some of the key questions that need to be asked include “Is a course the best solution to address this performance problem?” and “Are there alternatives, like tutoring by a colleague?” If the course is the best solution, is it best to run it off-site or on-site, within or out of the job context?

These questions lead to a number of possible options:

- **Learning at the workplace**, as, for example, *Apprendre et se Former en Situation de Travail* (AFEST) “Learning and Training in Work Situation” in France;
- **Supporting performance at the workplace**, that has led to the design of performance support systems, in particular Electronic Performance Support Systems (EPSS)[299], i.e. computer software programs that improve performance.

EPSS are not limited to supporting computer programmes. For example, if the objective is to operate or maintain a machine, the alternative could be between building a simulator (training) or a diagnostic tool supporting the maintenance operation (EPSS) using Augmented Reality (AR). AR enhances the field of view with real-time imposed digital information. This allows users to access information or step-by-step instructions on how to repair or operate an equipment.

Between full AR and simple electronic guides/helps, there is a range of opportunities to develop performance support solutions as alternatives to training, which have a number of benefits such as reduced time off-job; reduced human errors; reduced execution time and increased productivity. While in the case of AR solutions, costs are not negligible, they have to be compared with total cost of training (TCT) which includes the development of the training material, the time of training, the transfer to the workplace, the possible errors, etc.

TABLE 4-9: #8 DEVELOPING LEARNING IN REAL SITUATION

299 Examples of solutions: http://www.solantech.com/epss-electronic-performance-support-system/ and case studies: GE Aviation Pilots AR to Cut Errors, Save Millions: https://upskill.io/landing/ge-aviation-case-study/; Scope AR develops Augmented Reality performance support technologies: https://www.scopear.com/about/

#8 DEVELOPING LEARNING IN REAL SITUATION	
Subject	**Description**
Habit Loop element	4 REINFORCEMENT: Actions aiming to make sure that what has been learned is actually recognised and applied in practice (reinforcement measures)
Short description	Developing learning in real situation, at the workplace, with the support of electronic performance support systems (EPSS)
Target group	SME employers and employees
Leading stakeholders implementation	SME employers
Other relevant stakeholder groups	IT providers Training providers/trainers
Activities requiring dedicated budget	· Awareness raising: Pan-European initiative to promote "on-the-job" learning and alternative to training such as EPSS (1M EUR with a duration of 2 years) [European value added] · Piloting activities
Time horizon	Mid-term (2-5 years)

4.4.9. Providing collaborative spaces for experimentation and innovation

Experimentation is a crucial part of innovation, including innovation in learning. It allows to gather data, answer questions and test assumptions, and based on that, to make more informed decisions about specific ideas and projects[300]. To this end, there is a need for (digital) spaces for experimentation and innovation at a collaborative level for online training developers and practitioners, in which they can test ideas and share good practices. In essence, any project related to the development of (online) training solutions needs to incorporate experimentation. Rather than treating it as a separate measure, it could be embedded as a vital element in the relevant initiatives, as specific needs of such experimentation spaces are likely to differ depending on the type of solution, objectives of experiments, target audience, available budget etc. For example, this aspect could be prominently embedded into the sectoral pilots of the Blueprint for Sectoral Cooperation on Skills[301], when it comes to the development of specific vocational education and training solutions.

SMEs, (online) training providers and other relevant stakeholder groups need to be widely informed about the opportunities offered by *existing* and new initiatives, such as, for example, Digital Innovation Hubs (DIHs)[302] of the European Commission. DIHs are one-stop-shops that provide enterprises with access to the latest knowledge, expertise and technology to support their customers with piloting, testing and experimenting with digital innovations. As proximity is crucial, they act as a first regional point of contact. A DIH is a regional multi-partner cooperation, including organisations like RTOs, universities,

300 https://www.unhcr.org/innovation/why-theres-no-innovation-without-experimentation/
301 http://ec.europa.eu/growth/industry/policy/skills_en
302 http://s3platform.jrc.ec.europa.eu/digital-innovation-hubs

industry associations, chambers of commerce, incubator/accelerators, regional development agencies and policy makers. DIHs can also have strong linkages with service providers outside of their region supporting enterprises with access to their services.

The rationale is to help European industry to grasp digital opportunities. The Commission will use 500M EUR over the next 5 years from Horizon 2020 budget to support the development of DIHs. It is the Commission's ambition to make sure that all enterprises have a DIH within their region, through which they could be able to access competences in order to digitise their organisations and their products and services. Furthermore, the services provision by existing Hubs could be strengthened by the establishment of a pan-European network of DIHs. Our analysis confirmed the need for such measures, and the research team welcomes and supports the Commission's approach to DIHs. Special attention needs to be put to the awareness raising activities among SMEs, (online) training providers and other relevants takeholder groups within specific regions. Here, cluster organisations and/or industry associations could play a central role.

5. OVERALL RECOMMENDATIONS

While the previous chapter addressed a central question of "what exactly needs to be done and by whom to stimulate the uptake of online training by SMEs in Europe?" the current chapter provides overall recommendations with regard to the other key questions of this analysis. This chapter is a continuation of Chapter 4, and it aims to provide an overview of the remaining conclusions and suggestions, not covered by the previous chapter. Specifically, recommendations are provided for the following questions:

- To policy makers and supporting structures: How should the funding of online training-related initiatives be organised?
- To training providers: How can online training best complement other (more traditional) forms of training?
- To SMEs and supporting structures: What are the most promising ways of reaching out to the workforce, to engage them into online training?
- To all stakeholders: How can the impact of these methods, approaches and initiatives be measured and improved?

5.1. Organisation of funding for online-training related initiatives

Our analysis suggested that lack of financial resources is perceived by the stakeholders as being among the *least* important barriers for the adoption of online training solutions. A wide variety of emerging digital solutions become accessible for a relatively small price, with an increasing number of platforms offering free learning services. It is important to point out, however, that these solutions are typically of-the-shelf, with a standardised content. The investment required to develop bespoke training solutions often are still too high for many SMEs, and that is where funding still remains an issue.

There is no one-fits-all funding solution. **The funding landscape needs to be diversified to be able to serve a wide variety of needs and situations**. Specific approaches that were identified for tackling the funding issue for (online) training for SMEs include the following:

- Facilitating **partnerships between enterprises and training developers** to produce training with maximum relevance, share the cost and the profit; with a central role for the cluster organisations/industry associations as coordinators;
- **Procurement** of specific online learning materials for enterprises from a certain sector by industrial associations and other professional bodies;
- Training enterprises to develop bespoke online courses themselves by means of accessible **DIY strategies** (this measure was addressed in detail in sub-section 2.2.3);

- Offering **on-demand bespoke course development through government-funded initiatives** (similar to PARP Academy[303] in Poland, as described in sub-section 3.1.1.);

- Creating **lifelong learning and training accounts for workers** that would belong to workers and would be portable from job to job. The money from the accounts could be used by workers any time and any way to pay for education and training[304]. These accounts could be funded by European funds, national government, enterprises' contribution and other support measures such as reduced taxes as well as a payment of different proportions by the participant[305]. Special attention needs to be paid to identifying the ways to effectively encourage learners to make use of these accounts, as creating learning opportunities does not yet guarantee those will be pursued.

- Offering **individual loans[306]** for adult learners to acquire/advance high-tech skills in a short reskilling or upskilling program. Some core principles of good practice to be considered when designing and implementing loan schemes include[307]:

    - Extended eligibility (for higher number of learners, part-time learners, etc.);
    - Flexible repayment with built-in income safeguard;
    - Operated by a specialised institution with expertise, know-how;
    - Level of subsidy to be aligned with loan scheme objective;
    - Involving private capital, classified as private;
    - Possible involvement of financial institutions and other actors (e.g. tax authorities) in repayment collection and other administrative activities;
    - Links with other cost-sharing mechanisms;
    - Coordination of implementation of loans with wider policies;
    - Use of non-financial measures (e.g. increased monitoring and evaluation);
    - Capacity or more efficient guidance and communication strategies).

- An **Income Sharing Loan Agreement** could be used as an alternative/complementary financial instrument to individual loans. ISAs are emerging as a financing mechanism in which a training provider or other entity pays for all or a portion of the up-front training costs, and, in return, the learners commit to pay a percentage of their future income over a period of time after completion of the program. ISAs offer a number of benefits for promoting a system of lifelong learning, including affordability (i.e. people who have lower post-completion income pay less than those who have higher levels of post-completion income); higher quality of training (as training providers are paid on the basis of the ability of participants to find work and the income level associated

303 http://www.akademiaparp.gov.pl/
304 Schindelheim R. (2018) "A lifelong learning savings account could solve the skills gap", Working Nation, published on 25 May 2018 https://workingnation.com/lifelong-learning-training-savings-account/
305 Report of the High-Level Expert Group (2019) "The Impact of the Digital Transformation on the EU Labour Market", April 2019, see: https://ec.europa.eu/digital-single-market/en/high-level-expert-group-impact-digital-transformation-eu-labour-markets
306 A detailed evaluation of existing loan schemes in European countries, as well as recommendations for future-proof loan schemes are provided in Cedefop (2012) "Loans for Vocational Education and Training in Europe", Research paper nr 20, see: https://www.cedefop.europa.eu/files/5520_en.pdf
307 Cedefop (2012) "Loans for Vocational Education and Training in Europe", Research paper nr 20, see: https://www.cedefop.europa.eu/files/5520_en.pdf

with that work); and less risk (as part of risk shifts from the participant to the entity providing the ISA, leading to greater risk pooling)[308]. In order to minimise the associated risks and challenges, ISAs require careful design, monitoring, evaluation and appropriate learner protection regulation[309].

The ultimate objective here, however, should be to make sure that SMEs view (online) training as investment rather than cost, as short-term project funding often fails to secure long-term sustainability. Consulted stakeholders emphasised that funding of initiatives related to the development of (online) training from the government's size (be it EU or national government) creates a dependency culture that destroys entrepreneurship and intrinsic motivation. Therefore, **the most promising approaches are the ones building on a genuine interest of SMEs to invest in (online) training on a continuous base**. Such measures support SMEs not by fully taking over the funding part, but by sharing costs or effectively using the resources available by SMEs themselves, often by joining efforts with other SMEs and by being coordinated by an umbrella organisation, such as cluster organisation, industry association or similar.

For a detailed overview of specific applicable funding models, including their advantages and disadvantages and specific examples, the reader is advised to consult sub-section 3.4.2. of this report.

5.2. Complementing other forms of training

Online training should by no means be viewed as a silver bullet solution to all training-related challenges of modern SMS. Online training offers promising opportunities for providing flexible, adaptable, contextualised and just-on-time training courses to the workforce. At the same time, it is associated with a number of challenges:

- ***Pedagogical and learning relevance***: online training often (but not always) offers limited or no support for learners. To overcome this challenge, there is a need to have a solid support system in place. Learners can be offered a FAQ that can help them remedy any common issues, and email or instant message support for more complicated questions or concerns. Another effective solution implies encouraging peer collaboration (e.g. via a forum)[310].
    - An effective way to promote the use of online training and to improve its quality is the targeted and systematic training of trainers according to uniform quality standards[311].

308 Pollack E. (2019) "Can Income Share Agreements Promote a System of Lifelong Learning?", The Aspen Institute, 22 May 2019, see: https://www.aspeninstitute.org/blog-posts/can-income-share-agreements-promote-a-system-of-lifelong-learning/

309 Pollack E. (2019) "Can Income Share Agreements Promote a System of Lifelong Learning?", The Aspen Institute, 22 May 2019, see: https://www.aspeninstitute.org/blog-posts/can-income-share-agreements-promote-a-system-of-lifelong-learning/

310 Pappas C. (2014) "Top 5 Most Common eLearning Challenges And How To Overcome Them", published in eLearning Industry on 5 November 2014, see: https://elearningindustry.com/5-common-elearning-challenges-overcome

311 This was the main goal of the project "Certified European E-Tutor" (CET) funded by the European Commission. The project defined a comprehensive quality standard for the further education of VET teachers and trainers to becoming "e-tutors" and introduced a certification procedure, which supports the validation and recognition of e-learning qualifications in a transparent way at European level.

- For learners to become truly engaged in the overall online training process, they have to be aware of how the content is going to translate into real world settings. To tackle this challenge, it is possible to integrate simulations or online training scenarios that help the learner to see how they can apply the information they have learned in real life. The learners can also be offered real-world examples, or group collaboration projects that are based around problems or issues they might encounter regularly outside of the virtual classroom[312].

- ***Quality standards***: when it comes to developing an online training course, each company has its own process and courseware designers and developers around the world design courses in their own style and use their own standards. This may affect the quality of the online training course. However, there are certain industry standards that can be used to maintain the consistency and quality of online training courses. These standards include Interface Standards, Compatibility Standards, Production Quality Standards and Instructional Design Standards[313]. Following the industry standards helps ensure the optimisation of production development time and thus results in the optimisation of cost. Without these standards, the online training course might lose its aesthetic sense and functionality[314]. Special attention needs to be paid to the quality of content.

- ***Completion rates and learners' motivation***: an overall lack of learners' motivation might stem from learners who are not enthusiastic about the content or are not interested in the subject matter. Online training course needs to keep the learners engaged. Scenarios, eLearning games, and videos are possible ways to achieve this. All of these give learners the opportunity to immerse themselves within the subject matter, rather than just reading about it[315].

- ***Recognition/certification***: more European countries emphasise the importance of making visible and valuing learning that takes place outside formal education and training institutions. Yet, despite a number of initiatives and recommendations on the recognition of informal learning (e.g. European guidelines for validating non-formal and informal learning[316], CEDEFOP, 2015), there is a wide gap between the recognition of formal and informal or non-formal learning. Access to the recognition of informal learning is sporadic, and the outcome of recognition process is too often treated with suspicion[317].

