



REALISING THE SCOPE OF OPEN EDUCATION THROUGH CREDENTIALISATION

Report on Intellectual Output 5



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This project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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Co-funded by the
Erasmus+ Programme
of the European Union



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Executive Summary

Europe is undergoing a massive societal transformation against a backdrop of tremendous technological, economic and geo-political changes. The rapidly evolving demographics, digital technology advancements and imminent threats such as rising social disparity, global financial disruptions and the climate crisis are some of the significant drivers of these changes. The future is uncertain and hard to predict, but it is crucial to prepare for it. Education will be the key that will aid society in navigating these murky waters. However, it needs to charter a new course to deal with new problems. The higher education sector has undergone significant changes over the last few decades, and continuous efforts are ongoing that reflect the urge to propose adequate reforms. The open education movement has been one of the key focus areas for transformation in keeping with the changing nature of how and when information is absorbed. Unfortunately, most institutions and higher ed organisations firmly focus on handling the day to day issues they encounter in the management of their institutions while the strategic planning horizon remains limited to three to five years.

In this paper, we take a bold step forward and make an attempt at discerning the bigger picture in the long-term scenario when it comes to the changing nature of education. The goal of this paper is to conceptualise the effect of open education recognition on the overall higher education landscape by creating a future history i.e., the evolution from present conditions to one of several futures. These scenarios are the result of a combination of qualitative approaches including diligent desk research and outcomes from discussions during two expert workshops. The workshops focused on future foresight and scenario development exercises among experts and stakeholders from the field of education as well as educational technology from all across Europe. The results of this study are firstly, identification of key driving forces that affect the future of open education through credentialization and secondly, a forecast of five potential future scenarios, including predicting their probability, defining and projecting key measures that can have a great impact, and finally, mapping them to policy recommendations.

Why Focus on Recognition of Open Education?

Open education resources (OER) were the breakthrough that served as the beacon for the discussion surrounding the mainstream adoption of open education practices in traditional higher education during the final years of the 20th century. Two decades later, the United Nations has identified 41 actions to mainstream open-licensed resources to achieve the 2030 Sustainable Development Goal 4 on “quality and lifelong education”. Within the context of Europe, there have been several enabling factors that have led to an increased emphasis on adoption of open learning practices. Almost universal internet access and an easy access to OERs created within or outside the institutional purview has generated a certain willingness towards accepting open learning as part of a formal, non-formal or informal education. It has been argued by opponents of the human capital theory that the value of competences/skills does not remain the same over time, highlighting the importance of the continuous need to update one’s skills in accordance with the principles of lifelong learning. This need to acquire continually new skills has also been driven by the rapid advancement in various fields, be it science, sociology or ICT (Information and Communication Technology). In fact, the role of

ICT in enabling open learning practices has been monumental in reducing the entry barriers, allowing for personalisation of learning pathways and facilitating the possibility of knowledge sharing without borders, among others. Another reason for the need of continuous re-skilling is the prevalent issue of skill shortage and mismatch not just within Europe but globally (OECD, 2017). The advancement in digital technology such as machine learning and artificial intelligence has put many jobs at a risk of being automated (Nedelkoska and Quintini, 2018). Open education has been recognised for its potential to overcome such challenges by giving the learners ability and access to a new method of obtaining knowledge and skills in a personalised way as per their changing needs. The possibilities are endless.

Despite the immense interest shown by academia, private sector as well as the educational governing bodies over the last few years, the formal recognition of open learning remains one of the major barriers for widespread adoption of open learning. There are currently very few mechanisms in place to conduct a thorough recognition of learning undertaken outside the traditional university system in a way that leads to formal accreditation and henceforth, credentialization. As open education evolves in terms of teaching and learning, it is important to consider the role of credentialing, especially when institutional practices regarding it are not clearly defined or standardised. As our world shifts from an industrial society to a knowledge based society, we can ignore the need to evolve the current higher education practices at our own collective peril.

Foresight and Scenario Building

As a result of the qualitative desk research conducted for this publication, the first section identifies the key driving forces that have the ability to shape the future of education through credentialisation in the near future. Global trends such as shifting geopolitical clout of rising economies, data capitalism leading to asymmetric distribution of power, rising life expectancy resulting in the need of more skilled labour, rapid digitalisation and societal shifts towards diverse workplaces have been identified as significant enablers for change. Keeping these mega trends in mind, the next section develops five scenarios, predicting how possible futures of open education through credentialisation could look like. While two of the scenarios foresee a fully open and a fully closed higher education scenario, the other three scenarios are hybrid in nature, with varying emphasis on standards, collaboration and quality degrees, respectively. This section also positions the five scenarios with respect to the driving forces that allows to assess what pushes each scenario in one direction (towards a more open system) or the other (keeping the status quo of a more closed system). The next section goes into the intricacies of these five scenarios, exploring the current initiatives that are indicative of their probability and further defining and projecting key measures that can lead to their realisation. Finally, it provides policy recommendations and matches them to each scenario.

Scenario building exercises aim to create probable forecasts by understanding and isolating different variables and underlying assumptions as well as impacts. However, the ultimate goal here is to activate mental vision boards and create a blueprint of a strategy for the future. The future is not singular and knowing where certain aspects are heading in the long run might just do the trick. Future research is complex and can best be explained as an attempt to understand the relationships between 'possible, probable, and preferable' futures (Bell, 1997).

1. Introduction

“The future is inherently unpredictable, because it is always in the making” (OECD, 2019). What education will look like in 2030 can hardly be anticipated today. Since there is no certainty, when we talk about the future of open education through credentialisation, we have to consider not just one future, but several possible futures. New ideas of learning emerge, such as FutureLearn’s Common Microcredential Framework (FutureLearn 2020) and Harvard University’s *60-Year Curriculum Initiative*, implying continuous learning beyond the current higher education degree. Philipp Schmidt from MIT Media Lab anticipates that the future of credentialisation will look like the following:

“We will all have a wallet in our phone where we collect all the credentials...throughout our lives. And we are in full control on how we share them with employers, other universities, who get to verify them” (Schmidt in an interview with *(Hochschulforum Digitalisierung, 2019a)*).

As this quote implies, lifelong learning will most likely become the norm across society in the future. This is not to neglect that currently people already retrain, participate in workshops and keep on learning every day throughout their life. However, certain key driving forces that will be addressed more in-depth later in this paper showcase that by 2030 the need for lifelong learning will have become much more dominant than today. This poses questions, such as: How will the learners of the future gain and prove their skills? Will there be any restrictions or will education be fully open? Micro-credentials have the potential to provide answers to these challenges. As part of the ERASMUS+ project OEPass, this paper aims at assessing the future of open education through credentialisation by highlighting developments that are likely to take place until 2030.

1.1 About OEPass

The OEPass project intends to address the challenges preventing official recognition of learning via Open Educational Resources (OER) and suggests creating a standard format for describing open education and virtual mobility experiences in terms of ECTS which:

- Addresses common criticisms (lack of trust) of open education, in particular with respect to student assessment and identity authentication;
- Is scalable to hundreds or thousands of students through automatic issuing and verification of certificates;
- Can capture a wide range of non-formal and formal open education experiences.

1.1.1 Definitions, scope and outlook of this paper

For the purpose of the paper, the definition of an educational credential is:

“A credential, in its most essential form, is a statement awarded from one party to another describing the latter’s qualities. Credentials are used for the purpose of proving to a third party that the holder qualifies for something. An educational credential is typically awarded by a

responsible and authorized body that attests that an individual has achieved specific learning outcomes or attained a defined level of knowledge or skill relative to a given standard” (Camilleri & Rampelt, 2018; Hickey, Everhart, Ganzglass, Casilli, & Muramats, 2016).

A micro-credential is a “sub-unit of a credential or credentials (could be micro, meso, mini, etc.) that could accumulate into a larger credentials or be part of a portfolio” (MicroHE, 2020).

As outlined in a previous OEPass paper, educational credentials may be formal qualifications, non-formal certificates, recognition of skills and/or records of experience (Camilleri & Rampelt, 2018).

