

Unboxing Micro-credentials: An Inside, Upside and Downside View

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Abstract

Micro-credentials are the latest shiny new thing increasingly attracting the attention of politicians, policy-makers and educational leaders. This paper endeavours to ‘unbox’ the micro-credential phenomena by removing some of the mystique and through uncovering several inherent tensions in competing definitions and underlying drivers. It reports the tripartite methodology adopted for a state-of-the-art literature review which offers an inside, upside and downside view on the micro-credential. Selected preliminary findings from this comprehensive review illustrate how the growth of the micro-credential as a new type of recognition of learning needs to be understood in a wider socio-cultural context. The micro-credential movement ‘unboxed’ reveals a complex credential ecology steeped in history, politics and cultural norms which involves many different actors and stakeholders. In response to major societal and technological change forces the paper invites debate on what counts as valued skill and knowledge in today’s rapidly changing digital society. It also challenges existing business models for higher and further education and the traditional high status of the university degree. Therefore, the micro-credential movement is not just another passing educational fad, as it brings into question much bigger issues concerning employability, the changing nature of work and new models of life-long and life-wide learning.

Keywords: Micro-credentials; Literature Review; Higher Education; Employability; Life-long Learning

Introduction

The university degree strikes at the heart of what most modern societies value as evidence of intellect, advanced knowledge and the ability to be successful in a chosen profession. Historically a degree from a reputable university is known to open doors, enhance life chances and provide both valuable private and public returns on investment. While it is difficult to establish a direct correlation and there is some debate, generally the evidence is overwhelming that higher and further education pays off for the individual and confers wider societal benefits (Ma, Pender & Welch, 2016). We know that people who complete university degrees are more likely to earn more, have less chance of being unemployed over their careers, are generally healthier and live longer, and tend to be more active and contributing citizens. Thus, the traditional degree as a ‘macro-credential’ is a much prized proxy for future success and its valued status as an important cultural canon is enshrined in both developed and most developing countries.

Ehlers (2018) reminds us that the Latin root of the word credential is ‘credence’, which relates credential to the concept of credibility. He writes that “Credibility in terms of learning outcomes or achievements, is usually associated with solid learning and assessment design, backed by trusted, experienced educational organizations” (Ehlers, 2018, p. 458). At the same time this historical connection to the root of ‘credential’ helps us to appreciate that different types of micro-credentials (i.e., awards, badges and certificates) are not new in our societies (MICROBOL, 2020). Albeit under various titles and descriptions, these micro-type awards have been used to mark achievements in many areas, including military, sports and recreation (e.g. the Scouting movement).

While there is a sense in which the micro-credential is the latest shiny new thing that Usher (2021) describes as being like “catnip to politicians”, there is a degree of repackaging in the story being told about them. This paper begins by revealing how older types of micro-credentials are already huge and hiding out of sight but relatively little is known about them, especially in Europe. Following this line of discussion we introduce the research questions and related tripartite methodology that frames a state-of-the-art literature review on the growth of micro-credentials. A detailed account of the steps involved in the methodology is provided along with the Inclusion and Exclusion Criteria applied during the sample selection process. A brief descriptive profile of the literature published since 2015 along with selected key findings are reported based on a critical interpretative analysis. More specifically, we identify some of the major gaps, themes and underlying tensions in the literature. In this first systematic effort to ‘unbox’ the literature, and make sense of the wider socio-cultural wrapping around this growing movement, the paper offers an inside, upside and downside view of the micro-credential.

While the increasing level of interest in micro-credentials has many similarities to the hype/hope of MOOCs a decade ago (Brown, et al., 2021a), we argue they need to be taken seriously as they raise bigger questions about the future-fit status of traditional qualifications. The global momentum for micro-credentials provides an opportunity to realign, reassess and even reimagine existing credential frameworks to help realise the goal of a more equitable, socially just, and thriving learning society—for all.

Older Bundles in New Boxes

There is no global consensus on the term ‘micro-credential’ (Oliver, 2021). Indeed, the current micro-credential landscape is messy and poorly defined, with many competing viewpoints and disconnected initiatives (Brown, et al., 2021b). According to Kazin and Clerkin, (2018, p.3), this situation is partly because the field is still “rapidly evolving” and subject to constant change. To further confuse matters, several other labels are commonly used instead of, or interchangeably with, the term micro-credential—for example, digital badges, online certificates, alternative credentials, nano-degrees, micro-masters, and so on. Hence, globally the definition of micro-credentials varies significantly depending on who is using the term and in what context. Rossiter and Tynan (2019, p. 2) report the absence of an agreed definition of micro-credentials “...can make it confusing and bewildering to navigate...” the field.

Despite this problem, there has been an acceleration of interest in the potential of micro-credentials and online short courses since the outbreak of the COVID pandemic. Many governments around the world appear to have been attracted to the micro-credential movement as part of their strategy to get people back to work. In Alberta, Canada, for example, the Provincial Government announced, in September 2021, a \$5.6 million micro-credential initiative for post-secondary institutions as part of a recovery plan to help individuals re-skill or up-skill, and find new career opportunities (Wiseman, 2021). Investment in Canada is being led at the provincial level, with the Ontario Government announcing, in November 2020, \$59.5 million over three-years for an online portal of micro-credential training opportunities, to develop new programs, launch a public awareness campaign, and implement a virtual passport (Ontario Budget, 2020). In a critical commentary on recent developments in Ontario, Usher (2021) observes how the local provincial government has chosen to position micro-credentials outside of the formal qualifications framework. He claims:

...the gist of micro-credential policy is less about getting individuals short credentials that they can build upon than it is about creating very specific partnerships between institutions and employers which lead to specific jobs. Short-term training, in other words (Usher, 2021, p. 7).