- ***Busy schedules of learners***: many people are hesitant to take an online training course because they think that they will not be able to go at their own pace or that it will require a great deal of their time. It can be tackled by ensuring that an online training course is in bite-sized chunks that the learners can access whenever and wherever they are ready to learn. There is a need to grab their

312 Pappas C. (2014) "Top 5 Most Common eLearning Challenges And How To Overcome Them", published in eLearning Industry on 5 November 2014, see: https://elearningindustry.com/5-common-elearning-challenges-overcome
313 Habeeb Omer A. (2016) "The 5 Types Of eLearning Interface Standards", published in eLearning Industry on 24 October 2016, see: https://elearningindustry.com/elearning-interface-standards-5-types
314 Habeeb Omer A. (2016) "2 eLearning Production Quality Standards", published in eLearning Industry on 30 November 2016, see: https://elearningindustry.com/2-elearning-production-quality-standards
315 Pappas C. (2014) "Top 5 Most Common eLearning Challenges And How To Overcome Them", published in eLearning Industry on 5 November 2014, see: https://elearningindustry.com/5-common-elearning-challenges-overcome
316 http://www.cedefop.europa.eu/en/publications-and-resources/publications/4054
317 http://www.eportfolio.eu/community/projects/badge-europe

attention from the start with visually compelling graphics and images, and keep them engaged with multimedia elements which deliver key pieces of information clearly and concisely[318].

Even by tackling the abovementioned challenges, online training may still not always be the best solution for SMEs. Some employees simply learn better with face-to-face instruction, which is missing in an online environment[319]. Sometimes enterprises may need to keep employee information confidential and safe from potential hackers. This level of security can be costly and time-consuming to insure in an online environment[320].

In this case, enterprises may still want to use traditional classroom-type of training or opt for **blended** learning that combines the benefits of both online and traditional training. Blended learning is a hybrid strategy utilising both classroom and online learning methodologies. This approach was first used in classroom environments to provide differential learning delivery, but it has been gaining popularity within the business sector over the past years. It is predicted to become the main training method of choice across all industries[321]. Furthermore, the Electronic Performance Support Systems (EPSS) solutions can sometimes be more relevant. This topic has already been addressed in detail in sub-section 4.4.8. of this report.

5.3. Effective ways of reaching out to the workforce

Reaching out to the EU workforce implies reaching out to a massive target audience, in this case, a population of European SMEs active in high-tech domains. Rather than trying to target individual SMEs directly, future initiatives should target **supporting structures** that have access to specific SME clusters/communities, namely industry associations and cluster organisations at the EU, national and regional levels.

5.3.1. Role of supporting structures

The supporting structures can play a central role in spreading the relevant information among specific enterprises, as they are already in close contact with them. Furthermore, these structures can act as **initiators and facilitators** of specific (online) training-related activities of SMEs from the corresponding clusters/regions/sectors.

The following actions need to be taken by supporting structures (e.g. cluster organisations, industry associations and similar):

Examples of relevant support structures at the EU level include the following:

318 Pappas C. (2014) “Top 5 Most Common eLearning Challenges And How To Overcome Them”, published in eLearning Industry on 5 November 2014, see: https://elearningindustry.com/5-common-elearning-challenges-overcome

319 Pepping K. (2017) “Benefits of Blended Learning for your Company”, continu, 27 December 2017, see: https://blog.continu.co/benefits-blended-learning-company/

320 Pepping K. (2017) “Benefits of Blended Learning for your Company”, continu, 27 December 2017, see: https://blog.continu.co/benefits-blended-learning-company/

321 Burke L. (2017) “Blended Learning: A Training Strategy that Fosters ROI”, DevelopIntelligence, 23 October 2017, see: http://www.developintelligence.com/blog/2017/10/blended-learning-training-strategy-fosters-roi/

- Enterprise Europe Network[322] with multiple sectoral groups; general business associations such as SMEunited[323] (for SMEs), and BusinessEurope[324] (for enterprises of all sizes);
- Specific industry associations, for example, the European Association of the Machine Tool Industries (CECIMO)[325], the European Factories of the Future Research Association (EFFRA)[326], the European Photonics Industry Consortium (EPIC)[327], Photonics21[328], SEMI-Europe[329], EuropaBio[330], AENEAS (former ENIAC)[331], Nanotechnology Industries Association (NIA)[332] etc.;
- Digital technology industry associations such as European Digital SME Alliance[333] (former PIN-SME) for Europe, as well as national associations such as Bitkom[334] (Germany), or associations with a focus on decision makers in digital technology enterprises such as EuroCIO[335].

Examples of activities for reaching out to the workforce at the EU level include the following:

- Actively communicating with SMEs in a cluster/community and collecting insights on the most effective learning solutions, challenges and experiences; disseminating this information within the cluster/community; organising events to enable direct sharing of this information among SMEs and with other key stakeholder groups;
- Facilitating the development of online repositories of relevant courses, as well as the overall digital hubs in order to store best practices, exchange experiences and other relevant information;
- Encouraging large enterprises to open their learning systems to other enterprises in their value chain;
- Introducing pan-European learning awards/labels for SMEs actively engaged in (online) training;
- Organising a massive awareness raising campaign of online training for enterprises and their employees, and mobilising multiple channels including social media.

Furthermore, our analysis suggested that **clusters** are particularly well positioned to serve as platforms for effective learning ecosystems for European SMEs. To this end, a pivotal role in promoting (online) training opportunities among SMEs belongs to **cluster managers and their teams**. Specifically, cluster mechanisms could be effectively used for the following activities (as examples):

- Setting up local help-desks offering free or subsidised professional support and guidance for enterprises regarding the development and implementation of their learning strategies;
- Offering coaching services to SMEs for skills profiling and analysis;

322 https://een.ec.europa.eu/
323 https://smeunited.eu/
324 https://www.businesseurope.eu/
325 https://www.cecimo.eu/
326 https://www.effra.eu/
327 https://www.epic-assoc.com/
328 https://www.photonics21.org/
329 http://www1.semi.org/eu/
330 https://www.europabio.org/
331 https://aeneas-office.org/
332 http://www.nanotechia.org/
333 https://www.digitalsme.eu/
334 https://www.bitkom.org/EN
335 https://eurocio.org/

- Organising free or subsidised external support to SMEs with identifying relevant learning resources;
- Providing a scheme for SMEs to benchmark their learning strategies and outcomes against similar organisations in their cluster;
- Facilitating partnerships between training developers & providers and enterprises (including learners themselves) in order to develop relevant training etc.

Skills-related aspects should have a top priority in cluster policies.

When it comes to promoting online training opportunities among the workforce in Europe, action needs to be taken by all key stakeholder groups, including SMEs themselves. The role of these groups is addressed below.

5.3.2. Role of SMEs

The following actions need to be taken by *SMEs* (including both employers and employees):

- Be proactive with both looking for relevant training materials, actively engage in conversations with partner enterprises (other SMEs/large enterprises) about training opportunities, experiences and available resources;
- Actively share training materials and experiences with other SMEs via social media, joint events etc. (from ego-based to eco-based learning);
- Recognise workplace as a learning place and consider learning as investment rather than cost;
- Self-organise by joining forces with other SMEs for sharing costs and jointly developing training solutions;
- Make sure employee's skills become visible to both the company and the outside world (e.g. with the use of Open Badges).

5.3.3. Role of training providers

The following actions need to be taken by training providers:

- Closely collaborate with cluster organisations to co-develop and promote effective training solutions among the local enterprises;
- Develop efficient feedback system for online tools; offer review systems for the provided off-the-shelf training, indicating which courses receive the highest review scores;
- Apply data-driven approaches, develop solutions in close cooperation with end users and test those solutions in reality;
- Develop new business models that would allow for offering free training for SMEs.

5.3.4. Role of policy makers

The following actions need to be taken by policy makers:

- Cultivate policies and programmes aiming to inspire and enable SME leaders to promote (online) training within their enterprises;
- Support the development of an umbrella online platform allowing to compare the quality of training providers and specific solutions (similar to expedia.com, but for online training material);

- Support initiatives aiming to stimulate multi-stakeholder collaboration and engagement;
- Support initiatives aiming to create efficient recognition systems (e.g. Open Badges);
- Support initiatives aiming to develop evaluation systems for training providers (e.g. via self-benchmarking or reviews by the learners).

5.4. Ensuring a demand-led approach

Following a demand-led approach and serving a highly diversified market requires **systems that support just-in-time just-for-me learning solutions for vast numbers of individual learners and groups.**

Centralised platforms (i.e. a model of “Netflix of online training”) can play a valuable role here by aggregating offerings from other smaller, specialised niche players, and offer structure and direction for learners. At the same time, such platforms on their own would hardly be able to deal with a desired level of customisation of the offer, stemming from the requirements of personal learning. While, by using AI-based solutions, such platforms would be able to achieve a high level of personalisation, the choice of the learner would still be limited to what the platform has to offer.

The development of the abovementioned platforms needs to be complemented by the creation and maintenance of **learning ecosystems**, catering the specific needs of individuals, groups, enterprises, value chains and clusters. Training developers need to form a prominent part of these ecosystems, building on close collaboration with all other key stakeholder groups, with a central role assigned to learners themselves. Such learning ecosystems could benefit from the offer of the centralised platforms, but would not be limited to those.

AI-augmented learning ecosystems and platforms need to facilitate access of learners to relevant personal learning solutions from any suitable possible sources. They would also need to include guidance, coaching, assistance, assessment, validation and certification of learning outcomes with developing personal learning and career paths in connection with attractive job opportunities during the whole professional career.

Annex A: Overview of consulted stakeholders

TABLE A-1: Overview of consulted stakeholders (expert workshops, in-depth interviews and individual expert consultation)

Nr	Name	Organisation	Country
1.	*Ádám Bodor*	*Webuni*	*Hungary*
2.	*Alan Bruce*	*ULS Dublin*	*Ireland*
3.	*Alex Grech*	*National Skills Council*	*Malta*
4.	*Alfredo Soeiro*	*University of Porto*	*Portugal*
5.	*Ana Augusta Saraiva de Menezes da Silva Dias*	*University of Minho*	*Portugal*
6.	*Andras Szucs*	*EDEN (European Distance and E-Learning Network)*	*Hungary*
7.	*Anna Czaja*	*Gdansk University of Technology*	*Poland*
8.	*Anna Grabowska*	*Gdansk University of Technology, PRO-MED SME*	*Poland*
9.	*Anne Aubert*	*Ministry of Higher Education and Research*	*France*
10.	*Annika Lawrence*	*DIAL GmbH*	*Germany*
11.	*Ari-Matti Auvinen*	*HVI Productions and The Association of Finnish eLearning Centre*	*Finland*
12.	*Borut Campelj*	*Ministry of Education, Science and Sport*	*Slovenia*
13.	*Bruno Koninckx*	*KnowledgeFlow*	*Belgium*
14.	*Carlos Ripoll Soler*	*Universitat Politècnica de València*	*Spain*
15.	*Catherine Mongenet*	*FUN-MOOC*	*France*
16.	*Christian Friedl*	*FH JOANNEUM*	*Austria*
17.	*Claudio Dondi*	*Independent Expert*	*Belgium*
18.	*Danielius Stasilius*	*BitDegree.org*	*Finland*
19.	*Darco Jansen*	*EADTU (European Association of Distance Teaching Universities)*	*Netherlands*
20.	*Darren Mundy*	*University of Hull*	*United Kingdom*

Nr	Name	Organisation	Country
21.	*David Hardy*	*Distance Education International*	*United Kingdom*
22.	*David Jeggle*	*Celonis SE*	*Germany*
23.	*Deborah Arnold*	*AUNEGE*	*France*
24.	*Dénes Zarka*	*Centre for Learning Innovation and Adult Learning*	*Hungary*
25.	*Diana Andone*	*Politehnica University of Timisoara*	*Romania*
26.	*Donatella Persico*	*ITD-CNR: Istituto per le Tecnologie Didattiche (ITD) of the Italian National Research Council*	*Italy*
27.	*Ebba Ossiannilsson*	*Swedish Association for Distance Education and Quality in Open Online Learning Consultancy*	*Sweden*
28.	*Erin Adams*	*Udemy for Business*	*Ireland*
29.	*Ewelina Sygut*	*Fagbokforlaget*	*Poland*
30.	*Fabrizio Cardinali*	*Knowhedge Consulting*	*Italy*
31.	*Ferenc Tatrai*	*EDEN (European Distance and E-Learning Network)*	*Hungary*
32.	*Florent Martinet*	*Airbus*	*France*
33.	*Gábor Bay*	*Learn Digital Inc.*	*Hungary*
34.	*Giles Pepler*	*Sero Consulting Ltd.*	*United Kingdom*
35.	*Ginevilé Ramanauskaite*	*BitDegree*	*Lithuania*
36.	*Henrik Køhler Simonsen*	*Smartlearning*	*Denmark*
37.	*Igor Curcio*	*Nokia*	*Finland*
38.	*Jan Apollo*	*University College Lillebælt*	*Denmark*
39.	*Jean-Hugues Rodriguez*	*Airbus*	*France*
40.	*Jelena Revzina*	*Runway*	*Latvia*
41.	*Joao Moita*	*BEST (Board of European Students of Technology)*	*Portugal*
42.	*Joao Rei*	*ELEVATE*	*Estonia*

Nr	Name	Organisation	Country
43.	*John Newell*	*MultEversity*	*United Kingdom*
44.	*Jorge Muract*	*World Steel Association*	*Belgium*
45.	*Joseph Vancell*	*University of Hull*	*United Kingdom*
46.	*Juliette Denny*	*Growth Engineering Ltd*	*United Kingdom*
47.	*Kristjan Konks*	*Autlo*	*Estonia*
48.	*Kristoffer Hedram*	*Lin Education*	*Sweden*
49.	*Laura Linnaeus*	*Lin Education*	*Sweden*
50.	*Lindia Frietmann*	*IamProgrez.com*	*Netherlands*
51.	*Lutz Michel*	*mmb Institut for media and competence research*	*Germany*
52.	*Marjolein van Eck*	*IBM Global Markets*	*Netherlands*
53.	*Mark Liedekerken*	*Open University*	*Netherlands*
54.	*Mark Nichols*	*Open University UK*	*United Kingdom*
55.	*Märt Aro*	*DreamApply/Nordic EdTech Forum "N8"*	*Estonia*
56.	*Marta Jacyniuk-Lloyd*	*Cambridge Professional Development*	*United Kingdom*
57.	*Mathy Vanbuel*	*ATiT*	*Belgium*
58.	*Mira Kekarainen*	*Seppo.io*	*Finland*
59.	*Monika Janta*	*Fagbokforlaget*	*Poland*
60.	*Monika Simaškaitė*	*INFOBALT*	*Lithuania*
61.	*Myron Cizdyn*	*The BLPS Group*	*Poland*
62.	*Nadine Roijakkers*	*Open University*	*Netherlands*
63.	*Natasja Mol*	*IBM Global Markets*	*Netherlands*
64.	*Nicole Denzel*	*Karl Storz SE & Co. KG*	*Germany*
65.	*Niels Henrik Juul Hansen*	*Inspiratoriet*	*Denmark*
66.	*Nigel Lloyd*	*Cambridge Professional Development*	*United Kingdom*
67.	*Nikitas Kastis*	*Mind2Innovate*	*Greece*

