



COMPASS: addressing the challenge of Digital Skills skilling from the Regional Ecosystem Perspective

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ABSTRACT

This is a position paper presenting the scenario and main conditionings that delimit approaching the technological and digital (re/up)skilling problem by also enhancing the role of the university as a regional ecosystem key player. This is the main objective of COMPASS, an initiative initiated to face actual challenges on the labour market related to the digital skills mismatch. COMPASS goal can be stated as the development of a regional ecosystem-based training platform and associated methodologies for effective and efficient skilling pathways. COMPASS as a guiding tool is conceived to a) guide individuals and companies to get a closer idea of the skills-gap they need to cover, as well as to b) help universities as training providers to elaborate their offer on the basis of the detected regional needs. This will definitively help to make the overall ecosystem more efficient. On the other hand, COMPASS is also conceived as a learning & training environment, in the sense of a) dynamic micro-learning environment providing easy and mobile interaction between the learners and the content and b) micro-credential system linked to the achieved skills.

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1 INTRODUCTION

Today we are experiencing what has come to be called the Fourth Industrial Revolution or Industry 4.0, in which digitalisation is one of its most important pillars, while at the same time we are on the verge of a green transition towards a decarbonised and environmentally friendly economy. This is the so called Twin Transition to a green and digital economy firmly grounded in the objectives of the European Green Deal. Digitalisation can go further than is currently planned by facilitating the shift to a more sustainable production. Technologies such as blockchain, automation, machine learning, additive manufacturing, digital design, digital twins allow additional degrees of freedom for designers and engineers to create products that emit less CO₂ during their manufacturing phase, use (and re-use), and more value creation across the whole value chain, including wide based manufacturers. This twin transition is imposing urgent challenges to individuals and companies that need to face nowadays on the labour market. However, are companies prepared for this twin transition? What enablers they need? These facts, jointly with the COVID-19 pandemic have put a renewed focus on the core question: What will be the future of work, workers and workplaces? [1]

In this communication we present the drivers that motivated out university to face the technological and digital (re/up)skilling problem, specifically for adult population, as well as the conception of COMPASS as a platform to enhance the role of the university as key player on its regional ecosystem. On that respect, COMPASS, an initiative lead by the university but with the engagement of different societal players. Main purpose is to face some of the needs society 4.0 is facing for adult learning specially with respect to the engineering education related to technology and digital skills. Those needs are basically related to the skills needed to surf the Twin Transition; for an appropriate career guidance as well as an effective and efficient upskilling & reskilling formation offer. Career guidance can facilitate re-employment by identifying new job opportunities and proposing relevant training. However, coordination of the many actors involved in such career guidance is a challenge. Career guidance is a fundamental policy lever to help adults successfully navigate a constantly evolving labour market through advice and information on job and training opportunities. Most adults who do not train say that there was no training offer that they wanted to take up. This may reflect a lack of understanding of the importance of training in today's labour market, or difficulties in identifying suitable training opportunities. The concept of adult himself is changing, who are today's decision makers and voters sustaining or influencing change in Europe. Their knowledge, capacity and learning build the groundwork to address the urgency of recovery, to decrease the burden for next generations and to pave the way to the future that Europe anticipates.

The rest of the communication is intended to present the elements that constitute the scenario as well as the proposal approach for the COMPASS platform. The scenario includes considerations about the future-proof education, the role of the universities

and the considerations about a platform for appropriate reskilling/upskilling. Finally the components of COMPASS are presented. It is worth to say that in its actual stage, COMPASS is a project under development that is focused on the digital skills

FUTURE-PROOF EDUCATION

One of the indisputable consequences of the covid19 pandemic crisis is the acceleration of changes that were on the agenda of almost all universities but remained at the horizon. The crisis has motivated an urgency for teaching online and this has brought new ways of teaching and learning, look for innovative uses and new ideas with respect to the adoption of technology as a key educational tool. Much of those changes have proven to be really useful and will definitively stay as the crisis is remitting. Therefore, modernizing the on-campus learning.