Shortly before the Ontario budget announcement, in October 2020, a major initiative was launched in Ireland, with €12 million funding available under the Government's Human Capital Initiative (HCI) to develop a national micro-credential system for universities over the next five-years (IUA, 2020). Earlier in 2020, in April, the Australian Federal Government announced a COVID relief package to fund 20,000 places in new short courses for the unemployed and those seeking to upskill (Duffy, 2020). This announcement was followed up with news in June 2020 of its plans to build a \$4.3 million online micro-credentials market place in response to earlier recommendations resulting from a review of the Australian Qualifications Framework.

What the Australian initiative failed to mention is that micro-credentials are already “huge and hiding in plain sight” (Campus Morning Mail, 2021). A study undertaken in 2019 found there were 2.6 million people already enrolled in non-qualification ‘training bundles’, primarily to meet regulatory requirements in workplace safety, emergency preparedness, and authority to operate (Palmer, 2021). This figure reported in a detailed analysis of micro-credentials in Vocational Education and Training (VET) in Australia found that this sector is largely a ‘private’ market. Notably, over 90% of these short training bundles were funded on a fee-for-service basis with largely no government contribution.

The Toronto Workforce Innovation Group (2021) note the prevalence of similar training bundles in Canada by showing the St. John's Ambulance has been offering short courses in basic First Aid as well as in CPR (Cardio Pulmonary Resuscitation) for well over a century. Indeed, these courses, recognised and in high demand across Canada, were first offered in 1833. It is also reported that more than half a million Canadians annually seek to complete one of these certificates (Toronto Workforce Innovation Group, 2021). During 2020, over 10,000

jobs posted online in Toronto were found to have required some form of first aid training. As The Toronto Workforce Innovation Group (2021) observes:

Employers in many workplaces have confidence in St. John's First Aid and CPR training. That's why it's a useful certificate (p.16).

The key point is that smaller formal and non-formal training bundles have existed in the credential ecology for many years. Therefore, in many respects, the concept of micro-credentials is not a new one (Oliver, 2019). Everhart, et al. (2016) report, for example, that in the United States sub-baccalaureate certificates represent over 25% of all postsecondary credentials. Of course, there is a cultural tendency in most societies to view these alternative offerings as being on a parallel track and inferior to traditional high-status macro-credentials. Kato, Galán-Muros and Weko (2020, p.8) write:

The term “alternative credentials” is relatively recent, and has not yet developed a shared and common definition. It is a term first popularised in the United States to draw a contrast with credentials traditionally conferred by HEIs at the completion of study programmes – associate, bachelor's, master's and doctoral degrees.

The status of these macro-credentials is well-established and they have a certain national and international currency, just like monetary currency, depending on the issuer and where they come from. Put another way, just like money, degrees from some countries have greater personal value to the graduate than those from countries whose education system is perceived to be of lower quality. This point illustrates the political economy of traditional macro-credentials and how award and recognition systems need to be understood in terms of cultural prestige and the discourse around global university rankings.

While this discussion is beyond the scope of the current paper, the reality is that in the United States, even before considering workplace safety courses, industry recognition and new initiatives such as Google Career Certificates, the combined number of sub degrees awarded by higher education institutions:

...is roughly equivalent to the number of bachelor's degrees, around 2 million per year, with certificates and associate's degrees each accounting for about 1 million (Carnevale, et al., 2020, p. 2).

In Europe, Hudak and Camilleri (2021) make a critical point when they assert that short courses are dominant in certain sectors and professions and that unbundling similar to micro-credentials is not a recent phenomenon:

For decades, short courses have been an essential part of adult education and have had a prominent role in continuing professional education in many professions. In diving instruction, vendor-led IT certification, and in medical continuing professional development, they are even the dominant form of education. The idea

of ‘unbundling’ Higher Education into smaller parcels, functions and courses has been frequently mentioned in literature since at least 1975, while in European policy making the idea of offering short courses for reskilling has been present since at least 2001 (p. 5).

In a paper responding to the growth of micro-credentials, the UK Quality Assurance Agency (2021) reinforces this point:

In various guises, micro-credentials can be said to have been around for a while, although that particular name is new. Higher education providers have a long history of running short courses, with or without credit, and aimed at various audiences (p. 1).

In summary, a distinction needs to be made between ‘older’ and ‘newer’ types of micro-credentials when discussing the current level of interest in new recognition and qualification models. Importantly, many of the older types of alternative credentials which might now meet the definition of a micro-credential appear to serve different purposes from traditional macro-credentials. They are often awarded by different types of organizations based on different standards, professional frameworks and/or quality assurance processes from those applicable to universities. Notwithstanding this point, in most countries there is a lack of solid information about the number, value and impact of these older types of micro-credentials. Thus, there is already a significant gap in the literature that when coupled with growing interest in newer types of micro-credentials warrants further investigation. In this paper, we respond to this need by describing a comprehensive work in progress to establish the current global state of micro-credentials in the literature.