Nr	Name	Organisation	Country
68.	*Nils Carlberg*	*Triglyf AB*	*Sweden*
69.	*Paul Bacsich*	*Matic Media Ltd.*	*United Kingdom*
70.	*Paula Peres*	*Instituto Politécnico do Porto*	*Portugal*
71.	*Peter Mazohl*	*EFQBL (European Foundation for Quality in Blended Learning)*	*Austria*
72.	*Piet Henderikx*	*EADTU (European Association of Distance Teaching Universities)*	*Netherlands*
73.	*Rebecca Stromeyer*	*ICWE*	*Germany*
74.	*Renate Slucka*	*Intea*	*Latvia*
75.	*Sandra Kucina Softic*	*University of Zagreb, University Computing Centre*	*Croatia*
76.	*Sarah Cherif*	*CUTESolutions*	*Belgium*
77.	*Serge Ravet*	*Espace Mendes France*	*France*
78.	*Sofie Cabus*	*KU Leuven*	*Belgium*
79.	*Sonia Hetzner*	*University of Erlangen-Nurenberg*	*Germany*
80.	*Stella Stancheva*	*EfVET*	*Belgium*
81.	*Svenia Busson*	*Learnspace*	*France*
82.	*Teemu Patala*	*Context Learning Finland Ltd.*	*Finland*
83.	*Vesa Perala*	*Claned*	*Finland*
84.	*Wendy Chowne*	*The London Institute of Banking and Finance*	*United Kingdom*
85.	*Winfried Krieger*	*Krieger Consulting GmbH*	*Germany*
86.	*Yangos Hadjiyannis*	*Cyprus Institute of Marketing, Cyprus Business School*	*Cyprus*

ANNEX B: OVERVIEW OF DIGITAL LEARNING TECHNOLOGIES MATURITY

The current Annex aims to provide an overview of the current and emerging digital learning technologies. "Digital Learning" in itself is a broad term that covers a spectrum of technology-mediated educational experiences. The following glossary is collected from a variety of sources and arranged by tentative timeline of mainstream applicability[336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351].

Mature technologies (already available and deployable):

- **Traditional e-learning**: training content delivered via a website or application on a digital device.
- **Learning portal**: a digital hub with an aggregation of courses and materials; it may also serve other functions such as event calendar, discussion forum, FAQs etc.
- **Learning Management System (LMS)**: a software application for administering, documenting, tracking, reporting and delivering e-learning courses and trainings.
- **Authoring tools**: a software package to create and package e-learning content for end-users.
- **Courseware**: digital content to support a training programme.
- **Interactive PDF**: a dynamic PDF document whose content cannot be changed but can be viewed as an interactive non-linear slideshow.
- **HTML5/web-enabled**: content and applications accessible via (modern) browsers.

336 CEGOS (2016), Digital Learning Glossary of Terms, see: https://www.cegos.co.uk/insights/digital-learning-glossary-terms-2/
337 S. Briggs (2013), 10 emerging educational technologies and how they are being used across the globe, published at InformED, see: https://www.opencolleges.edu.au/informed/features/the-ten-emerging-technologies-in-education-and-how-they-are-being-used-across-the-globe/
338 S. Briggs (2017), 6 emerging educational technologies and how they are being used across the globe, published at InformED, see: https://www.opencolleges.edu.au/informed/features/6-emerging-educational-technologies-used-across-globe/
339 C. Rogers (2018), Edtech 2018: 17 emerging trends, published at Education Technology, see: https://edtechnology.co.uk/Article/edtech-2018-17-emerging-trends
340 W. Thalheimer (2017), Definition of Microlearning, published at Work-Learning Research, see: https://www.worklearning.com/2017/01/13/definition-of-microlearning/
341 C. Glennon (2018), Top nine trends from Learning Technologies 2018, published at Virtual College, see: https://www.virtual-college.co.uk/news/virtual-college/2018/02/top-9-trends-from-learning-technology-2018
342 S. Briggs (2016), Here's what adaptive learning is teaching us about learning, published at InformED, see: https://www.opencolleges.edu.au/informed/edtech-integration/heres-what-adaptive-technology-is-teaching-us-about-learning/
343 P.E. France (2018), Why are we still personalizing education if it's not personal, published at EdSurge, see: https://www.edsurge.com/news/2018-07-02-why-are-we-still-personalizing-learning-if-it-s-not-personal
344 Sappo School (n.d.), Tailored Learning, see: http://www.sapposchool.com/teaching-methodology/tailored-learning/
345 PwC analysis
346 M. Henson (2017), A Beginner's Guide to Open Badges, published at e-Learning Industry, see: https://elearningindustry.com/guide-to-open-badges-beginners
347 Accredible (n.d.), How to leverage digital certificates and badges to differentiate your program and generate more referrals, published at e-Learning Industry, see: https://elearningindustry.com/free-ebooks/leverage-digital-certificates-and-badges-differentiate-program-generate-more-referrals
348 Hubert AI (2017), 6 ways artificial intelligence and chatbots are changing education, published at Medium, see: https://chatbotsmagazine.com/six-ways-a-i-and-chatbots-are-changing-education-c22e2d319bbf
349 CoppellSD (n.d.), What is a digital learning coach?, see: https://www.coppellisd.com/Page/13472
350 OEB Insights (2016), 10 ways blockchain could be used in education, see: https://oeb.global/oeb-insights/10-ways-blockchain-could-be-used-in-education/
351 W. Grather, S. Kolvenbach et al, Blockchain for Education: Lifelong Learning Passport, published at EUSSET Digital Library, see: https://dl.eusset.eu/handle/20.500.12015/3163

- **Apps**: a self-contained program or software designed to deliver learning/training content or access to a learning portal.
- **Blended learning**: a combination of face-to-face and digital learning experiences to deliver course content.
- **Synchronous instruction**: simultaneous (real-time) participation of instructors and learners in a digital setting, such as via chat rooms, web conferencing and limited virtual worlds.
- **Asynchronous learning**: self-paced learning on-demand; also referred to as location independent learning.
- **Voice over Internet Protocol (VoIP)**: internet-based telephony to connect two or more parties.
- **Videoconferencing/Web-conferencing/Webinar**: conferencing between two or more parties with a live video feed for each participant; additional features may include real-time chat, presentation capabilities and live polling.
- **Cloud-based platforms**: cloud computing will enhance learning by allowing learners 24/7/365 access to content on any device anywhere they have an internet connection. Furthermore, cloud environments are suitable for collaborative learning experiences, which require active sharing of media among participants over a period of time.
- **MOOC**: an online-only course that is aimed at unlimited participation and open access via the web; in addition to documents, text and video, MOOCs also feature interactive quizzes and assignments which are used to assess successful transmission of learning content.
- **Psychometrics**: measurement and analysis of a candidate's quantitative or qualitative strengths and weaknesses to various degrees of granularity; usually used to assess employee suitability and cognitive competences.

Maturing technologies (1-3 years from mainstream adoption)

- **Bite-size learning**: high impact short training courses typically lasting between 30-90 minutes and addressing one aspect of a topic.
- **Microlearning**: Short learning engagements ranging between a few seconds up to 20 minutes; not to be used as a primary replacement for other forms of learning, but can be complementary in pre- and post-learning conditions.
- **Video-based learning**: learning programs where majority of content is transmitted via video instead of reading material.
- **Interactive video**: digital video that supports user interaction via gestures, clicks, voice commands etc. users can thus follow multiple paths in a game-like experience.
- **Mobile/tablet learning**: learning content that recognizes and caters learning content to the form factor and common usage patterns of mobiles and tablets.
- **Livestreaming**: mobile or desktop broadcasting of a live video feed over the internet; this allows both in-person and online viewers to participate in real-time.
- **xAPI (or Tin Can API)**: a digital learning specification that standardizes data transfer across learning content and platforms so that all types of learning experiences can be tracked, measured and stored in a centralised way.
- **Online 360**: a web-based service to provide 360-degree feedback on an employee with automated collation, scoring and reporting.
- **Shareable Content Object Reference Model (SCORM)**: standards and specifications for e-learning that allow LMSs to tracking learner activity.
- **Social learning**: theory that posits that learning is a cognitive process that best occurs in a social context, which could be through observation or direct instruction.

- **Social learning platform**: the systems and technology that enables social learning to take place within a controlled (web) environment.
- **Virtual Instructor Led Training**: training that is delivered in a virtual or simulated environment that resembles classroom experiences; especially if instructor(s) and learner(s) are not co-situated physically.
- **Virtual classroom**: an online classroom that allows participants to communicate, view presentations, interact with learning resources and work in groups.
- **Gamification**: learning content that is associated with activities and scores to provide feedback and motivate users to improve or continue their activities; typically used to promote behavioural changes.

Novel technologies (3-5 years from mainstream adoption)

- **Personal learning**: a humanistic addendum to overly-technocratic approaches to personalised learning, emphasizing meaningful transferable learning principles; in other words, personalisation not as an end in itself but as a means to an end, and the goal being learning as a fundamentally social activity that strengthens human connection.
- **Tailored programs**: an educational model where the student's learning style and personality type – beyond competence level – is used to shape the educational environment; maybe delivered with active sensors, detailed psychometrics etc.
- **Adaptive Learning**: learning systems where students benefit from customised learning content and immediate feedback based on individual strengths and weaknesses.
- **Continuous evaluation** (near real-time learning analytics): While previous generations of analytics have been done post-hoc and using aggregate data, future learning analytics will optimise learning outcomes for individuals with near real-time detection and feedback.
- **Next-gen LMS**: the next-generation of learning environments will be interconnected, collaborative and learner-centric; moreover, they may even enable user-contributed content for two-way learning models and tacit-knowledge sharing/management.
- **Open Content**: prepared content that are released under open source licenses for the broader public to use as they see fit. In the area of corporate training, it is not unthinkable to envision that MNCs and larger organisations may release some of their internal learning content (with some modifications) as open educational resources (OERs) for SMEs.
- **Open badges**: open badges are verifiable digital awards issued to individuals for learning/demonstrating specific skills or knowledge. Badges may be awarded by accredited institutions or nominated by peers in (digital) communities of practice.
- **Digital (learning) certificates**: providing trusted verified proof of completion of an online learning program, optimised for motivating engagement, sharing on social media and on-demand accessibility.
- **Serious gaming**: open-ended scenario-based learning experiences that allows learners to apply theory in mock situations; may be supported by interactive videos or round-based simulations.
- **Internet of Things (IoT)**: The IoT refers to the network of connected sensors, actuators and other devices specifically with the goal of enabling intelligent outcomes like remote monitoring, real-time optimisation etc.; integrated in education, IoT devices could enable digital training experiences for physical activities using connected "props" that can record learner's positions/movements and provide real-time feedback.
- **Wearable electronics**: physical-fitness and mental-state trackers, haptic feedback devices can help learners by better aligning their learning progress with

their present biological state. Moreover, wearable devices may also capture data and provide near real-time haptic feedback in real-world conditions to track and embed new behaviours.

- **3D printing**: 3D printing of replicas could help learners take apart and understand complex machinery more intuitively; moreover, rapid prototyping allows learners to learn by designing and testing their own prototypes in physical models.

Emerging technologies (at least 5-10 years from mainstream adoption)

- **Natural user interface**: systems that allow the use of real-world gestures and interactions in the context of learning and training; for example hospitality training using facial expression recognition to optimise for better control and response.
- **Natural language processing (spoken/written)**: AI techniques that can "understand" and "respond" to everyday human language; may be used in scoring open-ended essays, assessing competence via in-depth spoken interviews, retrieving just-in-time and just-for-me information on-demand, and providing real-time support and feedback during assignments.
- **Digital learning coach**: as learning content is increasingly delivered by digital resources such as interactive videos and adaptive learning management platforms, the role of a teacher shifts from transmission to transformation. A digital learning coach is able to use metrics and signals from the learning management system to listen/mentor/guide individual learners on their individual learning journey. Some aspects of this function may be digitized and embedded into the digital learning management system itself – for example, a chatbot that encourages you to reflect on learnt concepts and refresh older concepts at regular intervals.
- **Blockchain**: a distributed database that is transparent yet tamper-proof; it could be used by training providers, governments, employers and learners to manage certifications in a credible and secure way.
- **Integrated life-long learning**: systems that support lifelong learning in individuals from childhood through adulthood – both formal and informal learning achievements – across schools, higher education, career trajectory and skills upgrades/upskilling/reskilling programs. Likely will include digital technologies to record and access certification details securely.
- **Learner passport/e-Portfolios**: as digital learning and lifelong learning become more ubiquitous, learner passports could be vital tools to record, store and access an individual's learning history. A unified system could even integrate the individuals formal and informal certifications, skills and competencies in a single system. An aggregate database of skills and competences for an entire population would enable governments and employers to visualise and manage expertise in a more fluid manner – for example, on-demand expertise "gigs" could be possible instead of full-time employment. Moreover, the visualised "map" of skills and competences of an entire population could help individuals chart their own learning and career trajectories based on comparative information.
- **Augmented reality (AR), virtual reality (VR) and mixed reality (MR)**: the use of headsets and visually immersive content to simulate presence of a learner in a virtual learning environment and/or augment situational awareness of a learner in a real-world environment.
- **Storytelling**: the use of enacted skits, cartoons, images or otherwise evocative text to deliver engaging e-Learning content. While this may be more effort-intensive than delivering standard content, it is well suited for topics that are of a more humane or ethical nature. Digital toolkits like cartoon-creation software, conversational path management, and (immersive) 3D worlds and assets can help trainers prepare such content.
- **Quantified Self & biometrics**: advanced wearables and real-time biometrics using IoT can record learner(s) conditions and respond in near real-time. For

example, assessing the energy level of the audience to schedule the best time for coffee breaks, or using brainwave signals to optimise and personal pedagogy.