The mass adoption of technology has clear benefits, as it will allow universities to reach more people, provide new communication channels and the use of a wide variety of educational resources. However, personalization and human interaction are important, too. Those are key aspects to consider when looking for a future-proof education.

In his communication *on a European strategy for universities* (Strasbourg, 18.1.2022),^[2] the European Commission clearly delivers the message that Universities have to adapt to the rapidly evolving situation regarding skill needs: *The green and digital transitions require future-proof education, research and innovation, in close cooperation with the related industries and stakeholders and the significant disparities in digital skills across the EU must be overcome.* Therefore, universities need to be put at work to tackle those needs as a societal challenge. The reference to future-proof education is not a minor issue and introduces some considerations (constraints?) to highlight for universities to face educational needs for the coming future. So whatever the adopted solution, the educational approaches should take into consideration:

- **Embrace technology:** The adoption of technology has made possible the continued delivery of education even the challenging situation we faced during the last two years. This fact has led digital transformation of educational tasks at an incredible pace. Among them, the hybrid learning approach has opened new doors and made students' expectations to grow because of added flexibility.
- **Optimize human interaction:** Even technology provides means for a distance learning of improved quality, it is needed to put special attention to the added value of student and teacher meet face to face and spent time together, interacting. This time window should be focused on probing questions, look into student understanding, finding areas needing more clarity and having meaningful discussions and dialogue. Students can use recorded videos. Those are now a well-established resource (widely used, for example,



in the flipped classroom approach). They can review it at their own pace, on an asynchronous way, but they will not completely replace in-person time

- **Personalize content:** The use of online learning based on Learning management systems (LMS) either as a complement to presential on-campus education, hybrid-based approaches or on full on-line education, constitutes an unprecedented opportunity to use data analytics to understand individual learning and to tailor education for that learning. This allows learning and content to be adapted to evolve with the learner much more quickly. The use of interactive elements such as polls or questions, with informed, tailored personalized support can accelerate learning. As data reveals content that students find most challenging, the lecturer, tutors, and teaching algorithms can focus instruction in these key areas to improve learning outcomes.
- **Reach more people:** This has been one of the clear benefits the adoption of technology has put on the table during the pandemic crisis: being able to reach larger audiences than on pure presential formats. There is no discussion on this. The world's population is shifting, internationalisation is increasing, and in a closer future, our students will be coming from different places than they are now. We expect to see increasing demand for higher education from students in places such as India and Africa and it is becoming much easier to reach those students and make further learning more equitable.

All the presented factors, put on the shelf considerations that should be taken into account when designing training and learning approaches. Specifically for specific targets such are, in this case, adult people. Therefore, by combining our use of technology, optimizing our human interactions and personalizing our instruction will allow us to stay relevant and in demand through the changes ahead.

2 THE ROLE OF UNIVERSITIES

Future jobs will be more diverse, demanding, flexible. There will be more entrepreneurs and more people working in small and medium size enterprises. This complex future is driven by the new roles that will be (in fact are being) created by the Fourth Industrial Revolution, shifts in the global economy and industrial transitions towards sustainability. Those shifts are the drivers for the EU Skilling Agenda. How will University prepare himself for this complex future? Whatever will be the adopted strategy, there is no doubt in that this preparation will need to take place in coexistence with the complex world to which people is being prepared for. What is the role of university in this new ecosystem? [3]

There are clear positionings at governance level that points the central role of higher education systems in this new panorama. The World Economic Forum, The World Economic Forum launched in 2021 the *Reskilling Revolution* [4], an initiative to provide people with better education, skills and jobs by 2030. The scheme aims to future-proof workers from technological change and help economies by providing new skills for the Fourth Industrial Revolution. This is reinforced by the European