Framing the Box

This literature review does not take place in a vacuum. It is framed by a larger socio-economic ecosystem involving a range of actors and stakeholders. To reflect this bigger picture and several macro-level global trends and change forces the review is anchored in the following framing assumptions:

- The growing skills gap is real
- The nature of work is changing
- The digital transformation of society is impacting all our lives
- The current rate of participation in lifelong learning needs to increase
- The old frontloading model education is insufficient to prepare people for live
- The challenge of greater social and economic inclusion should concern everyone
- The public and private benefits of investing in further and higher education are well established
- The development of micro-credentials should in theory contribute to societal and individual benefits

It is also important to note that the literature review is framed by a strong European focus, which reflects the interests of the funding agency supporting the research and EU States in developing a common European approach to micro-credentials. The study is predicated on the assumption that such an approach has the potential to uniquely position Europe to build a more future-fit credential ecosystem that can also influence future global developments in micro-credentials.

Research Questions

The first challenge according to Bedenlier et al. (2020) is to define the scope of any literature review and depth and breadth of the research questions. In this case the research sought to investigate what the global literature currently says about micro-credentials. To achieve this objective, the literature review and critical and interpretative analysis is structured around 10 research questions:

- What is the problem and issue that micro-credentials are seeking to address?
- What are the underlying drivers and attractors of the micro-credential movement?
- How are micro-credentials being positioned within the credential ecology?
- How are different stakeholders responding to the micro-credentials movement?
- What are the main benefits arising from the development of micro-credentials?
- What are the benefits of adopting a European-wide approach to micro-credentials?
- What are the major barriers for the successful implementation of micro-credentials?
- What are the major enablers for the successful implementation of micro-credentials?
- What evidence is there that further development of micro-credentials will contribute to a more future-fit education system?
- What evidence is there that further investment in micro-credentials will lead to tangible individual and societal benefits?

Table 1: Summary of Research Questions by Major Thematic Focus

Research Question	Thematic Focus				
	Why	What	Who	How	Where
1. What is the problem that micro-credentials are seeking to address?					
2. What are the underlying drivers and attractors of the micro-credential movement?					
3. How are micro-credentials being positioned within the credential ecology?					
4. How are different stakeholders responding to the micro-credentials movement?					
5. What are the main benefits arising from the development of micro-credentials?					
6. What are the benefits of adopting a European-wide approach to micro-credentials?					
7. What are the major barriers for the successful implementation of micro-credentials?					
8. What are the major enablers for the successful implementation of micro-credentials?					
9. What evidence is there that further development of micro-credentials will contribute to a more future-fit education system?					
10. What evidence is there that further investment in micro-credentials will contribute to tangible individual and societal benefits?					

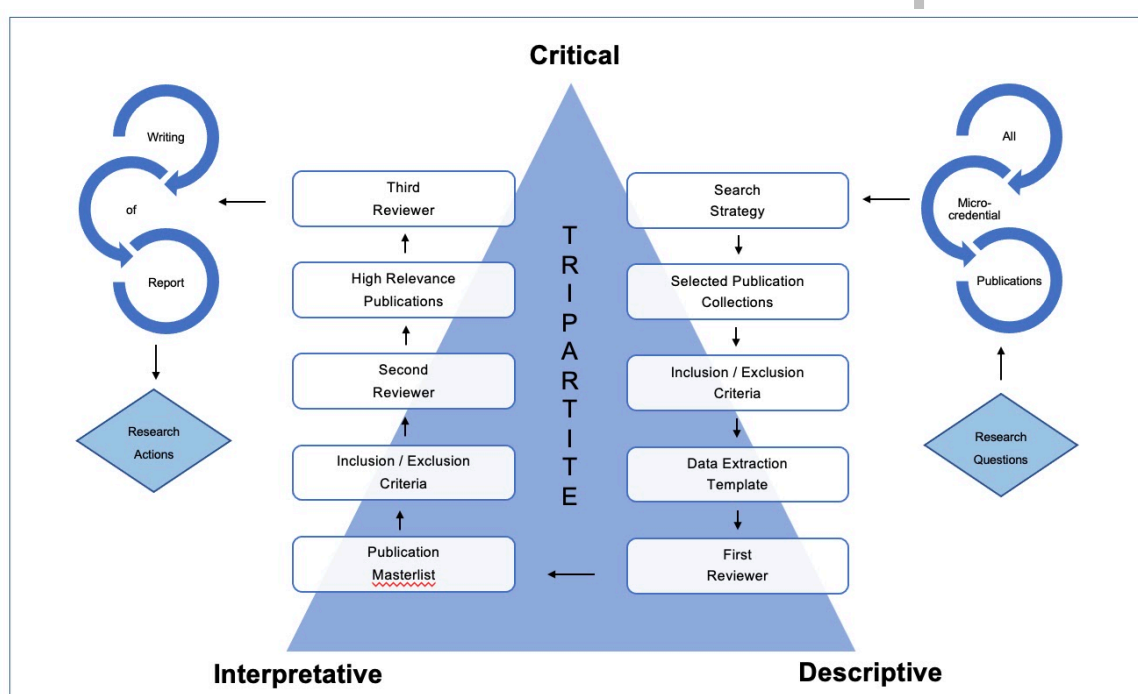
Woven across these questions are five major themes which ask the ‘why?’, ‘what?’, ‘who?’, ‘how?’ and ‘where?’ of micro-credentials. Table 1 illustrates how the research questions relate to each of the thematic areas. The initial work in developing the research questions, thematic areas and framing assumptions helped to situate the review theoretically. They bound the study and confirmed the merits of undertaking such a comprehensive analysis of the literature at this time.