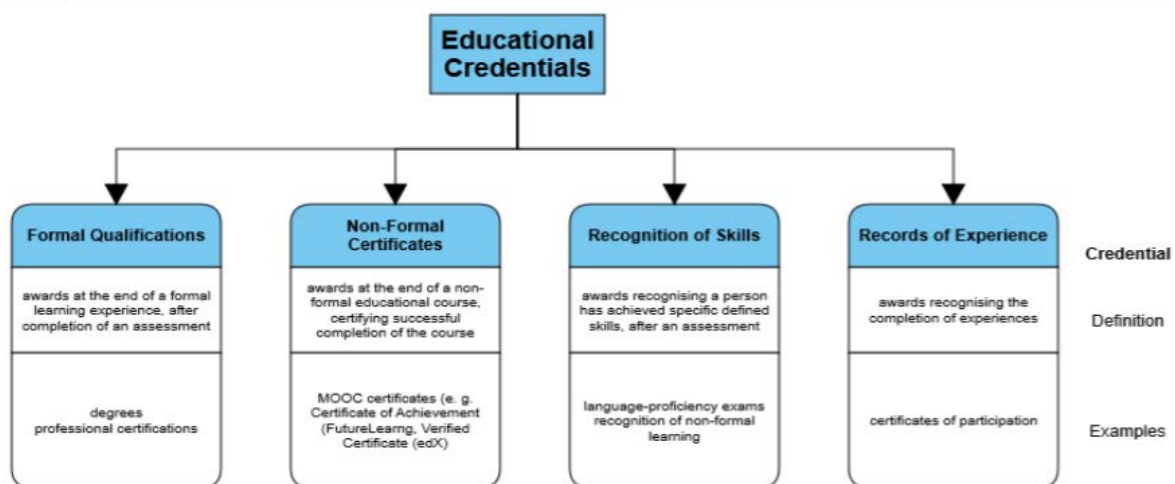


Figure 1: Educational Credentials (OEPass project, Camilleri & Rampelt, 2018).

As done for previous analyses of the OEPass project, the analysis of this report focuses on

- 1) formal recognition in higher education,
- 2) formal recognition in the labour market and
- 3) informal recognition in the labour market.

The elements of a system for open educational credentials include user-held credentials, open standards, open technology, independent verification and open aggregation (Mazar, 2018). While anticipating future scenarios, the analysis was not geographically limited, however, the main focus area was Europe. As the anticipated learner in 2030 will not only go to school, then complete an apprenticeship and/or higher education degree but will engage in lifelong learning, the used terminology is learner instead of student.

1.1.2 Methodology

The results of this paper are based on a set of qualitative approaches. First, a thorough desk research was conducted to identify the key driving forces of open education through credentialisation. Second, the results were matched with data from expert workshops, undertaken as part of the OEPass and MicroHE projects. During the Digital Credentials

Masterclass (24.-25.10.19, Bled, Slovenia), experts from diverse sectors, including policy, technology, pedagogy and institutional strategy, discussed as part of a foresight exercise the future of education through credentialisation (MicroHE 2019). At the Strategies Beyond Borders conference of the Hochschulforum Digitalisierung (9.-10.12.19, Berlin, Germany), a strategy workshop on digital credentials and recognition tested the developed future scenarios with higher education experts (Hochschulforum Digitalisierung, 2019b). The discussions and outcomes of both workshops were then incorporated into the further development of the future scenarios. Future scenario development is part of a foresight methodology that has the aim not to predict possible futures but to question the set of assumptions.

2. The Ecosystem

When assessing current or probabilistic future scenarios of open education through credentialisation, it is important to consider the wider ecosystem. This implies, amongst others, economic variables such as growth; the overall political climate, such as legislative environment; social aspects such as demographics, technology diffusion and proliferation. All these factors may directly or indirectly impact and shape future outcomes. Key drivers important to the future of microcredentialisation will be discussed in the following section. In this context often, reference is made to a strategic triangle composed of students/employees, public and private providers/institutions and the labour market at the ends (BEEHIVES 2018) and degree qualifications and microcredentials placed in the middle (see the MicroHe project). The policy-makers are operating around this triangle.

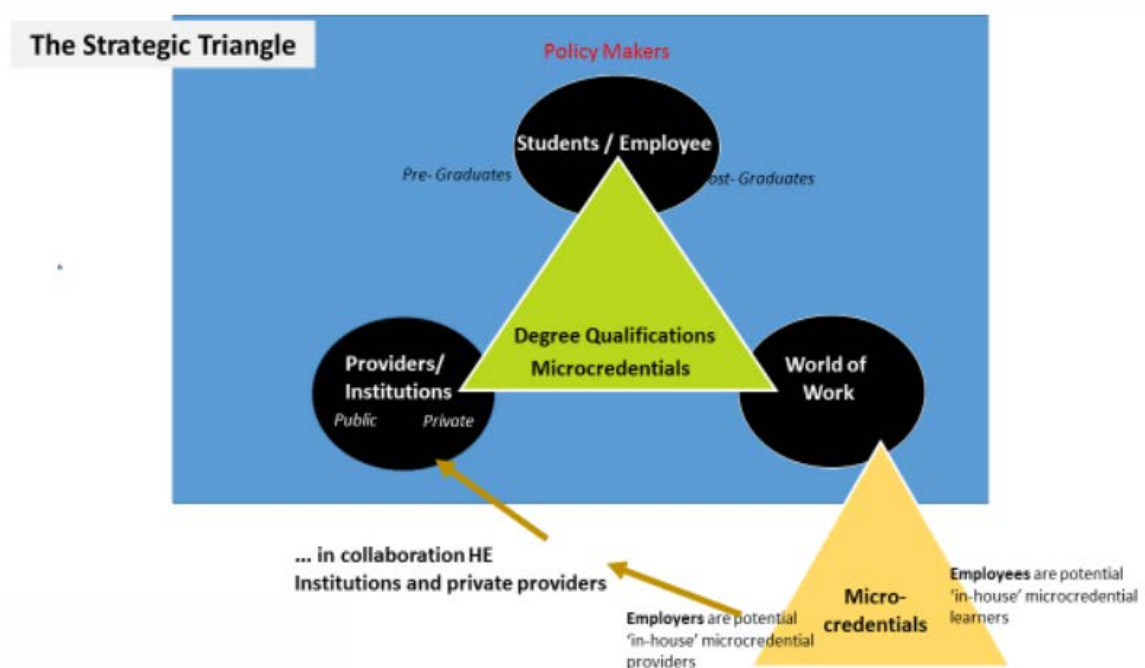


Figure 2: The Strategic Triangle (OEPass Project, MicroHE Project, BEEHIVES 2018, Raimund Hudak).

2.1 Key Driving Forces

A thorough literature analysis identified several key driving forces thought to be important to the future of open education through credentialisation. None of the key driving forces exists in isolation but rather each of them is intertwined, operating in a wider ecosystem.

2.1.1 Global trends

In the recent decades, globalisation has greatly impacted and shaped the development of global societies and non-localised education. The 2019 OECD Trends Shaping Education report identified several system level mega trends that affect the overall future of education with technology transcending all of them. These are 1) Shifting global gravity; 2) Public matters:

Citizenship and democracy; 3) Security in a risky world; 4) Living longer, living better; and 5) Modern cultures (OECD, 2019).

The mega trend “*shifting global gravity*” addresses the shift in economic power towards Asia as well as the increasing interconnectedness around the globe. China and India have been listed among the fastest-growing economies over the recent period. Both have a rapidly growing middle-class. In the future, the global education market is likely to expand further. As we increasingly move towards a hyper-connected world, both physical and virtual learner mobility increasingly becomes common practice. This might also enhance the competition in education across the globe. At the same time, while learner mobility becomes more common practice, educators are confronted with a more heterogeneous learner body, which they have to cater to. While some people take the opportunity to study abroad, others are forced to do so due to, for example, climate-induced migration. Another factor that becomes increasingly important is the role of the public vs. the private sector in the provision of education. Currently, across OECD countries evidence underlines that expansion of investment in R&D expenditure is still predominantly undertaken by the public sector. Yet, for the future, which role will the private sector, such as the Big Five tech companies (Google, Amazon, Facebook, Apple and Microsoft), play in an increasingly globalised world? And how might the private sector specifically impact and change the dynamics of learning and employment (OECD, 2019)?

The addition of new terminology such as ‘fake news and ‘post-truth’ to the public vernacular has given birth to the mega trend “*public matters: Citizenship and democracy*”. This addresses the importance of citizen education when it comes to digital literacy (OECD, 2019). In a global world where an abundance of information is available, questions arise on how to educate learners to filter through the information as well as safeguard democratic principles?

Linked to this, with the rise of tech companies and data being now often referred to as the gold of the 21st century, new opportunities and challenges arise for education. The mega trend “*security in a risky world*” points out that data breaches become more common (OECD, 2019). As education increasingly takes place online, questions arise, such as how do we ensure that learners’ education data is protected?

The mega trend “*living longer, living better*” addresses the rising life expectancy with people working longer, lifelong learning becomes increasingly important (OECD, 2019). The constant need of people to (re)train poses possibilities and challenges to the education system. The AHEAD study confirms these trends with higher education stakeholders anticipating changes by 2030 due to changing needs in knowledge and competence requirements on the labour market and in society in an ever expanding digitalised world (Orr et al., 2019). Responses by experts participating in the Masterclass underlined this by pointing out the move towards a knowledge-based society.

