The need, practice, and values of micro-credentials in the academic and business sector

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Industry 4.0 - the new order that reflects today's technological reality has only opened the "infinite Universe" of various possibilities and satisfaction of practical and business needs, so that the challenges in this sphere still exist, both in terms of improving and increasing the overall system of micro-credentials. Such changes have undoubtedly opened new industry sectors and professional disciplines and created some professions in more specific subspecialties, creating a greater need for continuous upskilling and improvement.

Micro-credentials as a modern concept of designing an educational-practical mix of knowledge and skills strengthens competitiveness in every industry and business environment. The concept of Micro-credentials also means setting up an adequate number of courses, practical skills within the academic and business community, or institutions that are accredited to combine such practical trainings, without having to invest in an expensive long-term educational and teaching process. Some typical examples of micro-credentials can be find in inter-modal domains as well as to acquired knowledge in ICT, digital entrepreneurship, digital marketing, data analytics, finance, corporate planning etc.

Micro-credentials can also play an active role and support the professional development and mobility of workers, including people in non-standard forms of work, such as those in the platform economy (all economic activity arising out of actual or intended commercial transactions in the internal market and facilitated directly or indirectly by online platforms, in particular online - intermediation services and online search engines), and who may have difficulties accessing training depending on their work status.

In that regard, the institutions in the EU give an appropriate place to the concept of micro-credentials. According to the EU recommendation, the support is aimed to the development, implementation, and recognition of micro-credentials across institutions, businesses, sectors, and borders. An effective culture of lifelong learning is key to ensuring that everyone has the knowledge, skills, and competences they need to thrive in their personal and professional lives.

The aim of this paper is to explain key concepts and provide description and specific position of the micro-credentials in academic and business sector as a stackable certification and a flexible way to address the demand for continuous learning and the need for agile, targeted education and skills development in response to rapidly changing job requirements and employability.

Keywords: Industry 4.0, new digital era, micro-credentials, skills anticipation, digital skills, digital business practices

1. Introduction

Today, the Fourth Industrial Revolution (4IR or Industry 4.0) is characterized by the consolidation of current automated machines, robotics, artificial intelligence based on the highest degree of digital technology and intelligent computer systems. The creation of artificial neural networks fed with huge amounts of data has allowed these computer systems to master even the most complex tasks. Artificial intelligence is all around us, from self-driving cars and drones to virtual assistants and software that translate or invest. The possibilities of billions of people connected by mobile devices, with unprecedented processing power, storage capacity, and access to knowledge, are unlimited.

Modern growing technology and digitization in all spheres of the business environment have forced industries to move at a fast pace. In some way, it inevitably affects the sphere of the labour market, changes in the academic community and social and educational policies in each country.

There is an increasing demand for workers with increasingly nuanced skill sets to match the needs of industry and emerging jobs. To meet these demands, we need a faster and more dynamic form of knowledge, learning and specialized skills that can respond to the needs of the business sector in the 21st century. Education, as a millennial mark of civilizational development, must undergo certain changes, to adapt to new business positions, artificial intelligence, interdisciplinary approach, and the speed of changes that the industries direct.

The needs for new occupations imposed by the digital age (the fourth industrial revolution) require educational institutions and various training centres to take care of the different individual needs, abilities, and capacities that the business community demands.
Also, they should offer learning opportunities to different categories of people, including in formal and informal institutions for a higher degree of effectiveness and flexibility for the business community. That is why the issue of planning, structuring, and implementing micro-credentials arises.

This paper explains the key concepts and provides description about the specific position of the micro-credentials in academic and business sector as a stackable certification and a flexible way to address the demand for continuous learning and the need for agile, targeted education and skills development in response to rapidly changing job requirements and employability. It also tackles the inevitable need for skills anticipation to support the process of design of relevant training programmes on time.

2. What are micro-credentials and why this model for boosting new skills is needed?

The basic question inevitably arises: what are micro-credentials, how can this concept be explained in the simplest way?

Some typical examples of micro-credentials can be acquired knowledge in ICT, digital entrepreneurship, digital marketing, data analytics, finance, corporate planning etc.