In the next section, we report how we went about opening up the micro-credential box by providing a detailed account of the methodology and sample selection process which forms the basis of the literature review.

Opening Up the Box

Given the current high level of interest globally in the area of micro-credentials and the way in which the term has become the latest buzzword, it was important to situate the review theoretically based on contemporary methodological guidance (see for example, Pigott & Polanin, 2020). There is a wealth of literature on the art and science of conducting comprehensive and systematic literature reviews (Alexander, 2020). It is well established that such reviews of the literature when done well make valuable contributions to the knowledge base of a field and can be advantageous to policy-makers, practitioners, and researchers alike (Polanin & Dell, 2017). They have the potential to offer a unique vantage point to help shape future research, theory and practice.

Figure 1: The Tripartite Methodological Approach



However, not all literature reviews are created equally or apply the same level of methodological rigour, with Grant and Booth (2009) identifying 14 different review types and methodologies. Accordingly, this literature review can be described as an effort to provide a

‘state-of-the-art’ account of major trends and matters of priority in a relatively new field to support further implementation, policy development and future investigation. However, ‘theory is one thing, practice another’ (Bedenlier et al., 2020, p. 113), particularly given the tight timeframe given by the European Commission to complete the study. Therefore, to implement the methodology, a tripartite approach was adopted where the review process and investigation of the literature was woven across three phases: descriptive, interpretative, and critical, as illustrated in Figure 1.

The first phase of this tripartite approach involves a descriptive summary of the literature. This process helps to provide a helicopter overview of recent publications in the field offering a general profile and positioning of micro-credentials. The second phase goes beyond a description of what is published by adding a deeper level of interpretative analysis identifying major themes, emerging trends and relationships apparent in the literature. In this phase, the core focus is extracting the most important ideas or themes and comparing and contrasting different viewpoints to identify areas of similarity and difference. This phase helps to spotlight gaps, tensions and inconsistencies in the literature, which provides the foundation to a deeper level of critique. Through a critical lens, this last phase takes a closer look at competing claims, contrasting viewpoints and contradictory evidence to reveal areas of debate, unresolved tensions and important gaps requiring further attention to advance the field and more fully answer the research questions. This final phase usually culminates in a constructive manner with proposed actions and recommendations.

Steps in the Search Strategy

The first challenge given the relative immaturity of the literature was formulating the appropriate search parameters, defining the scope of the study and primary literature sources, and specifying the search string of terms to help identify relevant publications. As described in Borah et al. (2017; cited in Bedenlier et al., 2020), “...the scope of some reviews can be unpredictably large, and it may be difficult to plan the person-hours required to complete the research” (p. 118). While this challenge applied to our review, the initial search strategy was assisted by the fact that the National Institute for Digital Learning (NIDL) at Dublin City University (DCU) already maintains a comprehensive collection of publications known as *The Micro-credential Observatory* [<https://www.dcu.ie/nidl/micro-credential-observatory>]. This Observatory contains links to over 150 publications related to micro-credentials.

The *Micro-credential Observatory* became the first collection of publications to contribute to a masterlist that would form the research sample. The second source of literature was a collection of 40 publications supplied by the European Commission. As many of these publications also appeared in the *Micro-credential Observatory*, the next task was to compare the two collections and develop a combined masterlist that could be considered for review based on relevant inclusion and exclusion criteria. However, the existence of the Observatory and European Commission list did not circumvent the need to identify other library and publication databases and to more precisely define search strings that would be used to help locate relevant literature.

Therefore, the search involved the use of the Scopus and Web of Science publication databases as well as Google Scholar using several different search terms. These terms included both hyphenated and unhyphenated spelling of ‘micro-credential’ and a range of synonyms. The choice of these terms was more challenging than anticipated largely due to a wealth of literature in the more general area of ‘open digital badges’ which sometimes made cursory reference in the body of the work to the term ‘micro-credential’. Brown, et al. (2021b) have previously noted that a common point of confusion and contention is the relationship between the terms ‘micro-credential’ and ‘digital badge’, which was evident during the initial search strategy. After testing a combination of terms, a decision was taken to limit the search in these two main library databases to variations of the term ‘micro-credential’, ‘alternative credential’ and ‘digital credential’ appearing in the title, abstract or keywords.

As illustrated in the following tables, it was not feasible given the volume of literature or deemed particularly valuable to extend the search beyond this string of terms as a preliminary review of several leading digital badge publications showed little or no relevance to the current study. Table 2 reports that 149 publications related to micro-credentials were identified in Scopus using the above search parameters. As mentioned above, before limiting the search string a selection of seminal open and digital badge publications (e.g., Ifenthaler et al., 2016; Mah, 2016; Liyanagunawardena, et al., 2017) were reviewed to determine their relevance to the study, particularly from a European perspective. On a side note, the number of publications found through this search is at odds with Selvaratnam and Sankey’s (2021) claim that a library search of the term ‘micro-credentials’ “...did not return meaningful results” (p.9).