The mega trend “*modern cultures*” stresses changes induced by almost universal access to the internet (at least across OECD countries), increasing women participation in the work force and changing family set ups (OECD, 2019).

All these mega trends underline the need of higher education institutions to become increasingly flexible and adaptable to changes in the wider ecosystem. Experts from the

Masterclass suggested that changes in society, student expectations, and technology will motivate higher education institutions, faculty management and instructors to rethink pedagogy and teaching methods.

2.1.2 Rapidly changing labour market needs

Any citizen in the future has to be able to work in a labour market that has ever more rapidly changing demands. The demand for a higher educated workforce and rapid upskilling will most likely continue to persist in the future. Experts from the Masterclass workshop anticipated that in the next 5-7 years due to changes in demographics, the demand for a higher educated workforce will be larger than the rise in qualification levels.

A knowledge-based society is anticipated. It is often said that the children of today do not know what kind of professions they will hold once they enter the labour market. This necessitates the education system to react and ensure that people have skills that allow them to adjust to constant changes. Further on-the-job training will be increasingly needed. Several studies have been conducted on these so-called future skills or 21st century skills that people need to possess. Here are just a few examples to showcase the overall current discourse on the topic.

According to the Future Skills Framework developed by Stifterverband and McKinsey, the following future skills are needed in the German economy and society, for example (Kircherr et al., 2018): *Technological skills*- to shape transformative technologies; *basic digital skills* - to allow people to play an active role in a digitized world; *classic soft skills* - such as adaptability, creativity and perseverance.

A recent study on future skills based on experts' informed vision of the future of higher education splits future skills into three interrelated dimensions (Ehlers and Kellermann, 2019): *Subject-development related skills* -autonomy, self-initiative, self-management, need/motivation for achievement, personal agility, autonomous learning competence, self-efficacy, tolerance for ambiguity and ability to reflect; *object-related skills* - agility, creativity, digital literacy; *social world/organisation-related skills* - sense-making, future mindset, cooperation competence, communication competence.

Another study focuses on the digitalisation of specifically the European higher education sector and defines the following digital skills 1) basic functional, 2) generic, and 3) using digital technology in empowering and transformative ways (Rampelt, Orr, Knoth, 2019). The study further points out that the changing skills demands inherently also lead to the need of curricula to be constantly reassessed and adjusted.

The future skills sets of the three studies have expected overlaps such as the need for digital skills and creativity. Most importantly, all studies show the importance of possessing a wide range of skills in order to be able to adapt to changing needs. Often, reference is also made to the "T-shaped professional" with in-depth knowledge in one field and system as well as the skills to work across disciplines, contexts and systems.¹ Experts from the Masterclass workshop predicted that in the next 5-7 years, there will be a greater differentiation in job

¹ See for example <https://pubsonline.informs.org/doi/10.1287/serv.2017.0204>

profiles. This raises questions, such as if “traditional” professions as they exist today will still exist or if there will not be any such professions in the future. Possible future scenarios of jobs predict an increase in the importance of 1) higher qualifications for entry level jobs, 2) new academic job profiles, as well as 3) cross- competences. The job hierarchy will likely be less rigid, with more fluid positions emerging.

If professions, as they are today, will still exist in the future, the question is how many profession changes a regular worker will have to undertake during their lifetime. As also addressed above, changes in demographics, in terms of an average longer lifespan and work life, in combination with factors such as increasing uncertainty heighten the likelihood of the need for multiple profession changes.

2.1.3 Digital Transformation

The wider disruption of education through the technological developments has so far brought about new educational tools that provide different ways to obtain new knowledge, skills and competences. New models of education include MOOCs, online and blended learning scenarios as well as experimenting with new technologies to further support existing models. These new models have the potential to allow any learner with access to the internet and a device to learn anywhere, any time independently and tailored to the learner’s study pace.

As digitalisation disrupts the European Higher Education Area, recommendations have been put forward on how to react. For example, the Bologna Digital 2020 white paper suggests that in order to take full advantage of the digital transformation in a sustainable manner, higher education institutions will have to allow for the following (Rampelt, Orr, Knoth, 2019):

- *“Learners need to acquire new skills and competences, which enable them to fully benefit from the ‘digital dividends’ of technology.*
- *Study programmes need to reflect on and react to the developments in society and the labour market.*
- *Higher education institutions should be a place to consider and even practice future social reform, which can truly harness the benefits of digitalisation for all.*
- *The opportunities of digitalisation for creating new learning spaces should be harnessed to improve the accessibility and quality of educational provision.”*

This links to the discussion on future skills as well as the overall global trends discussed above. Further, it specifically pinpoints that higher education institutions have to be active agents in this process to allow for learning environments that are fit for the 21st century. At the same time, with the digital transformation, new education actors arise that allow alternative ways to access knowledge, see for example initiatives by LinkedIn/Microsoft, as well as from MOOC providers.

3. Future scenarios of open education through credentialisation

With consideration of the wider ecosystem that micro-credentials operate in and specifically the above mentioned key driving forces, the question is posed: how do possible futures of open education through credentialisation look like? Based on further discussion during two expert workshops, five possible future scenarios evolved:

1. A wallet in your pocket (fully open)
2. European scenario (hybrid – focus on standards)
3. Fluidity between Higher and Continuing Education (hybrid – focus on collaboration)
4. Higher Education Institutions as credentials clearing house and testing center (hybrid – focus on quality degrees)
5. Higher Education Institutions resist open learning recognition (fully closed)

Each scenario entails an analysis of the levels of the system, the institutions and the learner. Through scenario planning, the aim is to challenge the set assumptions about future developments. The ecosystem is in constant change and thus, this list of scenarios is by no means exhaustive. The aim is to spur discussion on the topic and, by putting forward policy recommendations, to enable stakeholders operating in the system to take measures today in anticipation of future developments.

3.1 Scenario 1: A wallet in your pocket (fully open)

In this scenario, the learner educates him/her-self in a global setting: in the virtual world, on campus as well as at the workplace. Educational degrees are flexible, with tailored educational content and personalised pathways serving the learners' needs. Higher education institutions (HEIs) are no longer the most prominent provider of education - or skills and competencies in general. A wide range of public and private stakeholders operates in this global system, with different global and regional players dominating the market. Most prominently, these regional players come from the Americas, Europe and China. With changing global demographics, English remains the lingua-franca in education, yet this status is being challenged, especially as translation via machine-learning continues to make rapid improvements.

A global decentralised network working with commonly agreed standards jointly maintains a platform of exchange for the different public and private stakeholders acting in the micro-credential ecosystem. This system is characterised by voluntary agreement to, for example, international guidelines. The different stakeholders in this micro-credential ecosystem have established and maintain a system of trust and transparency between them. Labour mobility is eased due to mutual trust of employers in the recognition of obtained micro-credentials from different providers across the globe. This is also safeguarded through the establishment of

new technologies that allow for ownership and better protection of learner's data as well as for different decentralised institutions that ensure quality assurance.

Learners are empowered to take control over their own learning pathways by having the possibility to access a semi-open micro-credential education system. At the same time, the learner bears a responsibility to have enough know-how to assess which modules have to be taken and has to constantly adapt to new environments and a labour market that is no longer defined by set professions, but by rapidly changing, unique sets of skills and competences.

3.1.1 Defining key measures

- With the labour market being defined by competence demand, learners become less attached to a specific degree and move towards acquiring unique special skill sets that prove to be better aligned with the labour market trends. This leads to an increase in self-guided and modular studies (think of Data Scientists as an example). As a consequence to the demands of learners who want to access education from different providers and merge the different elements to a degree, individual educational pathways emerge, to form a kind of “Lego” system with stackable educational models (Orr et al., 2019).
- Globally connected knowledge labs operate across countries and companies. So-called think cells host centres for research and learning.
- Global agreements and consent enable the use of micro-credential documentation standards, quality standards and legal conventions that protect the learner data. On the institutional / provider level, decentralised digital, international and user-centered administrations are established. A focus on digital credential caters for even greater collaboration between HEIs, other education providers, and global or local employers.
- The further development of technical systems, such as blockchain and AI, facilitates recognition and verification in a semi-open system. Technical and legal systems are in place that allow for easy transfer of micro-credentials from the credential provider to the learner. Digital tools are set up to aid in “assessment and reporting of on-balance judgment about a learner and the degree to which they have attained relevant competence (rather than reporting grades reflective only of academic attainment)” (MicroHE 2019). Software solutions help “to support the management of learners’ portfolios, mapped to competencies, which allow showcasing of competence” (MicroHE 2019). Improvements are undertaken to “develop better ways to scaffold peer, employer and self-assessment and evaluation. These methods improve reliability of assessment, support peer learning and develop peer and self-evaluation as core professional competences” (MicroHE 2019).