Higher Education Area (EHEA) Rome Communiqué 2020 [5] that has already brought reskilling and upskilling to the forefront of the debate on changing the tertiary educational offer. This excerpt from the EHEA Rome Communiqué is a clear statement of this positioning “*higher education institutions have the potential to drive major change – improving the knowledge, skills and competences of students and society to contribute to sustainability, environmental protection and other crucial objectives. They must prepare learners to become active, critical and responsible citizens and offer lifelong learning opportunities to support them in their societal role.*”

The report *Upskilling for Shared Prosperity* [6] finds that dual vocational training systems are particularly effective in emerging and developing countries – by combining theory and training embedded in a real-life work environment. Despite these encouraging trends, the global education and training sector remains fragmented and would benefit significantly from the emergence of a more comprehensively interconnected ecosystem.

The previous situation is reflecting the starting point of a changing higher education landscape where some fundamental questions, not appeared nor raised before, are appearing. With this perspective in mind, learning demand is shifting to a fundamentally new paradigm. What is the best way of tackling this uncertain and complex future is a question with no answer. However, for these situations it is worth to devise plausible scenarios that stimulate university leaders to formulate appropriate questions, to analyse global trends and detect opportunities and threats. There will be the need for a continuous criticism regarding the resilience of current strategies regarding new patterns and emerging trends.

One of the clear positionings that the University should redefine himself is that of collaboration with local or regional social, cultural and economic stakeholders. This is usually seen less significant than research or international collaboration. Too often also, about associating university with the world of work. There is therefore the need for a shift in perspective from the university governance with regard to the societal compromise of the university. This applies specially for what matters to lifelong learning for adult people when we refer to technology and digital skills.

3 MICROLEARNING AND SKILLING PLATFORM CONSIDERATIONS

The constant and rapid evolution of knowledge, specially within the technological domains, requires workers to adapt to this new context in order to maintain their productivity. Therefore, increase opportunities within a new more dynamic labour market. Micro-learning comes into play to facilitate this process to potential learners by breaking down new concepts into small fragments or pills of content, also called micro-content. These small learning units are given to learners progressively and in a way that is suited to them [7].

The combination of several factors has stimulated the development and the positive reception of the micro-learning paradigm: i) the human capacity to stay focused on a single item, avoiding distraction and inattention, has decreased; ii) very quick changes in all areas, especially in technology, have resulted in workers needing to



update their training constantly; and iii) traditional training is not proving to be a good method to train workers effectively and efficiently.

In any case, offering adequate environments that can be totally integrated into the working processes is not a trivial aspect. An inappropriate training environment may result in high drop-out rates. This is clearly reflected in the use of MOOCs (Massive Open Online Courses) as a complement to daily work activity, with more than 90% of dropouts in this context, due to a range of reasons [7]. Accessibility is the main motivation of many students, who use the platform at their convenience for training without following the guidelines of the course in an exact way. Definitely this puts a very interesting challenge on the table of trainers, specifically at HEI. In fact, the difficulty in designing training content that is adequate for learners is not constrained to the field of continuous training for adults/employees, but it can also be used in other areas such as the university. Therefore, it is clear that the university itself will experiment a clear benefit of dealing with continuous learning as a direct multiplier effect.

These small lesson plans are gradually given to students in a way that is tailored to their needs, with the aid of telematics devices. For those employees who must be trained as an indispensable process in their professional career, micro-learning perfectly fits in by introducing short units of content, usually in audiovisual format, which can be digested in downtimes between activities. According to the main recommendations found in the literature, we consider that each unit of micro-content must be composed of three elements: a brief introduction or description, the development or explanation of the content and a small section to assess knowledge acquisition.

In order to support a micro-learning approach, it is necessary to provide activities and to facilitate the design of adequate training sequences. The Microlearning materials should be able to draw attention to very specific and clear aspects; besides, there should be complementary materials which enable learners to directly participate in their generation, assembling and modification. It is important to find a balance between brief format and complementary information. Finally, it is especially interesting to promote the micro-learning for communities, where materials derived from the training activities themselves are accessible for the student community in a manner that they can serve as a basis for debate, as support material for new activities or simply as a reference to consult.