Table 2: Summary of Results from Scopus Database Search

Scopus Search Date:18/06/2021 Date Parameters: 2015 - 2021 Search Strings								Results		
								Title, Abstract or Keywords	Abstract Only	Title Only
1	micro-credential* OR microcredential*							98	73	34
2	micro-credential* OR microcredential*	OR	"alternative credential*" OR "digital credential**"					149	117	41
3	micro-credential* OR microcredential*	OR	'alternative credential*' OR 'digital credential*'	OR	'digital badge*'			364	316	178
4	micro-credential* OR microcredential*	OR	'alternative credential*'	OR	'digital badge*'	OR	'open badge*'	398	349	206

A date range of 2015-2021 (June) was applied to the returns that were generated by these searches. Results from a search using the above terms through the Web of Science returned fewer results than Scopus and there was a high match between the two databases. Thus, Scopus

was deemed a more complete publication collection for the purposes of this literature review. In the case of Google Scholar, the search was limited to publications where the string of terms only appeared in the title. As Table 3 shows, inclusion of the search terms appearing in the body of the work would have increased the result to thousands of publications, including all manner of grey literature with limited relevance to the current study. However, this result did raise the challenge of how to systematically locate and incorporate relevant grey literature as part of the search strategy. This was achieved through a separate Google search where the return was limited to the top 50 items based on the key terms. It was found that returns beyond the first 50 did not yield any publications likely to meet the Inclusion Criteria.

Table 3: Summary of Results from Google Scholar Search

Google Scholar		Results	
Search Date:18/06/2021 Date Parameters: 2015 - 2021		Anywhere in Article	Title only
Search Strings			
1	microcredential OR micro-credential OR microcredentials OR micro-credentials OR micro-credentialing OR microcredentialing	3090	153
2	microcredential OR micro-credential OR microcredentials OR micro-credentials OR micro-credentialing OR microcredentialing OR "alternative credential" OR "digital credential" OR "alternative credentials" OR "digital credentials"	4840	
3	microcredential OR micro-credential OR microcredentials OR micro-credentials OR micro-credentialing OR microcredentialing OR "alternative credential" OR "digital credential" OR "alternative credentials" OR "digital credentials" OR "digital badge"	5650	
4	microcredential OR micro-credential OR microcredentials OR micro-credentials OR micro-credentialing OR microcredentialing OR "digital badge" OR "digital badges"	6480	
5	microcredential OR micro-credential OR microcredentials OR micro-credentials OR micro-credentialing OR microcredentialing OR "digital badge" OR "digital badges" OR "open badge" OR "open badges"	8210	

A further dimension to the search strategy was locating relevant publications produced by government agencies and international organisations that may not appear in high-level Google searches or traditional academic databases. To identify this body of literature a targeted search was undertaken of official government and organisational websites known for their interest in micro-credential initiatives. With only a handful of exceptions, this category of literature was found to already be available through the *Micro-credential Observatory*.

To recap, the literature review adopted a multipronged search strategy involving the following data sources:

- Micro-credential Observatory
- European Commission publication database
- Scopus and Web of Science publication databases
- Publication titles appearing in Google Scholar

- First 50 publications arising from a Google search
- Publications produced by government departments and agencies
- Publications produced by selected global and supranational organisations

An additional strategy to validate the search methodology and ensure the inclusion of relevant literature was an invitation to known experts working in the field to nominate relevant publications. This strategy resulted in four additional publications for consideration in the research sample.

Inclusion and Exclusion Criteria

Table 4 describes the Inclusion and Exclusion Criteria that set parameters on the initial sample of publications. Importantly, this state-of-the-art literature review includes only relevant publications produced since 2015. This date was chosen as it marks the time when the level of interest in the term ‘micro-credential’ was beginning to rapidly increase based on Google Trends data. It was also chosen as an important turning point in the field due to the release of several seminal publications after this date. As the criteria illustrate, most short opinion pieces, unpublished conference papers and grey literature were excluded from the literature review. The exception is where this literature reported empirical data or provided information on new developments in the field not yet available in formally published works.

Table 4: Inclusion/Exclusion Criteria for Initial Sample

Inclusion Criteria	Exclusion Criteria
Publications covering the period 2015 to 01 July 2021	Publications prior to 2015
Publications that appear in the Micro-credential Observatory	Publications for which the full text is not readily available
Publications in Scopus or the Web of Science databases that refer to micro-credentials, alternative credentials or digital credentials in either the title, abstract or keywords	Publications not written in English or with an English translation available
Publications in Google Scholar that refer to micro-credentials (and variations of spelling) in the title	Publications authored or produced by platform or commercial suppliers that fail to report evidence, empirical data or an innovative case study
Publications that refer to micro-credentials produced by government agencies, professional bodies, credible industry sources and/or supranational organisations	Publications that refer to micro-credentials or equivalent terms in grey literature (i.e., blogs, webinars, media commentaries, conference presentations, etc.) that merely comment on other published reports or what is already known and thus do not contribute to new knowledge
Publications that refer to micro-credentials in grey literature (i.e., blogs, webinars, media commentaries, conference presentations, etc.) that provide empirical data or critical commentary not previously published through other sources	Publications where the main focus is on digital badges and there is no explicit reference to micro-credentials or equivalent terms that either align with or inform the proposed European-wide approach

Collecting the Data

The development of a data extraction template was crucial to the review process. A draft version of the template was developed as a Google form, which was refined by the research team over several meetings. While the research team considered using several purpose designed technology solutions to support the literature review, including Rayyan [<https://www.rayyan.ai>], Leximancer [<https://www.leximancer.com>] and EPPI-Reviewer [<http://eppi.ioe.ac.uk/cms/>], the tight timeframe gave limited opportunity to pilot and implement new software. Therefore, a Google form was chosen as data could be easily exported to a Microsoft Excel spreadsheet for further analysis. The next step was validation and further refinements to the template after piloting it by reviewing 25 major publications appearing in the *Micro-credential Observatory*. Several valuable revisions to the original template were made to refine the sub categories to enable a deeper and more extensive level of analysis. The final version of the validated data extraction template contained 34 subcategories.