3.1.2 Important initiatives contributing to the emergence of scenario

- The global higher qualification development is further pushed by international organisations, such as the OECD, leading to a so called “elevator effect” with more demand for higher qualification.

- New global guidelines emerge, such as the UNESCO Global Convention on the Recognition of Qualifications concerning Higher Education (UNESCO, 2019). While these developments address the degree level and not the module level recognition, as is the case for micro-credentials, it is an example that showcases global efforts to reach a common understanding on guidelines.
- Private actors increasingly push into the education market, as HEIs struggle to keep up with rapid changes of professions. For example, the profession of a data scientist has quickly changing skills demand. Private education providers offer learning formats such as MOOCs (see for example Udacity, Coursera, EdX), (coding) boot camps and hackathons. They aim to provide fast track pathways to obtain education certificates (see for example initiatives by Microsoft/LinkedIn and Le Wagon). HEIs have also responded by offering summer schools, MOOCs or boot camps themselves with MOOCs completed at HEIs, such as MIT, widely recognised by employers around the globe.
- Inter-institutional initiatives have developed, such as the MIT Digital Credential Initiative (MIT Open Learning, 2020), made up of nine HEIs with global reach (based in Canada, Germany, Mexico, the Netherlands and the USA), aiming “to design an infrastructure for digital verifiable credentials of academic achievement”. A different example is IMS Global Learning Consortium’s network on digital credentials that works on “advancing the interoperability standards needed to support lifelong learning utilizing micro-credentials and open badges to verify skills and competencies” (IMS Global, 2020).
- Technological advancements in the field of emerging technologies such as blockchain and AI, are rapidly evolving and increasingly being promoted to allow for better data protection.
- Evidence also underlines that the learner increasingly demands education that is fit for purpose and has self-control over the education pathway (Teach Online Canada, 2018). HEIs have to change the operating model to allow for “crediting of learning that is not equivalent to a full course completion” (Teach Online Canada, 2018).

3.1.3 Projecting key measures

- Challenges can emerge if providers have different systems in place to verify that the credential holder actually did pass the course. An international organisation can guarantee exchange and the establishment of guidelines of globally compatible micro-degrees. While international guidelines can be agreed upon, the guidelines may not be implemented universally, as they are not legally binding. Yet, if providers adhere to the guidelines, this can facilitate learner mobility and global labour market access.
- The society and employers may be concerned that international law does not have the capacity to sufficiently cover problems such as learner data breaches.
- HEIs may respond with resistance when they see their role diminishing in such a global scenario.
- Micro-credentials provide a solution that allows for specific updating of skills and initial knowledge development, and can ease access to education, with learning tailored to the specific needs. Yet, there is a challenge of over-individualisation versus

comparability. Micro-credentials risk to exist as so called “lone wolves” with no curriculum in place. Henceforth, general skills may be missing.

- The community of learners and teachers may be absent in such a scenario. Evidence underlines the importance of interpersonal exchange and in-person training on campus. Not every learner is capable of dealing with such a hyper-flexible system. With no guidance in the system, there is a risk of high dropout/non-completion rates.

3.1.4 Policy recommendations

The table below indicates recommendations and the level at which action has to be taken if stakeholders want to move towards this scenario.

Policy Recommendations	Level		
	Sys-tem	Insti-tution	Lear-ner
<p>1. Standards and Guidelines, Technology Encourage the development and adoption of a system of commonly accepted standards and technologies for secure digital credentials. It is recommendable to create a digital standard format for documenting open education credentials, and link the credentials to already established frameworks and common standards such as ECTS and EQF.</p> <p>Establish a governing structure for the evolution of digital credentialing standards, guidelines and technologies, which is based on consensus between the different stakeholders. Promote a discussion and consensus on the usage novel technologies for Digital Credentialing.</p>	x	x	
<p>2. Quality Assurance The learning process, including the assessment and the award of the credentials has to be quality assured. A micro-credential is only as trustworthy as the assessment on which it is based. The assessment should focus on learning outcomes. To make the assessment trustworthy, authentication and cheating prevention techniques should be applied.</p> <p>For the medium which documents the credential to be trusted, it should encompass the security of the digital signature, longevity of the medium, and data ownership etc.</p>	x	x	
<p>3. Ownership, Data Protection Questions of ownership of credentials should be clarified: is the certificate owned by the institution or learner, or both? Learners have to be knowledgeable about what happens to their data and how it is protected. Learning providers are recommended to create spaces where learners can gain knowledge and can exchange on the ethical use of data.</p>	x	x	x
<p>4. Societal dimension: inclusivity, coaching and career guidance With the standardized curriculum giving way to more flexible learning pathways, education institutions should provide learners with the skills to</p>		x	x

manage their own learning and careers. This kind of coaching and career guidance can to ensure that access to education is inclusive and caters for a heterogeneous learner body.			
<p>5. Culture of Collaboration</p> <p>Encourage a culture among education institutions that values open education through micro-credentialisation, takes different stakeholders on board and clearly communicates the benefits and challenges.</p> <p>Foster even greater collaboration between higher education institutions, other education providers, and employers.</p> <p>Provide guidance to HEIs on their transition pathway to digital credentials. Technologies based on open standards.that facilitate transparency and prior learning recognition should become widely adopted.</p>	x	x	

Table 1: Policy Recommendations Scenario 1.

3.2 Scenario 2: European scenario (hybrid – focus on standards)

In this scenario, with the European Union (EU) having pushed for further integration, a shared understanding of education across EU Member States (EU MSs) has developed, while regional differences persist. A European micro-credential system has emerged based on collaboration. The EU, and more specifically, the European Commission (EC), constantly works on improving common European strategies on micro-credentialisation that are supported by all member states. The EC proposes common standards and transparent means of credential verification, and provides an open database of learning opportunities and accredited qualifications. EU MSs and education providers have the possibility to opt-in on the standards. The verification process of micro-credentials is a decentralised process with recommended procedures and guidance provided by the EU.

The learners can access educational content in different languages, and micro-credentials earned at any accredited institution in the EU are recognised by HEIs and employers in the European labour market. With increasing supply and demand for micro-credentials, the overall access to higher education is eased for each European citizen, independent of socio-economic background. This is supported by the recognition of prior obtained micro-credential courses outside the school setting, the facilitation of pre-higher education preparatory micro-credential courses tailored to the need of the learner, and the engagement in micro-credential courses during the higher education journey, to facilitate the transition to the labour market. Throughout the life cycle, the European citizens engage in multiple virtual exchanges and blended mobility actions to obtain new knowledge. The ENIC-NARIC centres can also devote more time and resources to unique credential recognition, as the verification of traditional HE credentials is increasingly automated (ENIC-NARIC, 2020).

3.2.1 Defining key measures

- A new European Quality Assurance Agency has coordinated work on standards and regulations, for example on linking quality standards and quality assurance of a wide range of learning opportunities to the EQF framework. With this new regulation in place, a common standard across the EU on micro-credentials has been achieved. Aligned to the European Credit Transfer and Accumulation System (ECTS) and the European Credit System for Vocational Education and Training (ECVET), a European Credit Transfer System for micro-credentials has been established. This now eases the portability of micro-credentials across the EU. This allows learners and employees in the EU to pursue personalised study paths across the EU.
- All EU HEIs operate in a network and recognise the micro-credentials obtained at the other EU HEIs. European-wide online administrative services are in place, including e-student consultancy.

3.2.2 Important initiatives contributing to the emergence of this scenario

- The high-skills mismatch across Europe, with many countries lacking high-skilled professionals, furthers the need to increase the number of higher education graduates, as well as upskilling possibilities.
- Several EU policy measures showcase the EU's goal to work towards a common European learning space, such as the European inter-university campuses as part of the European Universities initiative, the goal of a European higher education area by 2025 as well as the budgetary increase in the ERASMUS+ mobility programme.
- The EC is pushing for the possibility to personalise easily one's own curriculum. Specific initiatives are for example the recent establishment of the Europass Digital Credentials (European Commission, 2020a). In addition, the EU finances research projects on micro-credentials to further the knowledge on the topic as well as the exchange between different HEIs across Europe.
- The European MOOC Consortium launched a Common Microcredential Framework (CMF) to set up "portable credentials for lifelong learners" (European Commission, 2020b).