Many courses that structure the micro-credential system can be combined with other related or less closely related fields if the industry or competitive environment so warrants. So it's about combined, often collapsible sets of micro-credentials, which will systemically profile valuable skill sets with added value, which will meet the needs of employers.

Such a new and complex systemic approach in the professional-educational ecosystem enables profiled and competitive staff that will respond to the needs of a specific industry, sector or institution.

The concept of Micro-credentials also means setting up an adequate number of courses, practical skills within the academic and business community, or institutions that are accredited to combine such practical trainings, without having to invest in an expensive long-term educational and teaching process. Certain advanced economies are already providing practical examples, not wanting to waste time in certain institutional and bureaucratic procedures and offering practical concepts of micro-credentials.

Table 1 Main characteristics of traditional and modern qualifications

Traditional qualifications	Modern qualifications
Focused on initial training	Supporting lifelong learning
Determined by providers	Defined by stakeholders
Based on curriculum	Based on learning outcomes
Learning in a set context	Alternative pathways
Used for first job entry	Used for various purposes including job entry, changing jobs, further learning and career change
Focused on young learners	For all types of learners
Mainly vertical progression	Horizontal and vertical progression and mobility

Overseen by a single authority, often led by education ministries	Involve various institutions and stakeholders
Only full qualifications are recognised	Partial recognition (modularisation) is a key principle, including to facilitate the validation of non-formal and informal learning
Obsolete education programs*	The latest technology practices in education
Outdated and traditional perceptions of certain programs without real business application	Cutting edge science, technology and innovation in the business practisses

Source: ETF (2016) Qualification systems: getting organized **[1]**

*[Additions from the authors are also included in the table]

According to this table mentioned above (ETF, 2016, p.27) the findings are directed to that modern qualifications and micro-credentials have several overlapping functions: they are used to promote lifelong learning, enable alternative learning pathways, provide different options for progression, and facilitate the partial recognition and validation of prior learning.

Micro-credential education is not something to be discounted and derided by traditional academia. Knowledge of IT skills, use of advanced databases, calculations in Excel spreadsheets and web design tools are already becoming the established norm. Therefore, the future of academic communities, a combined model of practical and modern knowledge, training and skills with industry must become imperative.

Micro-credentials as a modern concept of designing an educational-practical mix of knowledge and skills strengthens competitiveness in every industry and business environment. System profiling for the needs of a certain industry imposes the need to acquire specific skills, concrete and necessary for the workplace itself. They can be quickly created and adapted to meet the demands of industry, with a high degree of flexibility and fluidity that is unachievable in traditional academic environments. University degrees, as offered when applying for a job position, have long failed to offer the concrete and practical knowledge and skills that an employer is looking for.

Educational institutions and chambers of commerce of certain industries in the USA, Europe and New Zealand are already offering micro-credentials on a larger scale, apostrophizing the importance, practicality and need to bridge the gap of practical application of certain modern advances in curricula and professional skills that are in step with industry needs to promote required professional development. The Institute of Internal Auditors in Australia recognizes and provides micro-credentials to demonstrate specific knowledge or skill set recognised by the industry. As an Internal Auditor, earning a micro-credential is the best way to showcase your earned knowledge to your professional network.

According to the Institute of Internal Auditors in Australia,[2] Micro-credentials are defined as the "industry-recognised demonstration of a skill or a competency".

Micro-credentials are one of the fastest-growing industry-recognised certificates. They are tailored short courses, industry-recognised, assessments-driven, and readily accessible to learners.

The National Micro-credentials Framework defines a micro-credential as "a certification of assessed learning or competency, with a minimum volume of learning of one hour and less

than an AQF award qualification, that is additional, alternate, complementary to or a component part of an AQF award qualification."

Some companies have gone a step further and even offer free micro-credentials.

Micro-letters of credit have become popular for some of the following reasons:[3]

- The digital and circular economy requires a professional, multidisciplinary and diverse approach to work
- Dynamic modern industries require nuanced skills
- Certain online learning courses lack practical tangibility and applicability of acquired knowledge
- Increased costs for higher education, outdated curricula, study programs that do not always fulfil the student with what he must master
- Increasingly, examples show that university degrees no longer guarantee a secure job.