Identifying High Relevance Publications

The original Inclusion and Exclusion Criteria identified 149 publications that constituted the initial research sample. A second set of Inclusion and Exclusion Criteria were then developed to screen those publications most relevant to the European context of the present study. These criteria included alignment to the proposed European approach to micro-credentials as well as literature offering useful contrasting perspectives or insightful critique. The purpose of this additional phase was to narrow the focus to a subset of literature which had greater European relevance in terms of conceptual clarity, policy salience, maturity of implementation, empirical research, valuable critical perspectives, and so on.

In the review process, the first reviewer assigned the publication into one of three levels of relevance: high, medium and low. Notably, of the 45 publications categorised as of high relevance, 87% (n=39) already appeared in the *Micro-credential Observatory*. After the first reviewer completed the data extraction template, a second review was undertaken by a second member of the research team to validate the analysis. An important aspect of this second review was validation of the overall relevance ranking. The 45 publications identified with high rankings then underwent a further analysis by a third member of the research team to extract relevant data and to compare and contrast this subset of publications as part of the interpretative analysis phase. This process meant that all high ranked publications were independently reviewed by three members of the team.

Looking Beyond the Box

Finally, it is important to note that during the course of searching the literature, several relevant publications were identified from outside of the core literature that did not meet the Inclusion Criteria. While they did not explicitly focus on the concept of micro-credentials, their wider scope in terms of the credential ecology and efforts to promote employability or life-long learning were often relevant to the study. One example was a recent OECD Skills Outlook Report (OECD, 2021) that focuses on promoting effective transitions into further education, training and the labour market and on engaging adults in life-long learning. This report

identifies important differences in learner persona, how opportunities for further training and professional development depend on the type of employer, and deeper structural barriers and enablers for promoting life-long learning that do not feature in the micro-credential literature. Thus, where appropriate, relevant findings from this horizontal literature were used in the interpretative analysis stage to broaden the discussion. Lastly, the field is particularly dynamic and over the period of data collection, publication review and the writing process (May to September 2021) several new reports were released on micro-credentials. Every effort was made to incorporate these new publications in the review process.

Unboxing the Literature

This section provides a brief descriptive analysis of the literature before the focus moves to reporting some of the major themes and key findings. For comparative purposes, a separate analysis of the subsample of publications ($n=45$) deemed to be highly relevant to the current European context is presented in the following tables alongside the larger sample. It is noteworthy that over three-quarters of the sample of 149 publications have been published since the start of 2019. The sample consists of a wide range of publication types with literature categorised as reports being the most frequent (30%), followed by journal articles (25%). Table 5 shows how the micro-credential literature has accelerated over time, with 93% of the highly relevant publications produced in the past 2-3 years.

Table 5: Distribution of Publications by Year

Year	All publications		Highly Relevant	
	<i>n</i>	%	<i>n</i>	%
2015	4	2.7	0	0
2016	10	6.8	1	2.2
2017	13	8.8	0	0
2018	15	10.1	2	4.4
2019	26	17.6	7	15.6
2020	46	31.1	19	42.2
2021	34	23.0	16	35.6

The publications come from over 20 different countries, with the United States the most frequent origin (36%), followed by Australia (16%), and Canada (12%). Regionally, approximately half of the publications come from the Americas (49%), followed by Europe (31%) and then Asia-Pacific (20%). Notably, the overwhelming majority of the literature reviewed (95%) were categorized as being positively disposed to micro-credentials.

Further analysis, compares how the frequency of the publications across the years differs by country. To keep the analysis concise, in Table 6 Europe is reported as a single category. This comparison shows that Australia and the United States have been publishing in the area of micro-credentials at a consistent level over the past years. In contrast, publications from Canada and Europe are both more recent, and more numerous.

Table 6: Distribution of Publications by Country and Year (All Publications)

	Australia		Canada		Europe		United States	
Year	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
2021	6	25.0	9	50.0	13	28.3	5	9.4
2020	5	20.8	7	38.9	21	45.7	12	22.6
2019	7	29.2	2	11.1	8	17.4	7	13.2
2018	1	4.2	0	0	3	6.5	8	15.1
2017	2	8.3	0	0	0	0	11	20.8
2016	3	12.5	0	0	0	0	7	13.2
2015	0	0	0	0	1	2.2	3	5.7

In terms of the scale of focus (e.g. local, regional, national, etc.), 40% of the publications have a national focus (40%), with another 24% a more international outlook. Just under half of the wider sample of publications (48%) reference empirical data, either collected through research, or cite and comment on other sources, whilst a slight majority do not. An analysis of the methodological strength of the empirical data reported reveals that only around 10% of the publications to do so based on a strong methodological design. Approximately one third of the publications reporting empirical data were found to have a weak design but the highly relevant sample differs in its profile under this category, as over 80% of the publications were judged to be either ‘strong’ or ‘moderate’ in terms of the methodological strength.