- **Simulations and digital twins**: the use of interactive simulations and digital recreations of real-world systems to train learners on patterns in how complex systems operate or fast-forward through crisis scenarios to see feedback loops and ripple effects.

ANNEX C: STATE OF PLAY OF ONLINE TRAINING IN SPECIFIC MEMBER STATES

TABLE C-1: Situation regarding the rate of adoption of online training in specific Member States[352]

Country	State-of-play regarding the adoption rate	Key challenges
Austria	Online training in general is popular among mid-sized to larger enterprises in Austria, less with SMEs. However, MOOCs are not so popular among Austrian enterprises yet. Only a few of the larger enterprises uptake external MOOCs or even create their own MOOCs.	Initial online training solutions could not fulfil high expectations of enterprises with regard to saving costs, flexibility, scalability, new networking opportunities, improving employee retention rates etc. There is lack of awareness of/experience with online training and specifically MOOCs. If enterprises are aware of MOOCs, often they still do not dare to create their own MOOCs because of missing experience. If they are aiming to use external MOOCs, they often lack experience and time to identify the right external MOOCs and integrate them into their training offers. Other challenges are related to company secrets, legal limitations, confidentiality issues, and technical security issues such as company firewalls blocking the access to certain platforms.
Belgium	The adoption rate largely depends on the size of enterprises. Larger enterprises usually have structured learning programmes for their employees, but smaller enterprises do not have time/manpower to spare to organise learning programmes, let alone giving employees time off to do these learnings.	SMEs also tend to have highly specific training needs. There may be a language barrier in select areas of Wallonia, but generally trainings in English (sourced internationally) should not be an issue. Cost of trainings does not seem to be a major barrier either. However, employees (who undertake training themselves out-of-pocket or beyond working hours) will probably expect some recognition or compensation.
Croatia	It is not popular among small enterprises. At the same time, it is quite widely used by medium-sized and large enterprises. Medium-sized enterprises have more training for their personnel. In smaller enterprises, it is more opportunistic, and there is usually no systematic learning and development process.	Availability of funding; Willingness of workers: this is not just motivation, but sometimes they are not skilled enough to use the technologies; Lack of recognition of achievements in a formal way; Language-barriers: in high-tech SMEs, English is common. However, older workers and low-skilled workers might prefer Croatian language training. Internet access/technology infrastructure is not a significant challenge anymore, except in some areas, e.g. islands, mountains.

352 Based on in-depth interviews with MS representatives

Country	State-of-play regarding the adoption rate	Key challenges
Cyprus	Online training is extremely unpopular among enterprises, especially SMEs. A rough estimate would be that about 5-10% of enterprises in Cyprus are currently to some extent engaged in online training. For small enterprises, this figure would be under 3%. There is still a long way to go before online training becomes a popular phenomenon for enterprises in Cyprus.	Low interest in training in general: many enterprises in Cyprus are family businesses; they typically do not have a long-term vision, especially regarding their skills needs. Training (even in a face-to-face form) is considered a luxury. Most enterprises (roughly 95%) do not look outside. Enterprises are not really bothered by lack of training, they see it as a waste of time. As long as they keep doing well, they are not interested in changing the situation. It is a cultural issue that is difficult to change. The attitude towards training is different for enterprises operating globally and facing global competition. However, there are very few of them. After the crisis, enterprises increasingly start looking for consultants' support in designing long-term strategies. However, there is still a long way to go before online training starts playing a role in these strategies. Low awareness of the opportunities offered by online training: many enterprises are not familiar with a diversity of learning solutions that online training can offer. For example, many would not know what gamification really is, and would consider reading a pdf file (manual) online as online training. Many enterprises do not have any online portals for their employees. Low awareness of the associated costs: most enterprises have a limited understanding of the costs associated with the development and use of online training. Lack of trust in online training: enterprises are often afraid to invest in what they do not understand.
Germany	The popularity of online training in Germany has grown significantly in the last decade. There was a shift from web-based training (WBT) to mobile learning. Video content is also highly popular, especially for SMEs, in particular for informal learning.	Traditional education providers continue to focus on face-to-face classes. This also has to do with the lack of entrepreneurial courage. There is a lack of e-learning skills among users/enterprises and education providers.
Greece	Online learning is much more popular with professionals and freelancers than in the corporate environment. Demand for online learning is not often initiated through the corporate organisations but rather, proactive individuals and	The biggest challenge is the attitude towards lifelong learning, business culture and regulatory framework for learning. The level of ICT infrastructure in terms of internet access and device availability is also mediocre in Greece. Investments are required especially in the countryside.

Country	State-of-play regarding the adoption rate	Key challenges
	professionals following courses out of their own interest.	
Finland	Online training has become mainstream for large enterprises (based on the experience with hundreds of enterprises). This shift took place in recent years, and now many enterprises start looking online first before they consider traditional forms of learning. The situation is still different with small enterprises. Only very few small enterprises are using online training on large scale, neither have they established strategic initiatives or roadmaps to develop and utilise online training on a regular, systematic basis. There is a small but significant niche market in SME sector that focuses on partner and client training. High-tech SMEs are at the forefront of small enterprises when it comes to the use of technology-enabled learning solutions. They are the ones primarily using online training, as it is often the most efficient way for them to meet their training needs. For example, small enterprises operating globally and having a need to train their partners and customers all over the world can hardly use traditional training methods for that, and online training is exactly the solution they need. There are generally two main directions for online training, namely off-the-shelf materials or resources that are ready to be used but sometimes do not fit the need, and customised training that is tailored to the needs of a specific company, but is more challenging to develop. For many enterprises, online training becomes the only way to meet their evolving training needs, and traditional methods do not fit anymore.	Small enterprises see that online training development in full-scale is a resource-challenge they cannot tackle. Enterprises lack understanding about the opportunities offered by online training and how to apply online training in different purposes. There is lack of understanding about the economics of learning – where costs actually incur and how costs can be kept low without sacrificing the quality of learning. For SMEs, in particular it is critical to understand the financial impact of training investment and how the impact can be made positive. Lack of trust in online training used to be an issue in Finland, but after a lengthy period of experimenting with different ways of doing it, the issue is not so evident anymore. Managers lack skills and capabilities to provide online training – according to recent studies most managers consider online training as an essential business enabler but similarly consider that they are not doing enough to increase employee training opportunities. Lack of concepts, tools and services that fit the specific demands and budget of SMEs. Technology barrier becomes less and less prominent, especially for the new generation of workers353. Lack of centralised resources for finding information about online training methodologies, different solutions available and how to apply them appropriately, and learn and share experiences with peers.
France	Many enterprises are still not using online training, especially small businesses. Regarding recognition of experience, France has programmes since 2002 that recognise formal/informal	Small business see lifelong learning as a “tax” and not as an opportunity to improve their business.

353 The first LMS and learning system implementations were heavily technology-driven and were focusing mainly on the infrastructure and technological solutions, rather than actual learning. It was essentially done in a “wrong way” by forgetting the user experience and what the systems should stand for in the first place (learning). This partly ‘spoiled’ the overall attitude of people towards online training in the early days (around the end of 90s – mid 2000).

Country	State-of-play regarding the adoption rate	Key challenges
	education and skills. However, not everyone uses them. High-tech businesses are actively involved in (online) training. Other types of businesses often do not do it at all.	When they look for something specific, they have difficulty with finding the training they need. In high-tech SMEs, international training in English is quite common. In other sectors, a foreign language is likely to be a challenge.
Hungary	In some sectors, training is not popular. Within small enterprises, even if government activities are going online, the way of thinking is changing slowly. There are about 10-50 high-tech SMEs directly working towards the US/global markets, e.g. Prezi, Bnovative Architecture, design, GPS, niche tech enterprises among others.	In medium sized enterprises, English is common. However, for small/micro enterprises, Hungarian language is preferred. Typically, SMEs hire already trained people rather than spend time/money training people. Almost any other activity by the company is seen as more important than actually training people. Hungary is well-connected and Internet connectivity does not represent a challenge, except in some rural areas.
Ireland	Often SMEs are not aware of what benefits online training might bring, especially given the time cost and lack of proof with regards to actual benefits. In contrast, enterprises like Amazon and Google, and many spinoff enterprises are highly savvy and use online training actively. However, in the non-high-tech field, it is hardly known and therefore not used.	Investment: SMEs need to know what kind of investments they need to make in terms of money, time, and expertise. Psychology: training is associated with negative experience from school. Lack of experience: there is a lack of leadership and managerial experience in this area. There is a fear that employees on training might either give away sensitive information OR leave the firm once they go through the training, and that fear holds enterprises back.
Italy	For large enterprises in Italy, it has become quite common to use online training. The use of online training by SMEs, however, is still rather limited. A rough estimate would be that about 15% of all enterprises (counting both large and small and medium-sized enterprises by the unit) in Italy use online training, and when looking at SMEs only, this number would be about 5%.	Historically, training is considered by enterprises in Italy as a cost item rather than investment. Technology infrastructure in Italy is still slightly behind many other EU countries. There is often a conflict between HR people and IT people in large enterprises when it comes to agreeing on the overall digital training systems and architectures. Training service providers in Italy are still quite traditional. For example, VET is coordinated by the regions, and the latter do not yet proactively mandate the use online training. Trends like micro-learning, social learning, VR, serious games etc. have not been largely applied yet. In general, the provided online training is hardly exciting and engaging, and the learner has to be truly motivated to complete it. It is still the first generation online training, with low attention to the aspects of learning

Country	State-of-play regarding the adoption rate	Key challenges
		experience, learner on boarding and engagement. The budgets spent on the development of online training contents in Italy are rather low (compared to the United Kingdom or Nordic countries). At this stage, most of the market is not yet asking for more attractive online training products and they are not ready to allocate higher budgets to it.
Latvia	Online training is not popular among enterprises in Latvia. Enterprises still prefer face-to-face training instead. Nevertheless, there are already some tools and platforms for online training (e.g. MOOC platforms), offered by universities. These courses, however, are often meant for students, not professionals. Large enterprises sometimes use internal e-learning platforms for generic training of their personnel (e.g. on safety issues). Other types of online training are hardly used by enterprises in Latvia.	The preference for face-to-face training stems from historical tradition. It is more a cultural issue that is difficult to change.
Lithuania	Many enterprises in Lithuania are SMEs. Most of them are not using online training. The popularity of online training varies per sector, however, in general, enterprises prefer more traditional ways of learning. Online training is not yet a significant part of a learning culture of small enterprises in Lithuania. In terms of content, enterprises mostly use online training for social & management skills and for 'hard-core' technical skills (e.g. for ICT sector). In terms of language, online training in English is a common practice, especially for the high-tech sectors (such as ICT), and it typically does not represent a barrier for (high-tech) enterprises to follow specific training.	Most small enterprises are localised in three cities (Vilnius, Kaunas and Klaipeda), which makes it easy to meet physically and to train employees in a traditional way (i.e. physical presence at the training). When enterprises start operating internationally, the issue of location becomes more sensitive and there, online training may play a more important role. Although it happens slowly, more and more enterprises start using the opportunities of online training.
Malta	With regard to bespoke e-learning, it is still at an early stage and availability is low. Not many MOOCs are available that are produced in Malta for the Maltese. They are developed mostly by the academic community in Malta. The Maltese government is also going to launch a new platform. Platforms like Coursera/FutureLearn become increasingly popular.	Lack of awareness about opportunities offered by online training; Accreditation: most countries are struggling with the certification issue with regard to online training. State universities are being cautious about what materials they serve online and which materials are used exclusively in formal learning.
Poland	Over 70% of Polish entrepreneurs continue to invest in expensive stationary training and do not use	SME owners often lack knowledge of the opportunities offered by online training and the benefits it offers.

Country	State-of-play regarding the adoption rate	Key challenges
	the opportunities offered by online training.	Young generation typically proactively looks for learning solutions, they are better aware of the opportunities of online training and where to find it (in contrast to older generations). In some cases, teachers at universities may even be deliberately 'hiding' online training from students due to their fear that online training will someday replace them. People working at enterprises often do not feel there is a need for them to advance their skills. They feel safe about their job. It is only when they plan to look for a new job, they are more likely to consider some forms of training.
Portugal	Only a few enterprises in Portugal actively use online training as a formal way of learning. For small high-tech enterprises, online courses are more popular in a self-learning mode, completely outside the formal training system. Big enterprises and corporations use formal online courses. Enterprises increasingly appreciate the flexibility offered by online training. There is still a need to prove that online learning is effective (compared to face-to-face learning). Panorama e-learning study (2014) estimated that roughly 10% of training courses are offered in online mode, while 90% imply face-to-face learning. The study covered enterprises, public bodies, training organisations and higher education. The government is preparing a legislation on distance education in Higher Education - HE (at the moment in public consultation). In general, HE will have a legislative framework to offer online education (1st, 2nd and 3th cycles of education). The framework expresses the importance of consortiums between HEI and the articulation with enterprises, employers, professional boards and other interested parties.	There is a need to increase digital literacy; the barriers are focused on the negative perception related to lack of human interaction in online training. There is a need for a positive discrimination in relation to e-learning and b-learning due to the mistrust of the formal system. E-learning is still a relatively new concept, although it exists already for many years. It may be a matter of a cultural barrier since many people do not trust it as a form of training and prefer human interaction.
Romania	E-learning is used in some enterprises, but not all enterprises use online training frequently. A rough estimate would be that about 10% of enterprises use online training regularly, especially those in the ICT field. Most of these are in the	Not knowing the advantages or disadvantages of certain trainings Quality concerns about trainings (Lack of) trust in the people/institutions providing the trainings

Country	State-of-play regarding the adoption rate	Key challenges
	major cities Bucharest, Cluj-Napoca and Timisoara. Some enterprises use MOOCs and SPOCs like Lynda.com	Language barrier Access to ICT, especially in rural areas Speed of broadband coverage in cities Updated technology to run e-learning content and activities
Slovenia	Online training among SMEs in Slovenia is not widely used. High-tech SMEs more often use elements of online training than other SMEs. Video content and off-the-shelf content are most often used in enterprises. Only a low percentage of high-tech SMEs as part of their training options use also virtual reality, gamification or serious games. Participation in MOOCs is often based on a personal decision of an employee and is not part of an overall training strategy of SMEs.	Lack of company's learning strategy, Lack of knowledge and understanding of employers and employees what online training really is and about the opportunities offered by online training, Lack of commitment from management, Lack of high quality content, Fear of high development costs.
Spain	Online training already has a high popularity among high-tech start-ups. They try to find an 'easy' way to access knowledge, and they acknowledge the benefits that online training can provide in this respect. Being active in a high-tech world makes these enterprises per definition better predisposed for online training, as they are well familiar with the ICT world. For more mature enterprises, as well as for enterprises from the sectors not related to high-tech, online training is a considerably less popular option.	It is often difficult to assess the actual outcome of the training. That may prevent enterprises from actively using it. Many enterprises do not see training of their employees as a key priority, and instead prefer to focus on operational activities (i.e. selling. buying, developing products etc.). Many enterprises also still prefer to pursue more traditional forms of training, implying physical presence. The offer of online training is often rather general, not tailored to the needs of a specific user profile.
Sweden	Online training is already a mature way of giving training in Sweden now. Especially high-tech enterprises use multiple online learning resources – even freely available, for example, on YouTube. Company training in Sweden is aligned with the business context. Most of the time, drivers for training refer to meeting business Key Performance Indicators (KPIs). The adoption of online training has also been actively supported by Swedish government.	There is a fear of manpower loss during training time. There is a big difference between sectors and regions in the country. On average though, enterprises are mature and understand that training is generally a good idea for the company and employees despite momentary inconvenience.
United Kingdom	In the UK, online training is increasingly popular but limited to a few areas: Compliance with regulations (either Europe-wide or national; e.g. GDPR); Manufacturing techniques (which can also be learnt via videos on YouTube);	While many providers market their trainings as tailor-made, they are ultimately not catered to the needs of the individual SMEs. Ideally, tailor-made content means it is either linked to the exact business/sector of the SME or the pace/standard of the learner.