3.2.3 Projecting key measures

- "National responsibility for quality assurance can be perceived to be challenged by cross-border quality assurance, and some EU MSs have been hesitant to recognise reviews from non-national agencies. One of the main benefits that quality assurance systems in Europe can bring is to strengthen trust. An important measure of the extent to which trust is developing is whether governments and national higher education institutions enable and accept a quality assurance agency from different country that works in compliance with the ESG to evaluate micro-credentials" (MicroHE 2019).
- A European micro-credential system with common standards can ease access to education (including mobility) and the labour market. Yet, as can be currently observed

with the establishment of an ECTS system for higher education course work across the EU, while common EU standards exist across the EU, students that take part in ERASMUS+ mobility schemes may still face challenges of recognition of course work obtained in a different country. Problems of recognition may also exist in the labour market. Similarly, with the potential future system for micro-credentials, institutional resistance to recognition may still occur.

3.2.4 Policy recommendations

The table below indicates recommendations and the level at which action has to be taken if stakeholders want to move towards this scenario.

Policy Recommendations	Level		
	Sys-tem	Insti-tution	Lear-ner
<p>1. Standards and Guidelines, Technology Encourage the development and adoption of a system of commonly accepted standards and technologies for secure digital credentials. It is recommendable to create a digital standard format for documenting open education credentials, and link the credentials to already established frameworks and common standards such as ECTS and EQF.</p> <p>Establish a governing structure for the evolution of digital credentialing standards, guidelines and technologies, which is based on consensus between the different stakeholders. Promote a discussion and consensus on the usage novel technologies for Digital Credentialing.</p>	x	x	
<p>2. Quality Assurance The learning process, including the assessment and the award of the credentials has to be quality assured. A micro-credential is only as trustworthy as the assessment on which it is based. The assessment should focus on learning outcomes. To make the assessment trustworthy, authentication and cheating prevention techniques should be applied.</p> <p>For the medium which documents the credential to be trusted, it should encompass the security of the digital signature, longevity of the medium, and data ownership etc.</p>	x	x	
<p>3. Ownership, Data Protection Questions of ownership of credentials should be clarified: is the certificate owned by the institution or learner, or both? Learners have to be knowledgeable about what happens to their data and how it is protected. Learning providers are recommended to create spaces where learners can gain knowledge and can exchange on the ethical use of data.</p>	x	x	x
<p>4. Societal dimension: inclusivity, coaching and career guidance With the standardized curriculum giving way to more flexible learning pathways, education institutions should provide learners with the skills to</p>		x	x

manage their own learning and careers. This kind of coaching and career guidance can to ensure that access to education is inclusive and caters for a heterogeneous learner body.			
<p>5. Culture of Collaboration</p> <p>Encourage a culture among education institutions that values open education through micro-credentialisation, takes different stakeholders on board and clearly communicates the benefits and challenges.</p> <p>Foster even greater collaboration between higher education institutions, other education providers, and employers.</p> <p>Provide guidance to HEIs on their transition pathway to digital credentials. Technologies based on open standards.that facilitate transparency and prior learning recognition should become widely adopted.</p>	x	x	

Table 2: Policy Recommendations Scenario 2.

3.3 Scenario 3: Fluidity between Higher and Continuing Education (hybrid – focus on collaboration)

In this scenario, the distinction between (degree-granting) higher education and continuing professional education (leading to various forms of credentials) becomes blurry. Learners switch seamlessly between the two systems, as well as the world of work. Citizens are lifelong learners. HEIs offer both forms of education and have efficient procedures for recognition and credit transfer in place.

As the knowledge-based society further advances and rapid changes in skills demands take place, a traditional three- or five-year HEI curriculum no longer covers all qualification needs. Thus, it becomes more important that students develop the competency to “learn how to learn”. They are now trained to seek out learning possibilities themselves and gain skills and certifications to meet changing labour market demands, as well as for their own personal development. More specifically, students may learn how to “manage knowledge...find, analyze, evaluate, and apply knowledge as it constantly shifts and grows” (Teach Online Canada, 2018). Big data analysis and learning analytics could be used to suggest suitable learning opportunities and career paths.

3.3.1 Defining key measures

- HEIs seek to create “double value” for their learners: providing them with a degree backed by profound scientific knowledge, skills and competencies, while also equipping them with professional skills, certified by an industry certificate or a professional license.
- HEIs have put into place pathways that allow learners to stack several credentials into a larger certificate or into an accredited degree. HEIs are aware of the needs of non-traditional learners. HEIs collaborate with employers, industry bodies and the public

sector, as well as with non-HEI education providers. HEIs have established a constant exchange of ideas with local and global employers to tailor micro-credentials to the needs of the labour market.

- HEIs have efficient procedures for recognition and credit transfer in place, relying on open databases and established standards for credential description, data exchange and quality assurance.
- Continuing professional education providers and online learning platforms actively seek academic recognition (or validation) of their courses because they see the added value for their learners. They make an effort to meet the quality standards for academic recognition and to establish degree pathways.
- Measures have to be taken to change the understanding of academic learning as and from an episodically process towards a culture of continuous learning throughout the lifecycle. With the knowledge-based society established this then also entails to equip students at HEIs with the skills to manage their own learning after higher education.
- Many employers will establish programmes and financial schemes to facilitate the further development and learning of their workers through micro-credentials.
- Employers may host the learning environment, or learning might take place at the employer's site. Spaces have to be developed that allow learners to interact also in person with their colleagues or other people taking the micro-credential course.

3.3.2 Important initiatives contributing to the emergence of this scenario

- Europass Digital Credentials Infrastructure (European Commission, 2020a)
- Emrex data standard for HE modules and degrees (Emrex, 2020)
- Fraunhofer Blockchain for Education Initiative (Fraunhofer Academy, 2018)
- Other important initiatives and standards include the Edubadges in the Netherlands (Surf, 2020), the W3C Verifiable Credentials (W3C, 2019) and the Open Badges 2.0 (IMS Global, 2018)
- The Swissuni model already allows for stackable CPD credentials (Swissuni, 2020). It has the following components:
 - Certificate of advanced studies (CAS, minimum 10 ECTS)
 - Diploma of advanced studies (DAS, minimum 30 ECTS)
 - Master of advanced studies (MAS, minimum 60 ECTS)
- Already today, universities work on lifelong learning scenarios, such as Harvard University's 60 year curriculum initiative (New York Times, 2019)
- Deakin University is experimenting with integrating micro-credentials into its master's degrees (Oliver, 2020)
- Several universities have already established short-term or flexible degree programmes (see for example Flanders; Duke University's non-credential micro courses that students can take online to develop labour market relevant skills; MIT Edx Micro Credential Course.).
- OECD 2012 PIAAC data shows that engagement numbers in continuous learning have been relatively low (OECD, 2012). Micro-credentials allow for greater accessibility than

a general degree. Learning that can be more personalised to students' needs and/or for experienced workers can be used to upskill in a specific area.

3.3.3 Projecting key measures

- Degrees will be “mass-customized”: a core curriculum ensures degree compatibility with the agreed standards in the field. Approximately 30% of credits will be dedicated for individual specialisation and a future skills focus. Multi-year part-time study programmes may be established to allow for continuous learning.
- HEIs engage actively in continuing professional education. They offer micro-credentials for students enrolled in degree programmes as well as micro-credential courses for employees. While there will also be separate courses for each target group, traditional students and lifelong learners might choose to benefit from each other’s perspective by taking a mixed micro-credential course. HEIs and learners engage in a lifelong alumni relationship.
- Due to the possibility of micro-credential online learning, greater flexibility exists on when and where the worker can undertake learning. At the same time, employers have to provide the space and time to engage in such learning during working hours.

3.3.4 Policy recommendations

The table below indicates recommendations and the level at which action has to be taken if stakeholders want to move towards this scenario.

Policy Recommendations	Level		
	Sys-tem	Insti-tution	Lear-ner
<p>1. Standards and Guidelines, Technology Encourage the development and adoption of a system of commonly accepted standards and technologies for secure digital credentials. It is recommendable to create a digital standard format for documenting open education credentials, and link the credentials to already established frameworks and common standards such as ECTS and EQF.</p> <p>Establish a governing structure for the evolution of digital credentialing standards, guidelines and technologies, which is based on consensus between the different stakeholders. Promote a discussion and consensus on the usage novel technologies for Digital Credentialing.</p>	x	x	x
<p>2. Quality Assurance The learning process, including the assessment and the award of the credentials has to be quality assured. A micro-credential is only as trustworthy as the assessment on which it is based. The assessment should focus on learning outcomes. To make the assessment trustworthy, authentication and cheating prevention techniques should be applied.</p>	x	x	

For the medium which documents the credential to be trusted, it should encompass the security of the digital signature, longevity of the medium, and data ownership etc.			
3. Ownership, Data Protection Questions of ownership of credentials should be clarified: is the certificate owned by the institution or learner, or both? Learners have to be knowledgeable about what happens to their data and how it is protected. Learning providers are recommended to create spaces where learners can gain knowledge and can exchange on the ethical use of data.	X	X	X
4. Societal dimension: inclusivity, coaching and career guidance With the standardized curriculum giving way to more flexible learning pathways, education institutions should provide learners with the skills to manage their own learning and careers. This kind of coaching and career guidance can to ensure that access to education is inclusive and caters for a heterogeneous learner body.	X	X	X
5. Culture of Collaboration Encourage a culture among education institutions that values open education through micro-credentialisation, takes different stakeholders on board and clearly communicates the benefits and challenges. Foster even greater collaboration between higher education institutions, other education providers, and employers. Provide guidance to HEIs on their transition pathway to digital credentials. Technologies based on open standards that facilitate transparency and prior learning recognition should become widely adopted.	X	X	

Table 3: Policy Recommendations Scenario 3.