Table 7 presents a distribution of the publications by sector of interest. Publications often focus on more than one sector, and as such the reviewer team had the option of selecting multiple sectors of interest. Despite this, the vast majority of publications considered micro-credentials in the context of Higher Education (85%). Other key stakeholder sectors were not as frequently considered, with Employers, Employees and the MOOC sector making up 10% of the sector focus respectively. A similar trend was also reflected in the highly relevant subsample, where an overwhelming 93% of the sample focused on Higher Education, although intentionally given the Inclusion Criteria there were a greater proportion of Employer and Industry focused publications. The combined Vocational, Further Education and Training sectors consisted of less than 30% of the publications across both samples.

Table 7: Distribution of Publications by Focus or Sector

Sector	All publications		Highly Relevant	
	<i>n</i>	%	<i>n</i>	%
Higher Educations	126	85.1	42	93.3
Vocational and Further Education and Training	42	28.4	12	26.7
Industry / Corporate	26	17.6	15	33.3
MOOC Sector	15	10.1	6	13.3
Community Organisation	2	1.4	1	2.2
K-12 Schools	8	5.4	0	0
Employers (i.e., recruitment, training, etc.)	15	10.1	9	20.0
Employees (i.e, CPD, career benefits, etc.)	15	10.1	7	15.6
Societal (i.e., future private and public benefits)	11	7.4	8	17.8
Cross-sector	8	5.4	7	15.6
Other	1	0.7	0	0.0

In terms of the main purpose of the publications, they predominantly sought to develop knowledge surrounding micro-credentials (72%), inform policy (55%), and inform practice (49%). A similar pattern exists among the highly relevant publications, although working toward a definition (47%) and establishing the current state of play (42%) also feature prominently as objectives among this subsample. Notably, only a limited number of publications across both samples sought to promote debate and critique.

Why Such a Buzz Word?

The above descriptive analysis of the literature confirms how micro-credentials have become a ‘hot topic’ in the published literature over the last few years. Why is this the case? In the following interpretive and more critical analysis of the literature we explore the question, ‘Why Micro-credentials?’

In answering this question, we found in the literature inherent tensions, mutually nested connections and competing worldviews between the drivers and attractors associated with micro-credentials. Based on the premise that ‘It is theory that decides what we can observe’ (Stachel, 2002, p. 238), the literature serves to remind us that the global education system is made from a colour palette with conflicting ideological, epistemological, and pedagogical assumptions. Although overly simplistic at the root of these assumptions are two broad worldviews: (i) the age-old tradition of the Learning Society, and (ii) the increasing influence

of the Knowledge Economy. A strong Knowledge Economy discourse is woven throughout the micro-credential literature covering a broad variety of areas related to employability, upskilling and the changing nature of work. These drivers were usually supported by publications making bold predictions such as “...that around 85% of the jobs that today’s learners will be doing in 2030 haven’t been invented yet” (The Institute for the Future, 2017, p. 14).

Table 8: Drivers and Attractors for Micro-credentials

	All Publications		Highly Relevant	
	n	%	n	%
Increase employability	94	63.5	38	84.4
Support CPD and workplace training	88	59.5	28	62.2
Increase flexibility for learning	80	54.1	34	75.6
Close skills gaps in response to changing nature of work	74	50.0	32	71.1
Promote lifelong learning	71	48.0	30	66.7
Develop 21st Century transversal skills	50	33.8	23	51.1
Develop a new 21st Century credential ecology	35	23.6	22	48.9
Increase access and pathways to formal education	30	20.3	17	37.8
Support new models of pedagogy	27	18.2	12	26.7
Respond to COVID crisis	23	15.5	14	31.1
Reflects Neo-liberal market forces	22	14.9	5	11.1
Test innovations and trigger changes	13	8.8	6	13.3
Reduce costs of education and training	12	8.1	5	11.1
Increase equity for under-represented groups	12	8.1	6	13.3
Promote major education system reform	10	6.8	4	8.9
Increase institution revenue and reputation	6	4.1	3	6.7
Promote Sustainable Development Goals	5	3.4	4	8.9
Respond to changing demographics	3	2.0	3	6.7
Provide more personalised learning	0	0	0	0

At the same time, understanding of the rapid growth of the micro-credential movement requires a type of double vision as imbued and woven throughout the competing and co-existing discourses are efforts to promote new models of pedagogy, more flexible curriculum design and delivery, and pathways to life-long and life-wide learning in the tradition of the Learning Society. From a learner perspective, micro-credentials are posited to provide an alternative and complementary approach to the flexible, accessible and affordable learning that 21st Century learners increasingly require (Oliver, 2019). As Brown, et al. (2021c) state:

Frontloading skills and competences through our schools and universities is not sufficient to prepare active and well-educated citizens for the rapidly changing nature of work and actively participate in building a more sustainable future (p. 2).

At a macro-level, therefore, the grand narratives and contrasting languages of persuasion associated with the micro-credential movement are part of a complex milieu of change forces and social, cultural, and economic influences. The following quote provides a useful example of the multifaceted drivers and attractors for micro-credentials in institutions of higher education:

...organisations have different motivations to enter this market. HEIs offer alternative credentials for several reasons, including increasing their visibility and reputation, experimenting with new pedagogies and technologies, generating additional income or reducing costs, as well as increasing their responsiveness to learners' and labour markets' demands (Jansen & Schuwer, 2015; cited in Kato, Galán-Muros & Weko, 2020, p. 21).

Table 8 hones in on the drivers and attractors stated (both implicit and explicitly) in literature considered as to why individual, educational and training systems, industry bodies and government agencies, to name a few, should and are engaging with micro-credentials. Many of these drivers and attractors are not unique to micro-credentials, but rather span an array of policy areas linked to the development of broader societal and economic agendas. Notably and unsurprisingly, therefore, within the review of all publications and those classified as highly-relevant, four out of the top five drivers relate specifically to work and training related factors with employability being the number one driver/attractor in both samples.