As Desmarchelier [4] indicated the international micro-credential landscape is a multidimensional hotch-potch of credentials, providers, and platforms. The type of organisation or institution producing the micro-credential has a profound impact on the positioning of educative aims for micro-credentials .

During the COVID-19 pandemic, micro-credentialing has demonstrated its potential to contribute to public good in several ways. The flexibility to develop and offer this type of learning meant it could be quickly leveraged to provide up-to-date knowledge and skills for workers to increase their employability in a time of economic uncertainty. In some arenas, micro-credentialing has been at the heart of COVID-19 responses and contributed to providing safer workplaces.[5]

The consequences of the COVID-19 Pandemic accelerated the need for changes in certain processes in the academic and business environment. There was a need for workers to improve and retrain. Rather than posing a "moral hazard," we would argue that microcredit would allow universities to respond quickly to the changing educational needs of workers rather than merely offering full degrees that may not be economically viable or personally desirable for individuals. Indeed, one of the cited motivations for developing the micro-credential marketplace in Australia is to address "the most common barriers cited by adult workers who are not intending to undertake further formal training or study: time and cost."[6]

Micro-credentials - sometimes known in certain academic and business circles as nanodegrees, digital badges or mandated degrees - recognize the achievement of new digital skills, but also entrepreneurial knowledge or a combined set of skills required by industry, professional associations, chambers or the contemporary community.

They are often nuanced by several professional domains that provide an excellent opportunity to delve into the essential problems of each industry or conceptual project in a specific activity.

3. Micro-credentials as modern academic tools to new knowledge and competitiveness

A flexible approach, an expert and well-designed practical model, aimed at helping young people to develop the practical skills, competences and knowledge they need for their personal and professional development, play a major role in the implementation of the micro-credentials policy.

Some micro-credentials deal with broad and specific professional topics that are in demand in the labour market, such as digital leadership, corporate management, or teamwork, but most

are focused on a specific skill. You can get micro-credentials for "digital (hard) skills" such as data analysis, coding; or "soft skills" such as communication, critical thinking or even creativity.

Unlike traditional degrees or academic certificates, micro-credentials are designed to meet very specific industry needs. They are also usually quite short, requiring several hours of professional training (e.g. 1 to 10 hours) to complete the basic skills required by the industry. Just for comparison, online short courses typically take about 6 weeks to complete and still fall short in terms of the practical skill set needed in a particular industry.

Micro-accreditations are already widely used in many education and training sectors, professions, and labour markets. The aim of the Commission's proposal is to establish a European approach that provides a common definition of micro-credentials, ensures common standards, and improves recognition across borders. Micro-credentials can support targeted, flexible upgrading and retraining to meet new and emerging needs in society and the labour market. Given their flexibility, they can be designed and delivered by different providers in many different settings.

Micro-credentials can be used as part of targeted measures to support activation and inclusion in the labour market: they are for everyone, regardless of age, gender, level of education or previous employment.

Therefore, the proposal of the Commission and the relevant bodies in charge of this issue are aimed at a well-thought-out policy of functioning, a defined model and temporal harmonization of the applicability of micro-credentials across institutions, businesses, and sectors.

To that end, Member States should agree on:

- ➤ a common definition of micro-credentials;
- ➤ standard elements for their description; and
- ➤ key principles for their design and issuance.

At the numerous meetings of the Council on the initiative of the European universities, conclusions were reached on: [**7**]

- ➤ Bridging higher education, research, innovation and society;
- ➤ Paving the way for a new dimension in European higher education [**8**] stress that "although not deviating from and undermining the core principle of full degree programmes, micro-credentials could help widen learning opportunities to accommodate non-traditional learners and the demand for new skills in the labour market;
- ➤ make the learning experience more flexible and modular; support access to higher education; and
- ➤ engage learners, regardless of their previous qualifications or backgrounds, promoting reskilling and upskilling opportunities, while ensuring quality education".