Country	State-of-play regarding the adoption rate	Key challenges
	Online training for social media; Growth hacking. Other than that, e-learning is highly limited, and what exists seems to be happening only at specific enterprises. A lot of players are offering trainings; however, most are not UK-based. The majority of the UK-based training providers tend to be universities.	The trade-off of cost and time is always challenging for SMEs.

TABLE C-2: Situation regarding key players in specific Member States

Country	Description
Austria	The only Austrian university platform, imoox, is not focusing on company-MOOCs. Telekom Austria have their own company-internal platforms and are highly experienced. AVL List GmbH participate in the BizMOOC project and have co-produced the MOOC on Intrapreneurship, which was also recommended to all their employees. However, those are only large enterprises. Almost every larger company has its own e-learning/LMS system. Many of them are offered in cooperation/hosted by external partners, such as ELC GmbH, IMC, Click & Learn, Bit Online, Webducation GmbH etc.
Belgium	There are some initiatives supported by the government and/or union-driven. For example, on the CEVORA[354] platform, many trainings are free and comparable to Lynda.com. There are few enterprises targeting upskilling and reskilling SMEs, but most active players target individuals who are interested in upgrading their skills. For example, VDAB355 provides retraining specifically targeting retrenched workers. Employment agencies like Voka[356] and Unizo[357] also organise training around some topics.
Croatia	There are a few private enterprises producing local e-learning materials. Universities are involved in it too, but mainly for academic purposes rather than for enterprises.
Cyprus	The market is currently underdeveloped. There are only a few (1-2) providers that have experience with developing online training. These are private enterprises. It is also rather costly to develop online training in Cyprus.
Germany	The e-learning market consists of a large number of local providers of all sizes. The key players are SAP Education, tts GmbH, imc information multimedia communication AG, Know How AG!, Haufe Group GmbH[358].
Greece	There are some established online training providers like the University of Athens Adult Education Institute. It is run as a for-profit business unit focussed on fully online (non-blended) self-paced learning with a traditional examination at the end, for courses like accounting and auditing. In general, more and more universities are entering this market but still in an amateurish way. In the private sector, a group of enterprises called Centres for Continuous Vocational Training receive structural funds for training disadvantages groups, (e.g. currently unemployed people). They develop some blended learning variants of their learning materials.
Finland	The market is not that advanced in terms of number of players. There are only a few enterprises that have 'serious' product or service offerings. There are also multiple players that develop learning videos (i.e. video production enterprises). However, those often lack a good understanding of the underlying learning needs and pedagogics. Additionally, many self-service solutions become available allowing enterprises to develop their own learning materials. This area is growing fast, but it can cover only a limited part of the demand, because these tools or services alone are not sufficient to make good learning – professionals with expertise and insights on corporate pedagogics are needed. The Finnish market is a mix of local (national) and international enterprises. Many enterprises use learning products (particularly off-the shelf) and LMS by global providers. However, when it comes to the development of customised in-house training, enterprises tend to prefer local (national, sometimes even regional) providers. This situation may also change at some point, and enterprises will also 'order' customised training from abroad. For example, Context Learning is already providing services internationally (covering about 30 language regions), but being

354 https://www.cevora.be/landing
355 https://www.vdab.be/
356 https://www.voka.be/voka
357 https://www.unizo.be/
358 https://mmb-institut.de/wp-content/uploads/mmb-Branchenmonitor_2017.pdf

Country	Description
	a considerably small online training service provider (and a pioneer in the field), this is more an exception than a rule on the market. Generally, cooperation between online training providers is challenging, enterprises compete for clients and do not see the real benefits of cooperation. There are too few joint projects where 2 or more enterprises offer online training courses or solutions to corporate clients.
France	France Université Numérique (FUN) the national strategy in the context of which FUN-MOOC platform was created. It is a platform for universities, grandes écoles and other partners. It includes FUN-corporate for professional education where the courses are given by university experts. Some start-ups have created platforms for other players. Big enterprises typically have their own platforms. Some start-ups work for big enterprises and sometimes participate in the trainings from big enterprises. Speaking of Coursera/EdX/FutureLearn and similar platforms, there are typically not that many French universities on these platforms.
Hungary	There is a Digital Welfare programme targeted at digitalisation to ensure equality of access and outcomes with regard to digital access. It includes Digital Startup programme for SMEs (including e-learning) and Digital Export (all the ways businesses can do import/export using digital means). Many Hungarian universities offer online courses/training. Key private players are large tech enterprises like Google providing trainings as vendors. Google Hungary approached the Hungarian government regarding themes like Digital Workshop, Smart Business and Online Marketing Academy. Typically, LMSs like Moodle and the various MOOC platforms are used. Neptune is also common – used for content organisation, enrolment, examination etc. Custom-made special platforms or customised versions of LMSs are becoming increasingly popular.
Ireland	The sector in Ireland is dominated by multi-national corporations – Apple and Intel alone command a significant portion. The state government had a programme called SAS – one of their divisions was dedicated to online training. There are educational providers such as educational boards. There are also smaller private enterprises, which focus on soft skills, diversity and inclusion and other values-related training.
Italy	The current market offers many opportunities for large enterprises and public organisations. However, the way e-learning is developed is still highly traditional (e.g. pricing based on page count). There are multiple small boutique enterprises developing bespoke e-learning on a price competing basis. There are multiple enterprises providing LMS and LCMS-related solutions (e.g. the LMS by Docebo[359], Together LMS by SkyLab[360] and eXact LCMS by eXact Learning Solutions[361] are world-leading enterprises in this field) on a product basis. While some large enterprises choose to work also with international LMS/LCMS providers, when it comes to content, the preference typically goes to local enterprises. In terms of content, it is thus a predominantly national market. That is related to the fact that there is a strong chance of a cultural clash when non-Italian enterprises are involved in the process. SMEs typically buy off-the-shelf products and hardly ever procure bespoke solutions as these are too expensive for them. About 90% of SMEs who use online training would go to big international catalogue providers offering also Italian versions of their contents (e.g. Cegos[362]) whilst large organisations are procuring bespoke contents by local producers varying in size from small to very small

359 https://www.docebo.com/it/
360 http://www.togetherhr.com/
361 http://www.exactls.com/
362 https://www.cegos.it/

Country	Description
	enterprises (e.g. Open Knowledge[363], SkyLab[364], Amicucci Formazione[365], Creattività[366]).
Latvia	Universities are the main providers of e-learning courses[367]. There are also some vendor-developed courses (e.g. Cisco, Microsoft), but they are available in an international format in English and are not customised to the local context. For most ICT enterprises though, is it is not a barrier and they are used to follow such courses in English.
Lithuania	When it comes to social & management skills-related online training, about 70% of it comes from foreign training providers (with 30% left to the providers from Lithuania). More and more local training providers start offering online courses for 'soft' skills. In case of hard-core technical training, more than 90% of supply refers to foreign training providers. It can be explained by a high importance of recognition/certification for users, and a higher value attributed to the certification by prominent foreign providers. Lithuanian training providers can hardly withstand the foreign competition in this respect.
Malta	There are no significant national players when it comes to online training. The local academic community, e.g. University of Malta, does produce some MOOCs but they are more academic and not directly catering to the needs of the labour market. The rest is imported, and includes players like Coursera, EdX and FutureLearn. Their materials are generally favourably received, on par with a university education. Local and international players are not currently working together.
Poland	There are quite many enterprises offering the development of online training. However, many people who actively do online training, use the offer of the foreign providers (in English). The latter are associated with high quality and good reputation, which Polish online training solutions often do not have. However, for the massive uptake of online training by enterprises (particularly SMEs) in Poland, there is a clear need to have high-quality supply in Polish.
Portugal	Portugal currently has a small e-learning market, there is a limited number of organisations (private enterprises, universities) involved in the development and provision of online training for enterprises. Most part of the e-learning enterprises are multinationals (for instance Deloitte, PwC, Cisco, Microsoft, others). Local enterprises are small firms. Multinational enterprises of different sectors tend to have their own providers for IT and e-learning. Some Higher Education Institutions or their Interfaces act as e-learning providers, and raise awareness on e-learning, being also involved in large projects with enterprises, but the market is not in expansion.
Romania	No platforms made in Romania were identified. Lynda.com is reported to be highly popular. Vendors like Microsoft also provide trainings to enterprises. MOOCs are known to local enterprises too. Romanian universities like University of Timisoara and University of Bucharest are also entering this space.
Slovenia	One of the key players when it comes to the development and provision of online training to enterprises in Slovenia would be DOBA Business School specialised in fully online learning and offering also online/blended programmes for enterprises. Enterprises such as B2, Akademija znanja, Kadring, Go tečaji, SAP Slovenia also offer corporate training programmes from different fields.
Spain	Spanish is a popular language, and that stimulates local providers to develop a wide variety of online training solutions in the local language. The online training supply can be used far beyond Spain (e.g. in Latin America), ensuring a massive target audience and good market opportunities. That makes national players on the market quite strong, and there is often no need to use the supply of prominent foreign providers (e.g. in English). Spanish enterprises typically refer to the latter

363 https://www.open-knowledge.it/
364 http://www.skylab-italia.it
365 https://www.skilla.com/en/news.asp
366 http://www.creattivita.com/
367 See, for example, LU Open Minded platform that is also open for managers and professionals: http://www.openminded.lv/ as well as (e.g. Baltijas Datoru Akadēmija https://www.bda.lv NH mācību centrs https://www.nh.lv/), Centre for Lifelong Learning of TSI: https://www.tsi.lv/lv/content/tsi-muzizglitibas-centrs

Country	Description
	in case they need some highly specific training not yet available in Spanish. International platforms like Coursera or EdX are also quite popular.
Sweden	There are a couple of catalogues for finding e-learning. There are also a few LMS platform providers; however, they do not create their own content. The vendors of high-tech products are also key training providers. In the high-tech industry, online training is often vendor-driven. Online skills-training platforms like Lynda.com are also quite popular. Lynda especially has a local office in Sweden and a strong marketing strategy. Some of their courses are available through various LMS vendors. In Sweden, platforms like EdX and Coursera are seen as academic and not exactly business-applicable.
United Kingdom	There are three groups of training providers within the UK: universities and other higher educational institutions (e.g. Universities of Coventry, Gloucestershire and Salford, putting out a lot of e-learning content); private training enterprises (some are SMEs themselves whereas others are more established players); and finally online skills-training portals like Udemy[368] are also gaining ground.

368 https://www.udemy.com

ANNEX D: SKILLS AND COMPETENCES FOR A DIGITAL WORLD

Contemporary online learning is to be understood as learning in an increasingly digital world. As such, this means that there is a natural distinction between new topics relevant to the digital workplace being covered in learning content and learning content being delivered in new ways via digital/online technologies. While the scope of the report is focused on the latter, this annex is intended to illustrate the types of new skills and competences that are expected to be vital for the digital workplace in the coming decade, and thus should be reflected in learning content.

For the purpose of this analysis, the following framework is proposed (see Figure D-1). This framework is adapted from a parallel ongoing initiative on "Curriculum Guidelines for Key Enabling Technologies (KETs) and Advanced Manufacturing Technologies (AMT)"[369] (contract nr. EASME/COSME/2017/004) coordinated by EASME/DG GROW of the European Commission and carried out by PwC. Every SME can be seen as a "black box" where inputs – such as energy, materials and labour – are transformed into product and service offerings via combinations of various internal skills, competences and processes.

Product and service offerings can be defined as the commodified deliverables of a company, and may take different forms depending on the sector or value chain each specific company operates in.

FIGURE D-1: Internal skills, competences and processes potentially transformed by digitalisation of the workplace

The figure illustrates a range of possible skills, competences and processes within SMEs. However, the exact combinations and intensity within any particular SME would depend heavily on the value chain it is positioned in, and the kind of products/services it offers. This particular list has been selected to illustrate how new technologies and new ways of working in the digital workplace will impact the kind of skills, competences and

369 The Interim Report of this initiative can be found at: https://publications.europa.eu/en/publication-detail/-/publication/4dcaeee3-29c2-11e9-8d04-01aa75ed71a1/language-en/format-PDF/source-87225354

processes required within SMEs. **The list is not intended to be exhaustive but merely indicative**.

In the following sub-sections, each element will be addressed in detail, examining its relevance to skills, competences and processes required by SMEs, the key new technologies or ways of working involved and thus implications for learning content.