3.4 Scenario 4: Higher Education Institutions as credentials clearing house and testing center (hybrid – focus on quality degrees)

In this scenario, HEIs embrace the possibilities of unbundling of education and place themselves at the heart of the emerging institutional architecture. Being the institutions authorized to grant academic degrees, they act as guardians of quality. In addition to their traditional teaching, learning and research roles, they assume the new role of a credentials clearing house and a testing centre, guaranteeing with their reputation that an awarded degree meets high academic and professional standards. To facilitate learner's physical and virtual mobility, they will have to re-define curricula in such a way that they are both rigorous and flexible.

3.4.1 Defining key measures

- Micro-credentials disrupt the education system and thus challenge the role on who will be in charge of assessing the quality and advising learners on what courses to take. Here, it is anticipated that HEIs operate as clearing houses and thus provide checks and balances in the system. HEIs develop appropriate strategies that allow them to routinely recognize and to grant micro-credentials.
 - Transparency on recognition and non-recognition of outside learning is essential in this scenario. With HEIs operating as clearing houses, micro-credentials databases and databases on recognition decisions have to be set up, either at each institution, or at the national, European or global level. In addition, HEIs have to build up capacity to efficiently deal with recognition requests and to guarantee for a constant update of the recognition database. The technology is preferably developed and maintained as open source.
 - HEIs remain the main gatekeepers for quality assurance in education, assess micro-credentials and provide a database to the learner of possible course content. HEIs verify obtained micro-credentials.
 - HEIs, accreditation agencies and regulators jointly develop and maintain standards for quality assurance and recognition, supported by the national governments and the European Commission. The culture at the individual HEIs and across the network of HEIs is open, with constant communication of staff across disciplines.
 - HEIs might become testing centers for outside learning, in such a way that they develop and maintain standardized tests that students can take to certify their outside learning. For their degree programmes, some HEIs might even come back to the idea of a final exam covering all subject areas to ensure that graduates have acquired all the required knowledge, skills and competences. The learners in the future will expect from their university to allow for reputable assessment of learning inside as well as outside of university.
 - A student-centered didactic approach is established. Learning takes place partly in the virtual world and offline in discussion groups on HEI campus or in a workplace. HEIs draw on their comparative advantage of collaboration among HEIs compared to the private sector's focus on competition. HEIs further their focus on employability and skills development of learners. Close collaborations are held between HEIs and industry.
 - Learning analytics helps to better tailor the specific needed qualifications to the worker.
 - HEIs provide counselling to learners to give advice on which course to take and how to structure a curriculum if demanded by the learner. The role of professors and instructors changes.
 - "Professors will act as instructors, encouraging contributions and reflections from the wider public, to accompany formal courses that are 'private' to enrolled students, thus opening up courses to external expertise, and providing students with important contacts and networks outside the institution."
 - "This approach challenges professors becoming more or less mentors, moving away from selecting and transmitting information in large blocks or chunks, such as a one-hour lecture, to guiding students to find, analyze, evaluate, and apply information relevant to a particular subject domain. This 'relevance' becomes
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more negotiated between instructors or call it mentor and student. The role moves more to that of facilitator with less control over where and how learning takes place, and often entering into negotiation over exactly what the content is or should be.”

3.4.2 Important initiatives contributing to the emergence of scenario

- Too many graduates leave higher education with poor basic skills (literacy, numeracy, digital) and without the range of transversal skills (problem-solving, communication, etc.) they increasingly need for resilience in a changing world.
- “Students can now access content, free of charge, from multiple sources via the Internet. They can choose alternative interpretations, areas of interest, and even sources of accreditation. Students have tools, such as smartphones and video cameras, to collect digital examples and data can be edited and used in student work. Thus, strictly managing a set curriculum in terms of limited content chosen by the instructor becomes less meaningful. The emphasis shifts to deciding what is important or relevant within a subject domain”. (Teach Online Canada, 2018)
- Changes in society, student expectations, and technology are motivating Higher Education institutions (HEIs), faculty management and instructors to rethink pedagogy and teaching methods.
- Employers demand quality control of micro-credentials to ensure that qualifications have actually been obtained.

3.4.3 Projecting key measures

- The agile learning approaches wanted by learners clash with institutions that might not be able to provide them.
- Greater entrepreneurship is developed among lecturers as the role of HEIs changes.
- The integration of outside courses transforms the existing institutions. This is challenging. For example, there may be institutional resistance as staff see their position challenged or fear a loss of reputation.
- This scenario offers the possibility to strike a balance between flexibility and providing orientation. Therefore, the risk of non-completion can be reduced.
- The guidance could ensure that learners also obtain general skills.
- As HEIs function as clearing houses, trust can be established, which then, for example, would ease the transfer between different HEIs.
- Depending on the size and outlook of the HEIs, some of them may lack the financial resources needed to engage in such activities.

3.4.4 Policy recommendations

The table below indicates recommendations and the level at which action has to be taken if stakeholders want to move towards this scenario.

Policy Recommendations	Level		
	Sys-tem	Insti-tution	Lear-ner
<p>1. Standards and Guidelines, Technology Encourage the development and adoption of a system of commonly accepted standards and technologies for secure digital credentials. It is recommendable to create a digital standard format for documenting open education credentials, and link the credentials to already established frameworks and common standards such as ECTS and EQF.</p> <p>Establish a governing structure for the evolution of digital credentialing standards, guidelines and technologies, which is based on consensus between the different stakeholders. Promote a discussion and consensus on the usage novel technologies for Digital Credentialing.</p>	x	x	x
<p>2. Quality Assurance The learning process, including the assessment and the award of the credentials has to be quality assured. A micro-credential is only as trustworthy as the assessment on which it is based. The assessment should focus on learning outcomes. To make the assessment trustworthy, authentication and cheating prevention techniques should be applied.</p> <p>For the medium which documents the credential to be trusted, it should encompass the security of the digital signature, longevity of the medium, and data ownership etc.</p>	x	x	x
<p>3. Ownership, Data Protection Questions of ownership of credentials should be clarified: is the certificate owned by the institution or learner, or both? Learners have to be knowledgeable about what happens to their data and how it is protected. Learning providers are recommended to create spaces where learners can gain knowledge and can exchange on the ethical use of data.</p>	x	x	x
<p>4. Societal dimension: inclusivity, coaching and career guidance With the standardized curriculum giving way to more flexible learning pathways, education institutions should provide learners with the skills to manage their own learning and careers. This kind of coaching and career guidance can ensure that access to education is inclusive and caters for a heterogeneous learner body.</p>		x	x
<p>5. Culture of Collaboration Encourage a culture among education institutions that values open education through micro-credentialisation, takes different stakeholders on board and clearly communicates the benefits and challenges.</p> <p>Foster even greater collaboration between higher education institutions, other education providers, and employers.</p>	x	x	

Provide guidance to HEIs on their transition pathway to digital credentials. Technologies based on open standards that facilitate transparency and prior learning recognition should become widely adopted.			
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Table 4: Policy Recommendations Scenario 4.

3.5 Scenario 5: Higher Education Institutions resist open learning recognition (fully closed)

In this scenario, HEIs ignore the growing reputation of open learning and resist a potentially beneficial adjustment of their traditional practices. They do have recognition procedures in place (as required by the applicable regulations), but they largely ignore the technological and labour-market changes around open learning and unbundling of education. The authors of this report do not endorse such a scenario, but nevertheless believe that resistance to change in some way or another is a reality in many institutions, and therefore has to be taken into consideration. There might be profound reasons for such an unwillingness or inability to change, such as that important players inside the institution are convinced that their proven centuries-old approach to teaching, learning, research and community-engagement is best, or that institutions lack the necessary capabilities or resources for change.