It is significant to note that the Ministers for Education of the European Higher Education Area committed in the Rome Communiqué of the inter-governmental Bologna Process [**9**] to help their higher education institutions to:

- ➤ diversify their learning offer;
- ➤ innovate in educational content and modes of delivery;
- ➤ support the professional development and mobility of workers, including people in non-standard forms of work, such as those in the platform economy.

The notion of the online platform economy should be understood to cover all economic activity arising out of actual or intended commercial transactions in the internal market and facilitated directly or indirectly by online platforms, in particular, online intermediation services and online search engines". [**10**]

One of the main challenges facing European businesses and employers is the insufficient and inadequate supply of relevant skills in the labour market of the Union countries. At the same time, workers face certain changes in the way work is organized, which affect the competitiveness of the European economy. In addition, job profiles and skill requirements are fundamentally changing due to digital skills, environmental standards, and the circular economy.

These smaller units can help learners to develop or update their cultural, professional, and transversal skills and competencies at various stages in their lives. Cooperation under the Bologna Process will explore how, and to what extent, these smaller, flexible units of learning – including those leading to micro-credentials – can be defined, developed, implemented, and recognized by using common tools. In addition to full degree programs, and while preserving their right to design study programs and to regulate questions of credit transfer independently, many higher education institutions offer or plan to offer smaller units of learning.

4. Industry 4.0 as an essential need to encourage micro-credentials

The concept of daily and endless changes brought about by the Industry 4.0 is best captured in Schwab, K. (2016) words: The Fourth Industrial Revolution, finally, will change not only what we do but also who we are. It will affect our identity and all the issues associated with it: our sense of privacy, our notions of ownership, our consumption patterns, the time we devote to work and leisure, and how we develop our careers, cultivate our skills, meet people, and nurture relationships. It is already changing our health and leading to a "quantified" self, and sooner than we think it may lead to human augmentation. The list is endless because it is bound only by our imagination.
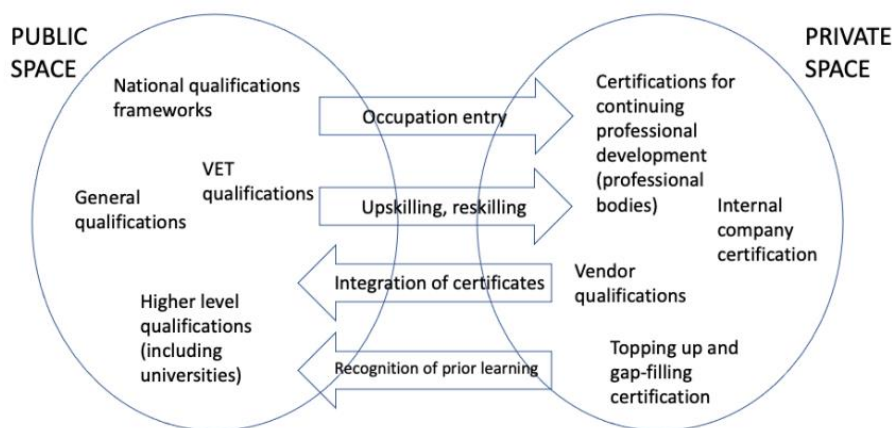

Figure 1 Micro-credentials in public and private spaces
Source: Cedefop. **[11]**

The fourth industrial revolution - the new order that reflects today's technological reality, brought with it numerous structural changes, from an economic, social and societal dimension where the use of micro-credentials has grown in both public and private spaces. These changes are a daily feature of changes in the labour market, digitization of products and services, automation in technological processes and stages, artificial intelligence, robotics, the

Internet of Things, the frequent appearance of autonomous vehicles on highways, 3D printing, nanotechnology, biotechnology, materials science.

Industry 4.0 has only opened the "infinite Universe" of various possibilities and satisfaction of practical and business needs, so that the challenges in this sphere still exist, both in terms of improving and increasing the overall system of micro-credentials. Such changes have undoubtedly opened new industry sectors and professional disciplines and created some professions in more specific subspecialties, creating a greater need for continuous upskilling and improvement. Such dynamism and digital variability are undoubtedly reflected as an essential need in changes in teaching and learning, as well as in the needs of the labour market. The use of micro-credentials has increased both in the public and in the private space. Such profiling is observed both quantitatively and qualitatively, that is, through the number of different types of letters of credit that are used.