The composition of micro-content to elaborate or define training sequences requires a system which can provide solutions to store, to locate and to compose micro-content. The cloud computing paradigm fits in perfectly with the concept of micro-learning, since if the latter is characterized by the use of brief educational resources upon request, the cloud computing paradigm is also supported by the flexible use of resources (hardware, software, storage, computation, etc.) whose amount dynamically varies depending on what is needed at each particular moment. Consequently, the application of this paradigm to the provision of micro-learning environments can be considered as a natural evolution from the first platforms based

on web environments, which would allow the availability of storage, backup services and computer services, elastically provided depending on the needs at each moment, and at a more affordable cost.

There is a wide range of options when deploying a micro-learning platform. In spite of the difficulties they must face, some proposals have proved successful in this context. The appearing of some commercial solutions providing the explicit characteristics that, especially for corporate training, workers do need because of the difficulty of combining training and their normal work. On the other side, Universities do conduct formal education lying on Learning Management Systems (such as Moodle, edX, etc). Those environments where not initially been designed to support the features needed to develop, manage and deploy micro-content and implement micro-learning solutions.

At this point is where a hybrid solution comes into the table to be explored. In a similar way such as formal education is not considered an appropriate option for the corporate context, a hybrid approach that combines formal training, work experience and informal training has proven to be effective, why not to analyse an integration of micro-learning activities in traditional distance learning frameworks?

The advantages of using an existing learning platform include (i) familiarity with the environment on the part of both technicians and professors, (ii) a range of tools to manage users, profiles, permissions documents, etc. and (iii) continuous updates and improvements in terms of security and functionality.

There are however some of the essential features of micro-learning that deal with the interaction between the learners and the content. This needs further analysis and, probably, some developments. For example, since one of the relevant aspects of micro-learning is the active participation of learners in the process of co-creation and distribution of micro-content there is the need to ensure the environment is providing the mechanisms to allow both students and professors to have a more collaborative role in the creation and learning processes.

4 METHODOLOGY

From the methodological point of view, COMPASS as a skills guiding tool will be elaborated incorporating regional ecosystem activity, sector-based skills taxonomy and introducing technological trends as a source for pointing at the near future needs. Therefore, the tool is conceived from the regional ecosystem detected needs and from a transnational point of view for what matters to implementation of the learning platform. This approach will foster expertise synergies among EU HEI that will collaborate in the joint micro-learning offering. The development is conceived in terms of the following steps and activities.

4.1 Skills Taxonomy

Methodological approach to skills characterization in the technological, digital and green domains from a taxonomical point of view. This encompasses some steps forward in the characterization of skills. The elaboration of a detailed skills taxonomy

is intended to allow for a statistical monitoring of brain circulation and to establish a set of indicators to allow monitoring and statistical analysis of training needs to properly redefine current offer. For example, defining a taxonomy of skills for the green transition, which will allow the statistical monitoring of the greening of our professions. This skills taxonomy should be developed jointly with the complicity of the regional ecosystem. Therefore, regional industry associations have been contacted and will take part on the skills taxonomy definition. This is a key point because the establishment, denomination and definition of the skills should be understood from both sides of the equation, academy and potential recipients.

4.2 IT Tool for Skills Taxonomy Management and Data Gathering

This IT tool is intended to feed a database defined in terms of the previous taxonomy. The data will be collected from the regional ecosystem and will provide a data base to enable decision making regarding training offers. The fact of facing training offers in terms of a skills-based approach will enable new pathways to employment by allowing a more tailored training offer in terms of the detected gaps (actual skills map, technological trends, regional job market, etc)

4.3 Ecosystem Engagement

Once the Skills Taxonomy is established and the IT tool for management implemented, ecosystem engagement will be worked out by means, for example, of a series of sessions organised by umbrella associations and joining companies, work placements, regional governments, adult organisations, etc. Main purpose is to present the faced problem on career guidance as well as the prospective for the COMPASS tool will be presented. These sessions will contribute to elaborate a radiography of the skills status of a region/economic area/company/etc. Allowing for trends in economy and technology to be introduced, skills gaps will also be reflected, and skilling pathways based on similarity profile.