3.5.1 Defining key measures

- Curricula at HEIs remain relatively rigid and linear. Departments do not see the necessity to free credits or modules for individual specialization. Thus, departments are reluctant to reduce workload (and credits) on specific subjects. Each professor regards his or her subject as the most important, which cannot be shortened without risking a devaluation of the degree. HEIs have full control over learning pathways.
- While some experimentation with online and blended learning scenarios is being carried out, the dominant form of learning is still face-to-face.
- Most assessments are done in person on campus, with some institutions experimenting with online proctored exams. HEIs are slowly improving transparency on assessment criteria and procedures.
- Recognition procedures are optimized for physical student mobility. HEIs embrace innovation. They make use and develop technology-enabled solutions to streamline processes.
- HEIs collaborate mainly with other HEIs, but might also collaborate with other learning providers.

3.5.2 Important initiatives contributing to the emergence of this scenario

- The aim of the Erasmus without Paper Initiative is to set up “an electronic network that enables Higher Education Institutions (HEIs) to exchange information about Erasmus+ students and their mobilities electronically in real time” (EWP2.0, 2020).

- The European Universities Initiative provides funding to create networks of universities in order to enable students to obtain a degree by combining studies in several EU countries (European Commission, 2020c).
- The European Student Card aims to create an “exchange platform [that] will allow the communication between the information systems of higher education institutions in Europe” by verifying student status and identity (ESC, 2020).

3.5.3 Projecting key measures

- HEIs mostly focus on providing education to traditional learners – for a large part number of more traditional professions, they remain the dominant providers.
- As technology causes large shifts in the labour market, and some types of professions are entirely phased out, entire areas of study will decrease in importance and eventually stop being offered
- Especially in cutting edge technologies and new business models, universities will not drive the Research & Innovation agenda, being too slow to react to many developments
- Many students who wish to compete on the labour market for ‘future jobs’, will gravitate towards innovative, specialized education providers.
- Tensions will arise in public education systems between continuing to fund established giants or redirecting funding to more nimble (mainly private sector) providers.

3.5.4 Policy recommendations

The table below indicates recommendations and the level at which action has to be taken if stakeholders want to move towards this scenario.

Policy Recommendations	Level		
	Sys-tem	Insti-tution	Lear-ner
<p>1. Standards and Guidelines, Technology</p> <p>Encourage the development and adoption of a system of commonly accepted standards and technologies for secure digital credentials. It is recommendable to create a digital standard format for documenting open education credentials, and link the credentials to already established frameworks and common standards such as ECTS and EQF.</p> <p>Establish a governing structure for the evolution of digital credentialing standards, guidelines and technologies, which is based on consensus between the different stakeholders. Promote a discussion and consensus on the usage novel technologies for Digital Credentialing.</p>	x	x	

<p>2. Quality Assurance The learning process, including the assessment and the award of the credentials has to be quality assured. A micro-credential is only as trustworthy as the assessment on which it is based. The assessment should focus on learning outcomes. To make the assessment trustworthy, authentication and cheating prevention techniques should be applied.</p> <p>For the medium which documents the credential to be trusted, it should encompass the security of the digital signature, longevity of the medium, and data ownership etc.</p>	x	x	
<p>3. Ownership, Data Protection Questions of ownership of credentials should be clarified: is the certificate owned by the institution or learner, or both? Learners have to be knowledgeable about what happens to their data and how it is protected. Learning providers are recommended to create spaces where learners can gain knowledge and can exchange on the ethical use of data.</p>			
<p>4. Societal dimension: inclusivity, coaching and career guidance With the standardized curriculum giving way to more flexible learning pathways, education institutions should provide learners with the skills to manage their own learning and careers. This kind of coaching and career guidance can ensure that access to education is inclusive and caters for a heterogeneous learner body.</p>			
<p>5. Culture of Collaboration Encourage a culture among education institutions that values open education through micro-credentialisation, takes different stakeholders on board and clearly communicates the benefits and challenges.</p> <p>Foster even greater collaboration between higher education institutions, other education providers, and employers.</p> <p>Provide guidance to HEIs on their transition pathway to digital credentials. Technologies based on open standards that facilitate transparency and prior learning recognition should become widely adopted.</p>	x	x	

Table 5: Policy Recommendations Scenario 5.

3.6 Summary of Scenarios

	#1 A wallet in your pocket	#2 Hybrid scenario	#3 Fluidity between HE & CPD	#4 HEIs as Clearing House	#5 Resistant HEIs	Improving measures	Impeding measures
Governance	Decentralised Governed by education providers	Decentralised but with centralised guidance from EU	Decentralised Governed by industry and HEA collectively	Decentralised but networked Governed by MC providers	Decentrali- sed Governed by HEIs	Play an active role in developing, applying and endorsing reliable open standards and credentialing/ recognition processes	Neglecting the potential of collaboration and trust
Role of informal learning	High	Medium	Low	High	Low	# Be more open to recognising source-independent knowledge, skills and competences # Develop mechanisms that allow the assessment and/or matching of external achievements with internal provision	Dismissing or underestimating the potential value of knowledge, skills and competences acquired via informal learning
Role of educators	Focus shift from knowledge provision to skill and competence development	Mostly unchanged with higher awareness and importance of micro-credentials	Cater to a broader LLL audience with a role of mentor rather than lecturer	Focus shift from knowledge provision to skill and competence development to meet labour market requirements	Almost no change	Acknowledge and reward responsiveness, creativity and innovation in educators who adapt to the changing role of HE (recognising open learning, serving part time learners, up- and re-skilling professionals, etc.)	Compartmentalising the educator's role as lecturer and innovation on institutional level
Promi- nence of tech- nology	Globally agreed codes and standards	EU supplied standards and implementation support	Technology is less relevant than learning content	Clearing house repositories/ databases are externally developed and are at the heart of the scenario	Limited scope	# Seek technological solutions to solve problems or improve operation/performance # Address the implications of the application of new technologies to avoid excluding vulnerable learner groups	Applying technology for the sake of following trends without assessing and appressing implications
Composition of degrees	Highly granular stacked macro credentials (e.g. Degrees) from multi-providers	Stacked mainly from HEI micro-credentials but also including external MCs	Stacked and expanded, degrees 'adorned'/complemented by employability skill MCs	Stacked and expanded, degrees 'adorned'/complemented by employability skill MCs	Linear curriculum-based degree acquisition predominantly from a single HEI	# Be more open to recognising third-party credentials as building blocks of degrees # Develop mechanisms that allow the matching of external learning achievements with internal provision	# Not recognising the benefit of non-degree sized education offering # Overly sceptic (or dismissive) attitude towards transparently documented third-party credentials
Learner autonomy	Learners choose their learning pathways, high indepen- dence and self-management is essential	Learners are guided in their pathways but have freedom to steer their learning	Lifelong learners have increasing freedom after acquiring basic education and move to CPD	Learners are guided in their pathways and have a lot of freedom to steer their learning	HEIs have full control over learning pathways	Design and provide guidance mechanisms to help citizens manage their learning and career pathways	Expecting citizens to adapt to changing learning and employment settings and dynamics

4. From the futures to the present: Implications of open education through credentialisation today

4.1 At a Glance: Overview of Possible Futures

Our analysis of the potential impacts of micro-credentialing indicates that the future higher education landscape is likely to be far more open than the one that exists today. Only one of five indicators sees the role of 'linear' or 'bundled' education remaining the same as it is today, and no scenario foresees an increase in this Fordist model of education. Looking across the set of scenarios, some key messages stand out:

4.1.1 Traditional Higher Education Institutions stand to be Micro-Credential Powerhouses: If they Choose to

New types of educational institutions currently lead the field in terms of innovation in the micro-credentialing space. These cover the range from small private educational providers aiming at teaching basic skills, to university MOOC networks to highly specialist continuing education providers, such as those in the healthcare arena. Despite the multitude of providers in terms of scale, traditional Higher Education Institutions already offer modular learning offerings to millions of students across Europe. For these institutions embracing micro-credentialing would merely involve 'un-bundling' these offerings, and allowing students from across Europe to select modules 'a-la-carte'. Thus, even small movements towards micro-credentialing by the incumbents in Higher Education are likely to have outside effects on the system as a whole.

However, harnessing the true potential of micro-credentialing would require institutions to make more meaningful change by enabling new and innovative ways of stacking credentials, facilitating cross-institutional recognition and automating many processes to facilitate travel by students through the system.

4.1.2 Standards are a key Facilitator of Adoption

Standards are a key to every part of the micro-credentialing equation. Technological standards are required for interoperability between admissions, student information and credentialing systems. Transparency standards are key for documenting student achievement across different modules. Recognition and Quality Assurance standards can facilitate the stacking and combination of credentials from different providers.

Currently the latent potential of micro-credentialing to disrupt Higher Education fails to realise itself mainly due to lack of movement on these standards – the unregulated promulgation of

multiple different approaches, providers and systems only serves to increase entropy and opacity in the market when taken as a whole.