D-1. Pre-production & Planning

Before physical products are even scheduled for manufacturing, they may be prototyped and refined iteratively to satisfaction. Finalised designs and required production volumes would necessarily point to defined quantities of input materials and resources to be procured. The workforce required for the production cycle should be trained and supported by necessary equipment and information where required. The Pre-production & Planning stage is crucial for meeting bottom-line targets in a time-critical and capital-intensive setting, and thus technology is increasingly playing an important role in improving processes in this domain.

D-1A. Research, Design & Development

Depending on the industry, Research and Development (R&D) and product design may be critical. The introduction of corresponding technologies and techniques may speed up development, reduce costs of iterative refinement, allow for better visualisations that are understandable by experts and non-experts alike, and even facilitate invention of new configurations that may not have been possible before. Within this context, the following technologies may be used[370,371]:

- Design thinking workshops and innovation sprints to identify and cater to user demands and requirements;
- Computer-aided design (CAD) tools for prototype and iterate on new product designs;
- 3D printing to develop proof of concepts and test aesthetic/mechanical qualities;
- Virtual, augmented or mixed reality (VR/AR/MR) headsets to visualise products at human scale;
- Advanced data analytics to process extensive documentation (e.g. material/substance properties databases);
- Pilot experimentation with new components or materials;
- Robotics to automate trial-and-error processes (such as high-throughput chemicals testing);
- Materials simulation software to develop at nanoscale precision (such as semiconductor and chip design).

Implications for learning content: any curriculum must provide the workforce with the skills to not only use the relevant software and hardware, but also train the

370 PwC analysis incorporating multiple expert sources
371 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/

workforce to identify potentially new opportunities for innovation and improvement across the product portfolio. Since no employee can effectively master all the necessary skills (nor is this desirable), the workforce must also be able to collaborate across territories, cultures, languages and competences.

D-1B. Resource Planning & Sourcing

Once the blueprints for a specific product have been fixed, there is a detailed procurement process to plan and order the volume of specific parts and components required to mass-produce the product. This includes conducting market research to determine product pricing, assembling a list of parts, components and specifications and estimate costs, drawing contracts with multiple suppliers across international borders and generating regular demand forecasts to optimise production volume and inventory management of both input supply and finished product output. Within this context, the following skills, competences and processes may be incorporated[372,373,374,375]:

- Manufacturing process simulations to optimise production volume and anticipate bottlenecks;
- 3D printing of parts and components *in situ* or *en route* where possible to minimize supply chain complexity;
- Complex unified, real-time enterprise resource planning (ERP) software, possibly incorporating blockchain, for tracking material procurement and preserving transparency of provenance;
- Automated and standardised workflows for contract management across hundreds (if not thousands) of suppliers and partners yielding higher efficiency, lower risk and more transparency.

Implications for learning content: the lean manufacturing paradigm will continue to drive demand for advanced manufacturing, with its holistic emphasis on high productivity and minimal waste. Achieving this goal requires human discipline and within complex value chains, a healthy dose of technological assistance. Curriculum should train workforce in identifying areas for improvement – both quick wins and fundamental changes – and utilising the right technologies to achieve these improvements. Communication about these opportunities should also flow both top-down and bottom-up and thus company culture needs to change and accommodate this. A certain level of agility is expected to capitalise on these opportunities in a matter of weeks rather than months or years – and thus training should communicate how such changes can be realised factory-wide in short periods of time.

372 PwC analysis incorporating multiple expert sources
373 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/
374 Vaseekaran, A. (2018). The Critical And Evolving Role Of Contract Management In Digital Transformations. Retrieved October 15, 2018, from https://www.digitalistmag.com/finance/2018/01/16/critical-evolving-role-of-contract-management-in-digital-transformations-05754529
375 De Backer, K., Mercker, B., Moder, M., & Spiller, P. (2017). Purchasing power: Lean management creates new value in procurement. Retrieved October 15, 2018, from https://www.mckinsey.com/business-functions/operations/our-insights/purchasing-power-lean-management-creates-new-value-in-procurement#0

D-1C. Labour augmentation and management

The role of the humans in advanced manufacturing will change from primarily manual labour to more tactical planning and specialised processes, with the other tasks being taken by machines. While lights-out manufacturing – completely automated factories where humans are not required at all - is possible in theory, many manufacturers are realising there are benefits to blended workforces where robots assist humans and humans assist robots to supercharge productivity[376]. In this context, the following technologies may be incorporated into the workplace[377,378,379]:

- Labour management systems to capture worker activity data and optimise processes both day-to-day and long-term;
- Real-time dashboards to monitor factory staffing and activity;
- Cameras, scanners and other sensors embedded in the production line to provide timely feedback and allowing supervisors to oversee factory remotely;
- Augmented reality headsets to help workers see relevant information in a timely manner, recall steps in complex processes on-demand, provide extended situational awareness in dangerous conditions, and enhance precision work;
- Mobile devices may also provide augmented intelligence and capabilities on-demand – such as wrist-mounted screen for displaying relevant details and recording observations on-the-spot;
- Embedded sensors can measure for inefficiencies in lean production systems (down to distance of trash can from seat);
- Wearable technologies that can detect level and strain of activity, suggest reminders for proper posture and schedule breaks;
- Exoskeletons to reduce the physical toll of repetitive work and help bear larger loads over longer distances;
- Collaborative mobile robots (or cobots) to perform repetitive tasks and be trained on-the-fly without programming required.

Implications for learning content: new technologies will fundamentally alter the role of humans in the manufacturing environment – and hence curriculum must familiarise workers with their “silver collar” co-workers i.e. automation and AI[380]. Workers should not only understand what digital technologies can do, but also what they cannot do – in order to compensate in complementary way. Moreover, workers should be made aware of potential risks – such as data privacy breaches, cybersecurity, anomalous data, etc. – so that they can keep a look out to avoid those. Finally, workers should be trained in

376 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/
377 PwC analysis incorporating multiple expert sources
378 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/
379 McCrea, B. (2017). Labour Management Systems Get “Smart.” Retrieved October 15, 2018, from http://www.supplychain247.com/article/labor_management_systems_get_smart/Gartner
380 Kayser, H. et al. (2017). Accelerating Labour Market Transformation. Retrieved October 15, 2018, from http://www.g20-insights.org/policy_briefs/accelerating-labour-market-transformation/

the maintenance and/or repair of the automation surround them, and where needed, briefed on human-only tasks in emergency situations.

D-2. Production & Logistics

When it comes to the product manufacturing itself, it is necessary to consider the transformation process of input materials into final products, and beyond that how these products are eventually distributed via various channels into the market and into the hands of clients and customers. This is especially complex because approaches like just-in-time production, which optimises for high throughput but low idle inventory, requires a seamless and smooth-running post-production supply chain to fully realise the efficiency benefits. Here, technological advances can easily provide many benefits.

D-2A. Machining, Production & Assembly

Manufacturing in the past often featured repetitive, tedious and even dangerous activities, and these tasks are increasingly being automated. The benefits from automation are not just increased efficiency and productivity, but also higher safety and flexibility. Cyber-physical systems like industrial robotics and 3D printing are getting cheaper, safer and often work in tandem with human tasks rather than completely independently[381]. In the future, production will become even more agile and customisable – requiring even more flexibility in a way that would challenge typical mass manufacturing paradigms. The following technologies are expected to play a role[382,383,384]:

- Heavy-duty industrial robotics for dangerous and high speed activities;
- Autonomous ground vehicles (driverless trolleys) to transport items for point to point without human supervision;
- Modular equipment that allows production to be flexible for customisation – for example, products may be designed to be assembled from smaller building blocks that may be arranged in various configurations instead of machined as a single artefact, or robotic arms may have switchable end-effectors depending on the requirements;
- Supervisory control and data acquisition (SCADA) systems and human-machine interfaces providing rich monitoring data for operations analysts;
- Industrial equipment may be custom-made on-demand for specialised tooling;
- Industrial cobots on the factory floor assisting humans on an ad-hoc basis; these robots may be “trained” on the fly with no programming required, performing tasks like drilling, sorting and packaging;
- Lights-out manufacturing where humans are not even needed to be present, and the machines don’t necessarily need lights or even heating/cooling;

381 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/

382 PwC analysis incorporating multiple expert sources

383 Autodesk. (2018). Autodesk Generative Design. Retrieved October 15, 2018, from https://www.autodesk.com/solutions/generative-design/manufacturing

384 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/

- Smaller and targeted batch production going hand-in-hand with hyper-personalised business models;
- High density of embedded sensors to recreate “digital twins” of the manufacturing environment;
- Augmented reality headsets to provide situational awareness and on-demand information in a hands-free manner;
- 3D printing (additive manufacturing) for custom designs, especially “no assembly required”;
- Computer Numerical Control (CNC) machines for automated subtractive manufacturing;
- Computer vision to spot defects;
- Algorithmic design that can generate substitute shapes with the same material and mechanical properties but less material usage overall;
- Exoskeleton support for humans working with heavy loads or repetitive tasks;
- Predictive maintenance to minimize downtime;
- Cybersecurity to preserve integrity of processes and prevent sabotage.

Implications for learning content: the production lines of the future will include less manual labour and more emphasis on speed, customisation and flexibility. Workers will regularly interface with real-time data visualisations and complex software on a variety of devices, while also switching frequently to performing some manual tasks. Workers on the factory floor will generally have more supervisory roles to guide automation. There is also a significant risk of cybersecurity threats in an increasingly digitized factory, and workers will need to be aware if not capable of preventing and dealing with various scenarios of cyberattacks.

Given the expected high robot density, workers will require training on how to work alongside “silver collar” workers, i.e. automation and AI[385]. This is not just a question of establishing familiarity but also vital for safety and quality reasons. Workers should be able to critically analyse inputs and outputs coming from digitised processes with a view on what machines are good at and where they are likely to fail. Management would also require training to manage expectations of productivity – even if machine increased speed and decrease errors in individual automated processes, the overall flow may still be bottlenecked by upstream/downstream human activities. Modular manufacturing also requires better planning.

Moreover, there are cultural aspects to learning to work with automation and AI. Unconscious biases like “uncanny valley” have been reported – wherein artificial objects that imitate lifelike behaviour may induce revulsion rather than fascination – and can be expected in an increasingly digitised factory setting as well[386]. As such, curriculum should instil a deeper sense of familiarity towards intelligent machines.

385 Kayser, H., Ey, M., Gerdemann, P., Kuz, S., Muller, J., Navrade, F., Sayed, M. (2017). Accelerating Labour Market Transformation. Retrieved October 15, 2018, from http://www.g20-insights.org/policy_briefs/accelerating-labour-market-transformation/

386 The Economist. (2012). Mapping the uncanny valley. Retrieved October 15, 2018, from https://www.economist.com/science-and-technology/2012/07/21/mapping-the-uncanny-valley

D-2B. Supply Chain Management

Products are increasingly complex requiring thousands of parts and components, each sourced from a multitude of suppliers. Moreover, finished products are also distributed internationally in various quantities and volumes with high frequency. Keeping track of this complexity is crucial to reduce risks, and anticipate bottlenecks. Hence, technology is increasingly entering the supply chain management aspect of manufacturing. Here are some examples of how technology may be incorporated[387,388,389]:

- Complex, real-time and unified ERP systems to manage inputs and outputs across thousands of suppliers, vendors, partners and clients;
- IoT tags, sensors and systems for tagging and tracking shipments;
- Blockchains to preserve provenance and process information on shipments across the value chain, from raw materials to finished products (and beyond), in a tamper-proof way;
- Payment technologies to facilitate secure and frictionless clearing and settlements;
- Predictive analytics to anticipate and resolve bottlenecks;
- Artificial intelligence and advanced analytics to assist in decision making, automate geospatial routing and optimise for emissions reduction;
- Robotic process automation for automatically handling “paperwork” alongside physical movement of shipments;
- End-to-end transparency in supply chain through digitisation;
- Decentralised supply chains;
- Cybersecurity to preserve integrity and prevent sabotage.

Implications for learning content: the opportunities for digitisation within the supply chain domain are plenty, with obvious benefits. Employees will increasingly need to interface with multiple platforms to track and maintain proper information flows alongside product flows. As such, employees should be able to work with data and have analytical capabilities to make data-driven decisions. More than that, workers will benefit from data analytics experience to realise more structural efficiency gains. Employees should also be trained and equipped with the know-how to identify and realise quick wins in terms of value-adding information capture. As sustainability and emissions reduction become increasingly important, workers will require the skills and autonomy to identify and implement measures to maximise efficiency. Finally, supply chain is also a key area where cyberattacks are likely, and at least a portion of the workforce should be trained to anticipate, prevent and/or deal with cybersecurity issues.

387 PwC analysis incorporating multiple expert sources
388 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/
389 Pettey, C. (2018). Gartner Top 8 Supply Chain Technology Trends for 2018. Retrieved October 15, 2018, from https://www.gartner.com/smarterwithgartner/gartner-top-8-supply-chain-technology-trends-for-2018/

D-2C. Warehousing & Transport

Once finished products exit the production line, they are either being transported or temporarily warehoused before reaching customers. The speed of storage and recall is critical, and the growing emphasis on emissions reduction requires new technologies like electric mobility and optimised routing. The following are examples of how technologies are impacting the warehousing and transportation processes[390,391,392]:

- Lights-out warehousing where there is no need for humans to store and retrieve items;
- Robotics for tasks like picking, sorting and palletising;
- IoT tags, sensors and systems for tagging and tracking shipments;
- Electric mobility to reduce net emissions from transportation;
- Autonomous vehicles within warehouses and on the roads to ultimately remove the need for humans to simply transport items from point to point;
- Real-time data visualisation to track shipments precisely and accurately;
- Decentralised and last-mile deliveries via drone;
- Automated scanning and recording of items using computer vision;
- Augmented reality headsets to provide situational awareness and relevant information in a hands-free manner;
- Exoskeletons to assist workers in repetitive or dangerous tasks;
- Artificial intelligence and advanced analytics to assist in decision making, automate geospatial routing and optimise for emissions reduction;
- Blockchain for tamper-proof recording of provenance and transit information in compliance with international border crossing requirements;
- Scheduling and sharing warehouses and/or fleets to minimise costs and risks.

Implications for learning content: workers will increasingly work with real-time data platforms and have to be trained in making critical and analytical data-driven decisions. Within warehouses, workers will require training and familiarity to work alongside automation. Safety training will also be important in this fast-moving environment.