4.4 Elaboration of the Career Guidance tool

This career guidance tool will be elaborate to operate on the skills taxonomy database that reflects the state of the region. On the basis of actual challenges, desired skills, individuals as well as companies can test their position with respect to the needed skills. The detected gap will suggest the most appropriate training. As per the university concern, what is relevant is the picture of the detected skill gaps at regional level. This should drive the university on what is the more suitable offer on lifelong learning if it has to impact on the region.

5 COMPASS CONCEPTION

COMPASS is conceived as the development of a regional ecosystem-based training platform and associated methodologies for effective and efficient upskilling and reskilling.

COMPASS as a platform is conceived as integrated by two key elements: a) skills guiding tool and b) a dynamic micro-learning based training offer. COMPASS as a skills guiding tool will be elaborated incorporating industrial activity, sector-based skills taxonomy and introducing technological trends as a source for pointing at the near future needs. COMPASS guiding tool is conceived to:

- Guide individuals and companies to get a closer idea of the skills-gap they need to cover.
- Help universities as training providers to elaborate their offer on the basis of the detected regional needs. This will definitively make the overall ecosystem more efficient.
- Provide a skills monitoring dashboard to facilitate a dynamic micro-learning based offer to cover the actual and forecasted needs.

On the other hand, COMPASS as a micro-learning based training environment:

- Dynamic micro-learning environment providing easy and mobile interaction between the learners and the content.
- Micro-credential system linked to the achieved skills.
- Incorporation of a challenge based system to help drive the learning pathway to the appropriate micro-modules

The tool is conceived from the regional industrial ecosystem detected needs and from a transnational point of view for what matters to implementation of the learning platform. This approach will foster expertise synergies among EU HEI that will collaborate in the joint micro-learning offering.

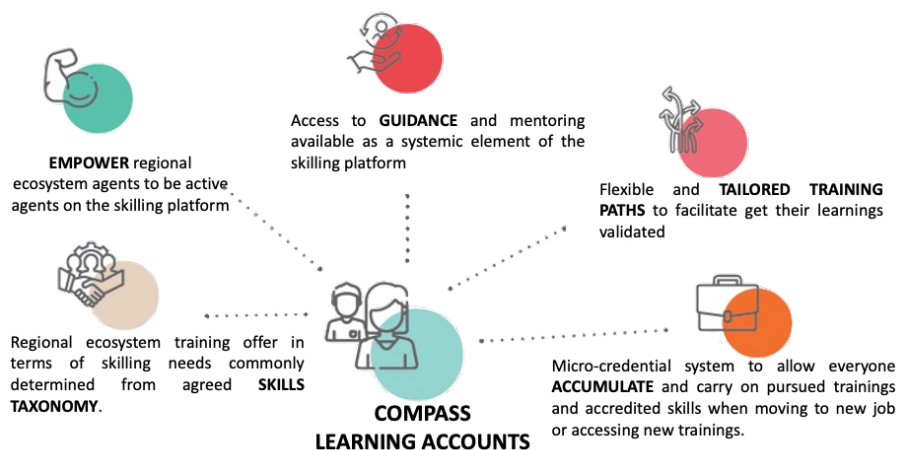


Fig. 1. COMPASS

6 SUMMARY AND ACKNOWLEDGMENTS

This communication has presented the scenario that drives an higher education institution to be involved into the training activities oriented to increase the labour effectiveness of the surrounding ecosystem. The settings are the ones linked to the COMPASS initiative that is focused on the technological, digital and green skills. The overall picture has been presented and the key role universitie should play into those regional ecosystems highlighted. The point of introducing a shift into the perspective of better valorising education in front of just doing research will by sure have a mid-long term impact on a more global level.

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