The anticipation of the skills that will be required by the new IR 4.0 technologies is important factor for on-time creation of training programs that will be required for upskilling and reskilling of the existing and future workforce. The acceleration of this process will mitigate the skills mismatch and contribute to the supply of workforce with the appropriate skills to complete the functions and tasks specified by the job positions. And this process needs to be accompanied with appropriate micro-credentials tool, to facilitate the professional development of the workforce. Micro-credentials can help create a pipeline of skilled workers, reducing the skills gap (skills mismatch) and ensuring that there are sufficient number of qualified individuals to meet industry demands i.e. the demands imposed by the new technologies. Most of the micro-credentials must be developed in collaboration with industry experts or organizations. The outcome of this collaboration is that the skills and knowledge acquired are directly applicable to current industry needs.

5. What is the perspective and benefit for micro-credentials?

Universities, as civilizational temples of knowledge and proven educational centres, have provided the basic need for knowledge for millennia. They are now institutionally well positioned to meet the demand for necessary micro-credentials, if they can make a real collaboration with relevant business companies, but also to make a symbiosis of the necessary knowledge in their study programs.

Micro-credentials represent part of a global shift toward the ways we can equitably access life-long and life-wide learning, flexibly upskill, and reskill, choose our own learning journeys and pathways, and shorten the time required to achieve our specific learning goals. Scanning the headlines of global publications and websites would suggest that micro-credentials have taken professional and higher education by storm.[12] The metaphor mentioned that at the heart of the storm is the disruption and significant disruption and separation of traditional forms of education. Therefore, it is considered that the very upgrading of educational and professional skills through the micro-credential model will pave the way to a new landscape of higher and professional education that will likely continue to develop based on the demand of the institutional and business sectors.

Cote and White [13] highlight some of the key pain points of traditional education that micro-credentials have potential to address:
  ➤ The long duration of study (and thus commitment);
  ➤ The relative inflexibility of programs that are more configured toward institutional, rather than learner needs;
  ➤ Often inadequate recognition of prior learning;

- ➢ Slow or limited innovation in pedagogy;
- ➢ Insufficient and opaque approaches to supporting students for career-readiness;
- ➢ Often weak alignments with the current and future workforce needs;
- ➢ The reluctance to commit to online and digitally-enabled learning.

According to Steel C., Louder J. & Drager Y. **[14]** micro-credentials can be offered with much more flexibility for learners, workers, businesses and industries.

- ➢ The duration can be short;
- ➢ They can often be commenced at any time, often online, and at a time that suits the learner;
- ➢ They can offer 'just-in-time' or 'on-demand' learning—for individuals seeking to reskill or upskill in specific areas and achieve specific career goals and shifts;
- ➢ They can be designed to recognize and certify prior learning;
- ➢ Pedagogical innovation is still emerging—but could arguably be applied quite quickly;
- ➢ They are often targeted toward specific career skills, knowledge and capabilities based on industry and workforce needs;
- ➢ While they can be offered online, face-to-face or in hybrid modalities—there is a distinctly 'digital' aspect to micro-credentials—especially when it comes to badging and verifying achievement;

According to Marentič & Mustar [**15**], main benefits and added value for end users differ according to specific user group:

(a) for individuals (employees, unemployed, students) they offer an opportunity to up-skill or re-skill for improving their employability, personal development, active ageing in the digital age, active citizenship ... etc., with emphasis on obtaining occupational specific and transversal skills through lifelong learning;

b) for employers they present a way to empower their employees with specialised in-depth knowledge in order to successfully adapt flexibly on changing technological environments and current needs;

(c) for education providers they enable the flexibilization and individualisation of learning paths, promote lifelong learning and widen education offer in the education and training market.