D-3. Monitoring & Control

As the manufacturing environment gets increasingly digitised, there will be a proliferation of sensors and data streams with the primary objective being to monitor

390 PwC analysis incorporating multiple expert sources
391 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/
392 RCS Logistics. (n.d.). Seven Ways in Which Technology Has Shaped the Warehousing and Distribution Industry. Retrieved October 15, 2018, from http://www.rcslogistics.co.uk/blog-and-news/7-ways-technology-has-haped-the-warehousing-and-distribution-industry/1273

and control critical variables in real-time. Doing so will not only enhance efficiency and productivity, but also quality, safety and compliance.

D-3A. Operations, Maintenance & Continuous Improvement

Enterprises of the future will be complex cyber-physical entities with only minimal need for human intervention. The goal according to lean manufacturing is to reach 100% Overall Equipment Effectiveness (OEE) – which is a measure of actual performance against theoretical production capacity[393]. For reference, the average factory has an OEE of about 60% whereas world-class manufacturing sites have an OEE of close to 85%[394]. Therefore, optimising this metric can best be achieved by incorporating more technology in the manufacturing environment, such as[395,396]:

- High density of IoT sensors and actuators combined with real-time synthesis of data streams to create “digital twins”;
- Manufacturing process simulations to optimise production volume and anticipate bottlenecks;
- Enhancing worker productivity and minimising errors using augmented reality headsets to provide situational awareness and hands-free relevant information on-demand;
- Automated scanning and recording of items using computer vision;
- Predictive maintenance to minimize downtime;
- Connected manufacturing equipment that “talk to one another”;
- Supervisory control and data acquisition (SCADA) systems and human-machine interfaces providing rich monitoring data for operations analysts;
- Edge intelligence providing decentralised decision-making and automation potential based on incoming sensor data; saves data bandwidth and may reduce cyberattack exposure;
- Cybersecurity to preserve integrity and prevent sabotage;
- Blockchains for tamper-proof logging of machine and sensor data;
- Advanced data analytics for optimisation and continuous improvement.

Implications for learning content: as workers perform less manual labour in digitised factories, this area will require more manpower to perform – aided by custom software and Artificial Intelligence. Workers involved in these processes must be trained in advanced data analytics and processing of big data. They must also be comfortable with working with both hardware and software (IoT sensors, cameras, computer vision algorithms, cloud machine learning, blockchain etc.) to generate positive outcomes.

393 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/
394 *Ibid*.
395 PwC analysis incorporating multiple expert sources
396 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/

Finally, this is a critical area that will potentially be exposed to cyberattacks so workers must be trained in cybersecurity hygiene, detection and response.

D-3B. Quality, Risk & Compliance

As workplaces become digitised, quality assurance will increasingly be embedded in codebases. Moreover, robotics and automation may remove risks such as those due to human error, while introducing new risks to be assessed and managed such as those stemming from equipment malfunction or cyberattacks. Moreover, digitised manufacturing environments have the opportunity to embed compliance specifications within the codebase. One of the biggest benefits from digitising the manufacturing environment will be increased transparency not only for enterprises and regulators, but also ultimately to clients and consumers as well. Technology may be incorporated in the following ways[397,398,399]:

- High density of IoT sensors and actuators combined with real-time synthesis of data streams to create “digital twins”;
- Predictive maintenance to minimize downtime and prevent accidents;
- Blockchains for tamper-proof logging of machine and sensor data;
- Cybersecurity to preserve integrity and prevent sabotage;
- Real-time quality control as opposed to post hoc quality checks;
- Risk assessment and management simplified by connected equipment and data streams to directly process and evaluate performance data.

Implications for learning content: workers involved in these processes must be trained in advanced data analytics and processing of Big Data. If involved with the installation and implementation of codebase and equipment responsible for production, they must also be trained in context of cybersecurity by design, and be able to output clean and readable code as well test, find and fix potential bugs – as their input is critical for the workplace (and potential customers) to achieve zero incidents and zero defects.

D-3C. Health, Safety & Environment

Not only can automation reduce the need for humans being exposed to unsafe or dangerous activities/environments, technology can also actively reduce and prevent injuries or casualties across the workplace. Moreover, human safety is paramount not just within the fences of the factory, but also the wider public. In this context, technology can also support environmental monitoring and process by-products to minimise downstream health effects. The following list provides examples of how technology may be incorporated in this area[400,401]:

397 PwC analysis incorporating multiple expert sources
398 CBInsights. (2018). Future Factory: How Technology Is Transforming Manufacturing. Retrieved October 15, 2018, from https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/
399 Pilgrim Quality. (2018). Smart Quality Management: The Impact of Industry 4.0 on QMS. Retrieved October 15, 2018, from http://blog.pilgrimquality.com/smart-quality-management-impact-industry/
400 PwC analysis incorporating multiple expert sources
401 Minturn, A. (2017). Safety first: How Industry 4.0 can optimise safety. Retrieved October 15, 2018, from http://www.controlengeurope.com/article/133867/Safety-first--How-Industry-4-0-can-optimise-safety.aspx

- Augmented reality headsets to provide situational awareness and relevant information in a hands-free manner;
- Virtual reality and immersive simulations to train workers on critical actions to undertake in emergency scenarios;
- Exoskeletons to assist workers in repetitive or dangerous tasks;
- Collaborative mobile robots (or cobots) to perform repetitive tasks and be trained on-the-fly without programming required;
- Cameras, scanners and other sensors embedded in the production line to provide timely feedback and allowing supervisors to oversee factory remotely;
- High density of IoT sensors and actuators combined with real-time synthesis of data streams to create “digital twins” – with specific features for health and safety;
- Computer vision and Artificial Intelligence to monitor critical areas to prevent accidents (similar to a “traffic policeman”);
- Wearable technologies that can detect level and strain of activity, suggest reminders for proper posture and schedule breaks;
- Environmental sensors monitoring heat, sound, radiation, chemical leaks etc. to alert workers to evacuate when unsafe levels are detected;
- Data-driven and real-time risk assessment allows for strategic as well as tactical safety monitoring;
- Blockchains for tamper-proof logging of machine and sensor data – especially fumes, emissions and composition of waste streams.

Implications for learning content: workers involved in designing or implementing Health, Safety and Environment (HSE) systems must be able to incorporate sensors to detect critical signals, program the require logic to meet or exceed compliance standards and be able to retrieve the data for subsequent analysis. Systems and software should be simple enough for workers on the production line to use without significant changes to their daily routine. Workers should be trained not to tamper with HSE equipment and sensors, and regularly check if the equipment is functioning as intended.

D-4. Emerging Paradigms

The following themes and processes are gaining relevance and popularity, especially in response to the new requirements of the increasingly digitised workplaces. Cyberattacks are a significant risk to any digital infrastructure and can deal severe damage to commercial and industrial value chains without ample cybersecurity to anticipate, detect and mitigate the damage. Products are increasingly augmented with software and intelligence, which subsequently allow products to be supported over the product lifetime via value-adding services – this is known as the Product-Service System paradigm. Enterprises must increasingly incorporate support systems to deliver digital products and services to their customers. Finally, the growing importance of sustainability and circular economy are becoming clear in light of environmental and

ecological threats like climate change. Hence, this is also an area that enterprises must accommodate in future.

D-4A. Cybersecurity

With digital factories featuring hundreds (if not more) of connected equipment, the cyber-exposure is quite high and the potential damage from a breach could be devastating, with many ripple effects in the upstream and downstream supply chain as well[402]. As such, cybersecurity strategies should be implemented ground-up and by design. The goal is to be secure, vigilant and resilient. It is critical to note here that cybersecurity is not just a technological vulnerability and that even the strongest encryption system is vulnerable to human error such as responding to phishing emails or carelessly exposing login details in public. That said, the following technologies can help within the context of a comprehensive cybersecurity strategy[403,404]:

- Blockchains for tamper-proof logging of network connections;
- Real-time network monitoring with artificial intelligence to detect fraudulent behaviour or suspicious activity within the network;
- Extensive ethical hacking and/or bug-testing to minimise cyberattack vulnerabilities;
- Cybersecurity by design specifications for hardware, software and infrastructure deployments; unit and integration testing compulsory;
- Logical decentralisation of equipment and processes to prevent single point of failure;
- Incorporation of techniques like multi-factor authentication, zero-knowledge proofs, differential privacy, advanced biometrics and/or hardware security modules to increase friction for tampering with systems;
- Edge intelligence on air-gapped equipment to prevent remote tampering;
- Secure data storage and deletion; compliant with data privacy regulations.

Implications for learning content: even as manual labour decreases in the workplace, the need for cybersecurity professionals in the Advanced Manufacturing context will increase greatly. Employees involved in cybersecurity must be trained to work closely with other IT and Information Security colleagues. Workers must be well-versed in networking paradigms, ethical hacking, and able to work effectively in a complex real-time environment with multiple devices, software and running processes.

402 Waslo, R., Lewis, T., Hajj, R., & Carton, R. (2017). Industry 4.0 and cybersecurity. Retrieved October 15, 2018, from https://www2.deloitte.com/insights/us/en/focus/industry-4-0/cybersecurity-managing-risk-in-age-of-connected-production.html

403 PwC analysis incorporating multiple expert sources

404 Waslo, R., Lewis, T., Hajj, R., & Carton, R. (2017). Industry 4.0 and cybersecurity. Retrieved October 15, 2018, from https://www2.deloitte.com/insights/us/en/focus/industry-4-0/cybersecurity-managing-risk-in-age-of-connected-production.html

D-4B. Product-Service Systems

Product-Service Systems (PSSs) can be defined as tangible products and intangible services designed and combined so that they jointly fulfil specific customer needs[405]. As an example, the iPhone can be seen as a PSS wherein Apple not only manufactures the hardware device but also supports it extensively with an operating system, updates and an "App Store" such that the device remains usable and valuable for a wide variety of consumers, each using it in different ways for different purposes. Products with associated services not only command a premium and build loyalty; they are also capable of gathering usage data and delivering value-added enhancements to services iteratively. However, it should be noted that delivering a PSS is a strategic move and is intrinsically tied to the (digital) business model of the company. As such, PSS is a promising direction for advanced manufacturing in the context of supporting digital business models, whose data insights feed back into the design of new products in an end-to-end loop. The following are the technological applications that come to bear[406,407]:

- Close integration of hardware and software features and capabilities;
- Usage of data capture and storage; compliance with data privacy regulations;
- Data analytics to identify patterns and personalise services;
- Cybersecurity to maintain integrity and prevent tampering;
- Cloud computing integration for deploying apps and updates;
- Digital customer feedback mechanisms;
- Digital rights management for "timed" or "pay-per-use" actions;
- Digital payments for secure and frictionless service purchases;
- Incorporating new hardware technologies like hardware security modules (HSMs), biometrics, neuromorphic chips etc. to provide user-centric personalised features.

Implications for learning content: to deliver a successful PSS, both hardware and software need to work seamlessly from the customer point of view. This means employees from both the hardware product design and software engineering need to be aligned and working together on a unified product roadmap. Moreover, once the product is manufactured and in the hands of consumers, a significant portion of the workforce will be involved in supporting the software stack and data flows.

D-4C. Sustainability & Circular Economy

According to the IPCC Special Report from October 2018, human-caused carbon emissions are accelerating climate change with potentially severe impacts if this global emissions are not halved by 2030 with the target of reaching and sustaining net-zero

405 Tukker, A. (2004). Eight Types of Product-Service System: Eight Ways to Sustainability? Business Strategy and the Environment, 13. Retrieved from http://sustainelectronics.illinois.edu/NSFworkshop/Reading/Eight_Types_of_Product-Service_System_Eight_Ways_to_Sustainability_Experiences_from_Suspronet.pdf

406 PwC analysis incorporating multiple expert sources

407 Tukker, A. (2004). Eight Types of Product-Service System: Eight Ways to Sustainability? Business Strategy and the Environment

emissions by 2050[408]. In this context, reducing emissions from business, industries activities and the associated value chain would be a critical necessity. Deep application of sustainability within the industrial context would require significant reinvention and optimisation of products, services and processes. Technology can help in this regard[409,410]:

- High density of IoT sensors and actuators combined with real-time synthesis of data streams to create “digital twins” – optimising for efficiency and emissions reductions;
- Artificial Intelligence-enabled energy and material usage optimisation;
- On-demand decentralised manufacturing (enabled by 3D printing for example) to minimise waste and distance travelled;
- Electric mobility to reduce net emissions from transportation – including trucks, ships, trains;
- Powering business and factories with exclusively renewable energy;
- Designing for and extending product lifecycles with better service, support, maintenance and repair;
- Enabling circular economy by designing products for easy dismantling and reuse;
- Designing energy-efficient products and services;
- Technologies for recovering valuable materials and components from existing products;
- Blockchains for tamper-proof recording of provenance, transit, transaction and recovery of products;
- Enabling circular economy by creating a “reverse-logistics” supply chain – where products in the hands of consumers eventually find their way back to the manufacturer to be reused;
- Designing products and services for the sharing economy, supported by digital demand-response platforms;
- Digitising products and services wherever possible – for example streaming media is preferable to manufacturing DVDs and DVD players.

Implications for learning content: the urgent and large-scale need to shift to sustainable production implies that business and industries must consider holistic and fundamental shifts in the manufacturing environment. This coincides with the equally necessary shift to Industry 4.0, and as it happens, digital technologies can be a key

408 Intergovernmental Panel on Climate Change. (2018). Global Warming of 1.5 °C, an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change. Retrieved October 15, 2018, from http://www.ipcc.ch/report/sr15/

409 PwC analysis incorporating multiple expert sources

410 Najouk, N., Le Fleming, H., & Srivatsav, N. (2018). Digital Technology and Sustainability: Positive Mutual Reinforcement. Retrieved October 15, 2018, from https://www.strategy-business.com/article/Digital-Technology-and-Sustainability-Positive-Mutual-Reinforcement?gko=37b5b

enabler for sustainability[411]. Workers and management need to be understand and be motivated to act on sustainability – not only from an economic standpoint but also a moral one.

Moreover, designing for sustainability is an opportunity area to diversify products and services. Consider that the lean methodology is focused on minimising waste in the production cycle perspective; interestingly the circular economy approach is also focused on minimising waste from the product lifecycle perspective. Thus, there is a lot of synergy and potential to be tapped. Workers need to be trained in (and rewarded for) extending the use of software like process simulations, AI optimisation, blockchain etc. to achieve both business, societal and environmental goals (e.g. triple bottom line)[412].