Thus, somewhat counter-intuitively, the degree increase in openness of education will actually be proportional to the degree of coordination in the sector via (open) standardisation initiatives to facilitate such openness. The rate of change is likely to also directly correlate with standardisation activity.

4.1.3 Demand for Autonomy will drive student choice

This report establishes the case that, looking forward, technology will continue to dramatically increase the number of potential educational pathways open to learners. However, current and historical data does not provide any indicators as to whether students are able or even willing to take advantage of such choices. On the one hand, students may choose to distinguish themselves on the labour market by assembling unique portfolios of skills, while on the other hand they may prefer to avail themselves of pre-packaged sets of skills and distinguish themselves through high performance on these preset pathways. While we currently are seeing a movement from fixed towards flexible pathways, it remains to be seen whether the rate of this movement is linear, and whether there is a ceiling to flexibility.

4.1.4 How educators adapt will have major consequences

The focus of our study has not been on the role of educators, but all our scoping indicates that each of the scenarios (except for resistant HEIs) implies major changes in their relationship with students. Despite increased automation of certain activities, very one of our scenarios foresees that educators will continue to hold a major role in the educational process. Increased flexibility indicates that the educators role will need to focus more strongly on inclusion, mentoring and career guidance. It also implies significant changes in working methods affecting everything from working hours to holidays to whether work occurs in a classroom or in front of a computer. Thus, rather than seen as a casualty of change, given the key role they hold in the system, educators need to be seen as key facilitators or impediments to increased openness and flexibility. Thus, ensuring a more open future to education also requires policymakers to construct an attractive value proposition to the educators that will need to power it.

4.2 Recommendations

Given the key driving forces described in this report, we believe that the status quo is untenable. Even the 'Resisting Change' scenario describes a scenario whereby institutions need to actively defend their current operating model in a changing environment.

Given this, irrespective of which scenario is preferred, there are clear benefits in establishing a culture among higher education institutions that recognises the value of open education through micro-credentialisation, taking different stakeholders on board and clearly

communicating the benefits and challenges. To establish this culture, strong collaboration (MSs-EU institutions, HEI-HEI, HEI-Industry, formal education providers-open non-formal and informal education) is required. A shared commitment towards quality of (open) learning based around learning outcomes should be a start for such work.

Standards and guidelines, technology

To make micro-credentials a valuable and widely accepted currency, common guidelines and standards need to be developed. Technologies that facilitate prior learning recognition should become widely adopted. In particular, governments and stakeholders need to urgently reach agreement on a digital standard format for documenting all educational credentials, including open credentials. Such a standard should be closely linked to ECTS, and unite the various already established frameworks and common standards across the EU. The Europass Digital Credentials may form a basis for such a standardisation initiative.

Quality Assurance of Credentials

Within a landscape of hundreds of credential-types by different providers, trust in the credentials becomes imperative. Work conducted within OEPASS indicates that this trust comes primarily from two factors:

- The learning process, including the assessment and the award of the credentials has to be quality assured. A micro-credential is only as trustworthy as the assessment on which it is based. The assessment should focus on learning outcomes. To make the assessment trustworthy, authentication and cheating prevention techniques should be applied.
- trust that the medium which documents the credential can be trusted: encompassing the security of the digital signature, longevity of the medium, data ownership etc.

Ownership, data protection

Questions of ownership of credentials should be clarified: is the certificate owned by the institution or learner, or both? Learners have to be knowledgeable about what happens to their data and how it is protected. Learning providers are recommended to create spaces where learners can gain knowledge and can exchange on the ethical use of data.

Societal dimension: inclusivity

HEIs are recommended to continue driving change towards a highly inclusive and responsive learning ecosystem, where prior learning (irrespective of its source) can be assessed and recognised towards degrees and skill-competence profiles that enhance citizens' employability.

Annexe 1: References

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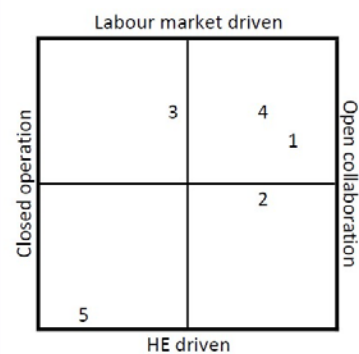
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Annexe 2: Drivers of Change

The scenarios expose a set of tensions in terms of how micro-credentials may affect the power-dynamics of educational provision and skills policy moving forward.

Institutional Drivers of Collaboration

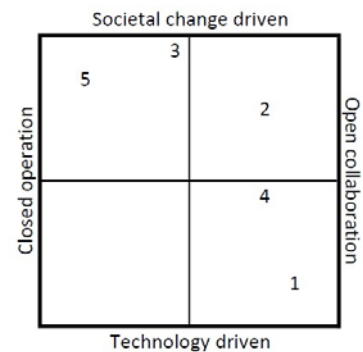
A look at our scenarios finds that unless (as in Scenario 5), Higher Education Institutions intentionally and forcefully resist change, in most scenarios, an increase in openness to the needs of the labour market also coincides with an increased openness to collaboration at various levels. Broken down by scenario:



- Scenario 1 & 4
 - These scenarios have the labour market as the main driver with open collaboration. Both scenarios could benefit from ensuring the involvement of all stakeholders in the education system as well as ensuring a mutual understanding of guidelines on quality assurance.
- Scenario 2
 - With this scenario, HEIs remain to hold their prominent role as main providers, while the system is characterised by open collaboration. It could be beneficial for HEIs to engage with the different stakeholders in the system and thus, also industry to ensure that educational models are tailored to the needs of the learner.
- Scenario 3
 - With this scenario, further learning is pushed for by the labour market with closed operation. This scenario could benefit from employers granting employees the time and space to engage in learning and HEIs providing more flexible models for further development.
- Scenario 5
 - The scenario is characterised by close operation and higher education driven. This could be improved for the benefit of HEIs as well as citizens if HEIs become more open towards collaboration with other HEIs and the industry. This scenario could also be improved if HEIs allow greater influence on their traditional curricula content by the industry and/or by willing to recognise external learning outcomes, e.g. skills and competences acquired via apprenticeship or other work-based practice.

Socio-Technological Drivers of Collaboration

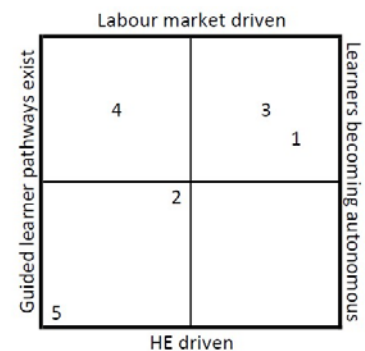
The figure in the middle gives an overview of the position of the scenarios along the same y-axis, while on the x-axis the factors of societal change driven vs. technology driven are set.



- Scenario 1
 - The scenario is predominantly technological solution driven and could increase the credential wallets' uptake by exploring and addressing societal implications and bottlenecks.
- Scenario 2
 - This scenario could be further improved by setting sound guidelines and utilise technological systems to facilitate the mobility of learners across the EU.
- Scenario 4
 - This scenario holds the potential to combine learners demands for more flexible models with quality assurance by HEIs.
- Scenario 3 & 5
 - These scenarios could benefit from adopting technologies that facilitate credential transparency and prior learning recognition.

Institutional Drivers of Personalised Learning Pathways

The figure on the right puts focus on the role of the learner. The y axis compares the guided learner pathways to learners becoming autonomous, and puts it on the scale with labour market driven vs. HE driven on the x-axis.



- Scenario 1 & 3
 - These scenarios are risking the exclusion of learners who are lacking appropriate levels of digital literacy and/or experience of managing their own learning and career pathways. The provision of support and guidance to these groups of learners is inevitable in an inclusive society.
- Scenario 2
 - This scenario can benefit from establishing common agreed upon guidelines across the EU to allow for greater learning autonomy, while also safeguarding recognition.
- Scenario 4
 - This scenario could benefit from establishing close exchange between HEIs and industry to assess what qualifications are needed by the learner.
- Scenario 5
 - This scenario risks ignoring the demands by learners for more open educational models that also respond to labour market demands.

Our analysis of the potential impacts of micro-credentialing and open learning recognition indicates that the future higher education landscape is likely to be far more open than the one that exists today. Based on workshops with experts, five future scenarios were analysed:

Scenario 1: A wallet in your pocket (fully open)

Scenario 2: European scenario (hybrid – focus on standards)

Scenario 3: Fluidity between Higher and Continuing Education (hybrid – focus on collaboration)

Scenario 4: Higher Education Institutions as credentials clearing house and testing center (hybrid – focus on quality degrees)

Scenario 5: Higher Education Institutions resist open learning recognition (fully closed)



Co-funded by the
Erasmus+ Programme
of the European Union