The Committee for Development of Australia (CEDA) is pushing for more Government funding into lifelong learning and education, so that "new, shorter and more modular forms of learning and reskilling" can be offered. [**16**]

In that regard, the institutions in the EU give an appropriate place to the concept of micro-credentials. Within Europe, a growing number of people need to update and improve their knowledge, skills and competences to fill the gap between their formal education and training and the needs of a fast-changing society and labour market.[**17**]

Namely, on 16 June 2022, the Council of the European Union (EU) adopted a Recommendation on a European approach to micro-credentials for lifelong learning and employability. The Recommendation seeks to support the development, implementation, and recognition of micro-credentials across institutions, businesses, sectors and borders. An effective culture of lifelong learning is key to ensuring that everyone has the knowledge, skills, and competences they need to thrive in their personal and professional lives.

To achieve joint successes in the field of competitiveness and the acquisition of the necessary knowledge and skills, the Member States and the Union work towards developing a coordinated strategy for employment and in particular for the promotion of a qualified, trained and adaptable workforce, as well as labour markets that are future-oriented and responsive to economic changes." Continuous improvement of knowledge in different areas, interdisciplinarity and retraining are essential for workers to respond to the needs of their

current job or to move to new jobs and to expand new business sectors, such as the green and digital sectors, especially in context of demographic aging trend.

The future, prosperity and competitiveness of EU countries is mainly focused on the following issues: [**18**]

1. How can Europe reach the Digital Decade goals regarding digital skills, bearing in mind the reality that training, especially for people who have already completed their initial education, often requires too much time and financial resources, and
2. Is therefore not available to everyone?

In order to be able to build an appropriate strategy to achieve the planned goals, two new proposals adopted by the European Commission (on December 10, 2021) were given: to solve the problem and to guarantee that Europeans are able to improve their digital (and not only) competences and that they are able at the same time to be validated, the two proposals adopted today for Individual Learning Accounts (ILAs) and micro-credentials will help address these challenges by opening up more opportunities for people to find learning offers and opportunities for employment. But what are individual learning accounts and micro-credentials?

Competent institutions and professional bodies in the EU confirm the applicability results of the Micro-credentials. They point out that hands-on learning experience (e.g. a short course or training) can be of valuable value to the relevant industry, shortening the time for appropriate profiling and yielding the right results.

We can bear in mind that micro-credentials represent part of a global shift toward the ways we can equitably access life-long and life-wide learning, flexibly upskill, and reskill, choose our own learning journeys and pathways, and shorten the time required to achieve our specific learning goals, without which no business practice today can function at a globally competitive level.

Conclusion

We live in a world of technological revolution that has fundamentally changed the way we live, work and connect with each other, anywhere on the globe.

In its scale, scope and complexity, the business transformation of each activity "pulsates" with great speed and dynamism, and the knowledge and skills for "new business needs" cannot be satisfied by traditional academic and professional profiling as before.

Industry 4.0 has only opened the "infinite Universe" of various possibilities and satisfaction of practical and business needs, so that the challenges in this sphere still exist, both in terms of improving and increasing the overall system of micro-credentials. If the 21st century is the age of knowledge, then the application of the micro-credentials model exactly justifies this axiom. Micro-credentials offer a flexible, advanced way to help people develop their knowledge, skills and competencies, introducing them to new digital tools they need for their personal and professional development.

Micro-credentials are already widely used in many education and training sectors, professions, and labour markets. They can support sectoral, targeted, flexible upgrading and retraining to meet new and emerging needs in society and the labour market. Given their flexibility, they can be designed and delivered by different providers in many different settings. Micro-credentials can be used as part of the targeted measures of any government policy to support activation and inclusion in the labour market: they are for everyone, regardless of age, employment, or level of education.

Educational institutions and chambers of commerce of certain industries in the USA, Europe and New Zealand are already offering micro-credentials on a larger scale, apostrophizing the importance, practicality and need to bridge the gap of practical application of certain modern advances in curricula and professional skills that are in step with industry needs to promote required professional development.

The European Commission and the relevant institutions are constantly working on certain regulations and forms to simplify the way and form for the application of micro-credentials as common standards that will raise the competitiveness of the European economy.

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