D-5. Customer Centricity

The following themes are relevant to enterprises that offer either/both business-to-business (B2B) and business-to-consumer (B2C) products and services. The client/customer-facing spaces and activities of enterprises will need to increasingly incorporate digital tools and experiences to attract business and deliver positive outcomes. Service Design refers to holistic customer-centric planning and implementation of internal processes so as to deliver distinct experiences to potential clients/customers. Customer Experience refers to the actual operational processes the company performs from the moment clients/customers show interest in products and service offerings of the company to the moment the client/customer relationship is concluded (which may be at the end of a transaction or over a longer period of time). Finally, some enterprises also have to invest in new ways to make the retail/commerce experiences functional, if not memorable, such that they are able to funnel more prospective parties in the target market into actual paying satisfied clients/customers.

D-5A. Service Design

Service Design is increasingly seen as a promising method to distinguish a company from the competition in a competitive market, by designing a holistic customer journey and experience before, during, around and after a product/service interaction such that the overall level of satisfaction that clients/customers feel when working with the company keeps them loyal[413]. Service design requires a commitment to creating a unified experience for users interacting with a product/service, with a strong preference for seamless system-level integration rather than individual component-level excellence. Moreover, the challenge is to find a balance between creating more added value for users while also improving the business case for the product/service. The following technologies may be needed[414]:

- Personalised marketing to attract target customers at the right time and provide the right product/service at the right price;
- In-store digital experiences such as augmented reality helpdesk, product comparison and customisation dashboards;

411 Van den Beukel, J.-W. (2017). Industry 4.0 as an enabler of the Circular Economy: preventing the waste of value and permitting the recovery of value from waste. Retrieved October 15, 2018, from http://pwc.blogs.com/sustainability/2017/06/industry-40-as-an-enabler-of-the-circular-economy.html

412 Kenton W (2019), Triple Bottom Line (TBL), see: https://www.investopedia.com/terms/t/triple-bottom-line.asp

413 Interaction Design Foundation (2018), “What is Service Design?”, see: https://www.interaction-design.org/literature/topics/service-design

414 CBInsights (2019), “Emerging Trends: Retail Trends 2019”, see: https://www.cbinsights.com/research/retail-trends-2019/

- Last-mile delivery of products using autonomous robotics, drones;
- Cloud-connected live help and support for products/services;
- AI-infused products/services that are personalisable and/or customisable;
- Increased number of customer touchpoints both online and offline, made possible through intelligent scaling of digital support services such as chatbots and social portals;
- More integration capabilities with other platforms, products, services and tools that prospective clients/customers may already be using in their day-to-day activities;
- Closer relationships with clients/customers through the product/service interaction lifecycle made possible with tools like Know Your Customer (KYC), Customer Relationship Management (CRM), live/remote systems monitoring etc.;
- Close integration of hardware and software features and capabilities;
- Data analytics to identify patterns and personalise services;
- New tools such as UX/UI design, rapid prototyping and user testing software.

Implications for learning content: to deliver on compelling service design, SMEs must become more familiar with methodologies like Design Thinking and Design Sprints. They must also understand fundamentals of systems thinking and how collaborative relationships between value chain partners can improve client/customer experiences in a more seamless and holistic manner. Finally, a critical part of Service Design is user testing so as to critically test new concepts to see if good ideas translate into actual added value for real users in real world conditions. All of these skills, competences and processes will be required.

D-5B. Customer Experience

Similar to Service Design, a lot of market emphasis is also going into Customer Experience. To a large extent, Service Design and Customer Experience are interrelated; here, Service Design is distinguished as the planning and execution of customer-centric strategies whereas Customer Experience refers to the actual day-to-day operational execution of customer-centricity. Focusing on Customer Experience is increasingly seen as an essential strategic competitive advantage in growing and maintaining revenue growth. As always, new technologies may play a big role in this regard[415]:

- Closer relationships with clients/customers through the product/service interaction lifecycle made possible with tools like Know Your Customer (KYC), Customer Relationship Management (CRM), live/remote systems monitoring etc.;
- Social media engagement, community management and other digital channels for continuous support;

415 Claveria K (2019), “CX expert predictions: 10 trends driving the future of customer experience”, see: https://www.visioncritical.com/blog/cx-expert-predictions

- Cloud-connected live help and customer support for products/services;
- Mobile customer experiences with quick, relevant and contextual value-added services;
- Personalised marketing to attract target customers at the right time and provide the right product/service at the right price;
- In-store digital experiences such as augmented reality helpdesk, product comparison and customisation dashboards;
- Increased number of customer touchpoints both online and offline, made possible through intelligent scaling of digital support services such as chatbots and social portals;
- More integration capabilities with other platforms, products, services and tools that prospective clients/customers may already be using in their day-to-day activities;
- Augmented and virtual reality platforms for on-demand remote client support and engagement; voice and chat based interfaces;
- Usage of data capture, sensor fusion and storage for seamless in-store/product intelligence; compliance with data privacy regulations;
- Digital payments, automated checkout, for seamless payments;
- Subscription services and micro transactions for seamless and continuous product-service systems with continuous improvement and updates.

Implications for learning content: improving on Customer Experience is likely to be an iterative task as every customer/client will have unique problems and demands. This should be seen as an opportunity to endlessly innovate and build more value-add features around core products/services. This requires SMEs to organise modular extensible product-service systems, and utilise all manner of knowledge acquisition methods – from social media to sensor data to user behaviour – to find new methods to innovate while also building a strong sustainable business model. Training would thus be required to become deeply familiar with themes like Agile/Scrum, LEAN innovation, data-driven customer development and continuous development operations.

D-5C. Retail and Commerce

Inevitably, many products and services made by enterprises reach their target market through some form of retail or commerce – be it brick-and-mortar shopfronts or digital e-commerce interface. Hence, this area will see stiff competitive innovation as enterprises vie for customer/client attention to convert interest into sales. Some technologies that might come into play here include[416, 417, 418]:

416 CBInsights (2019), "Emerging Trends: Retail Trends 2019", see: https://www.cbinsights.com/research/retail-trends-2019/
417 Olmez M (2017), "Seamless, Smart and Supercharged: the Future of Commerce", see: https://www.accenture-insights.nl/en-us/articles/seamless-smart-supercharged-future-of-commerce
418 Holbrook T (2018), "The Future of Commerce is Built on These Four Pillars", see: https://www.forbes.com/sites/forbescommunicationscouncil/2018/01/03/the-future-of-commerce-is-built-on-these-four-pillars/

- Experiential and destination retail as brick-and-mortar shopfronts create novel shopping experiences to compete with the convenience of online shopping;
- Pop-up stores that serve as a way to evangelize their brand to a larger audience in-person without committing to a permanent physical footprint;
- Inventory management to ensure that no customers/clients experience product unavailability or delivery delays, which are reported among the most frustrating experiences during shopping;
- Augmented and virtual reality experiences to augment both in-store, online and mobile shopping experiences;
- Visual search for customers to be able to search for items by image/photo even if they do not know the exact descriptive words for the specific product;
- Geofencing to offer in-store personalized experiences;
- Personalised marketing and customer support for online shoppers;
- Chatbots and voice shopping for novel interactive online shopping experiences;
- Autonomous last-mile delivery via drones or other delivery robots;
- Hypercustomisation through made to order additive manufacturing processes;
- Social media influencers and native advertising strategies.

Implications for learning content: to deliver on next-generation retail and commerce experiences, SMEs must 'go where the customers are' and be on all platforms that potential clients/customers are already using. The customer journeys for their products and services also have to be well-integrated with day-to-day operations such that customers receive immediate feedback and support, which will only increase the chances of conversion of interest into sales and continued loyalty. As such, customer attraction, engagement, service and support are all crucial areas to be developed.

D-6. Workplace soft skills

The following themes are relevant for all enterprises to attract talented employees, retain them longer and empower them to innovate new ways to stay relevant in the marketplace. In general, these require enterprises to be more open to change, entrepreneurial, less hierarchical and more interdisciplinary. Innovation will be the primary competitive advantage in the marketplace in the coming decade, and so enterprises have to design their day-to-day operations to not only discover promising new directions but also reliably scale them up with market-ready business models. A key requirement for innovation is inter-disciplinary collaboration, combining skillsets and competences fluidly to find unique competitive advantages where possible. Finally, the changing social norms and demographics of the workforce will require enterprises to formally account for inclusion and diversity, especially if they have not made efforts to do so previously.

D-6A. Innovation

Innovation in an increasingly digital world is made easier by on-demand access to information over the internet, but it creates new challenges such as information overload and analysis paralysis. To be innovative, enterprises have to be able to quickly filter

relevant information for a sea of data, synthesize meaning from disparate atomic insights and adopt a design mind-set that places an emphasis on stakeholders achieving desired outcomes. Another key requirement to take advantage of new digital tools and capabilities is for all employees to be sufficiently familiar with technological/ computational thinking – being able to map inputs to outputs through a series of technical steps depending on the most advanced/efficient tools available for the job. Technology will play a huge role in this[419]:

- Integrating data flows within the company/value chain into strategic decision support dashboards;
- Unifying multiple siloed software systems (customer relationship management, supply chain, logistics, payroll etc.) into a unified system architecture for leaner management;
- Effective knowledge management tools to better capture valuable insights, share them with relevant personnel at the right time and retain these insights over time;
- Achieving agility through open backbone to quickly connect with other digital services in the ecosystem;
- Being able to develop hardware/software concepts and rapid prototypes in sandbox environments;
- Protect intellectual property and prevent data leakage;
- An integrated framework for user testing and feedback to deliver customer-centric products and services;
- Design tools such as UX/UI design software for prototyping and testing;
- Quick and continuous learning via MOOCs, OER and online communities of practice.

Implications for learning content: enterprises will need to use online and digital tools to build new products and services that are relevant to customers/clients who are also working with a multitude of online and digital tools. New information may come from a number of sources, and not every new idea will necessarily lead to a successful new product or service – and yet enterprises that do not have the attitude or the internal processes to be able to quickly generate ideas, test them and funnel the most promising ones into production are likely to fall behind. As such, practical methodologies for continuous innovation alongside day-to-day business operations are a must.

D-6B. Collaboration

Closely connected with the theme of innovation in the digital world is collaboration. It is only because of digital collaboration tools that information is able to be shared both within enterprises and across the world at unprecedented speed. Moreover, new

419 Viswanathan K (2017), “The strategic role of technology in enterprise agility”, see: https://programmablebusiness.com/the-strategic-role-of-technology-in-enterprise-agility-e6f36f26b1d1

collaboration tools allow enterprises to quickly learn, share and apply new ideas more easily than ever before. Technologies that accelerate collaboration include[420]:

- Digital project management including scheduling, billing, and remote team synchronisation functionalities;
- Integrated chat apps that connect across departments and a host of industry-standard software to create a one-stop hub for intra-company communication;
- Digital Kanban boards for coordinating Agile/Scrum ways of working;
- A host of video-conferencing and document-sharing services for quick on-demand team communication;
- Mobile communication for anytime anywhere access.

Implications for learning content: enterprises (both employers and employees) have to become extremely familiar with the new capabilities offered by collaboration software as they do unlock significant productivity benefits. Moreover, there are several etiquette and practices that are uniquely relevant to working remotely or virtually, which have to be learned. Finally, collaboration with different profiles also requires enterprises to be less hierarchical and more transdisciplinary in their approach. Team members should be able to share ideas with one another even if some in the team do not have the same expertise, but equally team members should be able to receive new information from outside their domain and be able to apply it within the context of their domain.

D-6C. Inclusion and Diversity

As demographic changes occur in broader society and the workforce, social norms and expectations are also changing alongside. As such, there are increasing calls for diversity and inclusion. Not only are they beneficial for enterprises, they are also increasingly necessary because diverse perspectives allow enterprises to identify new opportunities and solve them in interesting new ways[421]. However, it is not simply a matter to deciding to hire differently, and changes cannot be seen overnight[422]. Technology can help in this regard[423, 424]:

- AI techniques such as natural language processing to identify/remove bias in hiring decisions;
- Diversity and cross-cultural competency trainings for company staff via online training delivery methods;

420 Fearn N, McCaskill S, Turner B (2019), “Best online collaboration tools of 2019”, see: https://www.techradar.com/best/best-online-collaboration-tools
421 Deloitte Review (2018), “The diversity and inclusion revolution: Eight powerful truths”, see: https://www2.deloitte.com/content/dam/insights/us/articles/4209_Diversity-and-inclusion-revolution/DI_Diversity-and-inclusion-revolution.pdf
422 Wittenberg A (2017), “Diversity is hard work and requires rethinking”, see: https://www.digitalistmag.com/future-of-work/2017/08/01/diversity-is-hard-work-requires-rethinking-05256439
423 *Ibid*.
424 Deloitte Review (2018), “The diversity and inclusion revolution: Eight powerful truths”, see: https://www2.deloitte.com/content/dam/insights/us/articles/4209_Diversity-and-inclusion-revolution/DI_Diversity-and-inclusion-revolution.pdf

- Collaboration software with nudges and reminders to push for diversity and inclusion within teams;
- Using data analytic methods to evaluate employee performance (e.g. metrics tied directly to anonymized customer/client feedback) such that promotion and pay are not affected by implicit biases;
- Using social intelligence and geofencing tracking to understand intra-company information flows and optimising for diversity and inclusion;
- Using democratising tools to ensure more participative decision-making;
- Using human capital analytics to identify leaks in the talent lifecycle, and tracking success metrics in diversity and inclusion policies.

Implications for learning content: enterprises need to deeply internalise the intrinsic benefits of diversity and inclusion so that they see it not just as a mandatory standard or arbitrary goals to be met, but also as a strategically beneficial element of a successful company. Moreover, a diverse workforce will also require cross-cultural sensitivity. In general, this is also a good opportunity to invest in social intelligence skills – which will also have a lot of overlap with collaboration-related skills. Finally, diversity and inclusion within the company can also been seen as a way to better understand and serve the real world needs of an increasingly heterogeneous society and as such, even products and service offerings would need to be localised or designed with relevant cultural affordances.

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