A more detailed analysis of the literature by region revealed that the European context placed greater emphasis on increased flexibility for learning, the promotion of life-long learning and employability as the top three drivers/attractors for micro-credential development. In contrast, employability, closing the skills gap and supporting work-based training and continuous professional development were more prevalent Knowledge Economy drivers/attractors for the Americas and Asia-Pacific. This geographical difference suggests that some factors are more in play than others depending on the social-cultural context and the extent to which education is positioned as a private or public good. What is clear is that micro-credentials are being positioned quite squarely as a means to catalyse and progress a number of distinct, and distinctive, processes and ends, advancing a myriad of agendas, including those associated with

and those which traverse social protection, labour markets and educational and training systems.

While the need to develop more life-long learners and invest in reskilling to help get people back to work following the COVID crisis is part of the current ‘playbook’, not everyone accepts the underlying drivers or arguments supporting the development of micro-credentials. For example, Buchanan et. al. (2020) claim that:

...preoccupation with aspirational curriculum reforms like ‘21st century skills’ and ‘micro-credentials’ promoted to achieve employment growth can be a distraction from what successful education systems can achieve (p. 2).

A participant in a recent survey on the status of micro-credentials in Canadian colleges and institutes reports:

Micro credentials started as an idea but remains a solution looking for a problem. It remains an unproven concept for most jurisdictions and institutions. It lacks common understanding and definition... To be clear, the idea may have merit, but I remain cautious and somewhat skeptical (Colleges & Institutes Canada, 2021, p. 12).

In a stinging theoretical critique of micro-credentials, Ralson (2021, p. 83) adopts a Postdigital-Deweyan perspective to argue they are nothing more than a case of ‘learning innovation theater’. Beyond being a novelty factor, at a deeper level, Ralson (2021) claims that higher education institutions are selling their soul to business interests and market forces by unbundling the degree to quickly bolster their profits. A newfound emphasis on future skills and vocational training is at the expense of educating the whole person. As Ralson (2021) writes:

The craze represents a betrayal of higher education’s higher purpose and a loss for students and faculty who continue to see university learning as more than vocational training (p. 92).

This line of critique argues the drive to unbundle the traditional degree can be traced to the forces of the ‘neoliberal learning economy’ (Ralson, 2021, p. 83). From this viewpoint, Higher Education takes the form of a commodity, a product or service, marketed and sold and acquired like any other commodity in this economy. While Wheelahan and Moodie (2021) offer a similar line of critique arguing that micro-credentials are ‘gig qualifications for a gig economy’, explicit neo-liberal drivers were evident in fewer than 15% of publications. This finding illustrates that sweeping generalisations are unhelpful as the literature on micro-credentials reveals they have many different sides and should not be treated or generalised as a single uniform entity. The critical point is that the micro-credentialing movement is part of a wider social practice.

While micro-credential drivers centred on a wide range of societal issues, particularly employability and life-long learning-related agendas, other key policy areas such as green transitions, wider climate concerns, and equity and social inclusion were only sparsely referred to in the literature. This gap was also noted with respect to achieving and implementing the wider UNESCO Sustainable Development Goals (SDGs), although Oliver (2019) in her seminal report positions a change in educational models through micro-credentials as key to achieve:

...a better and more sustainable future by addressing global challenges related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice (p. 35).

Where do they fit?

The literature review confirms that internationally the definition of micro-credentials varies significantly depending on who is using the term and in what context. Table 9 reveals that more than 35% of the wider sample of publications give no definition whatsoever of micro-credentials and only 15% explicitly support an existing definition in the literature. Around one third (32%) of the publications provide their own definition, which is not generally anchored in or built on an existing definition. The highly relevant sample tends to be more explicit in stating a definition, with 58% of the publications either providing their own definition or supporting an existing one.

Table 9: The Positioning of Micro-Credentials

Position	All Publications		Highly Relevant	
	n	%	n	%
Alternative to mainstream education (i.e., operates separately)	20	13.5	3	6.7
A supplement rather than substitute to existing degrees (i.e., co-exists)	46	31.1	8	17.8
Embedded in mainstream education	35	23.6	13	28.9
A new entry pathway to mainstream education	1	0.7	0	0
To bridge informal, non-formal and formal learning	10	6.8	1	2.2
Reimagined partnership model	1	0.7	0	0
Disrupt traditional 19th Century recognition model	3	2.0	1	2.2
Recognises multiple approaches	28	18.9	16	35.6

Further analysis indicates that most of the literature can be classified under one of four broad positions: ‘Alternative’, ‘Supplementary’, ‘Embedded’ or ‘Multiple Approaches’. Assigning publications to only one of these categories required an analysis of whether micro-credentials were being positioned as a core or mainstream initiative as opposed to an alternative, complementary or supplementary type of credential. Typically the ‘Multiple’ category recognised micro-credentials as more of an umbrella concept that could be positioned as embedded within formal qualification frameworks as well as on the edge of the credential ecology. A Supplementary positioning (31%) was the most common way in which micro-credentials are being viewed in the wider sample of literature and when combined with the Alternative (14%) category, totals 45% of the publications. A more Embedded orientation (24%) is less common. However, when this category is combined with a Multiple viewpoint (19%), the literature is roughly divided between those publications positioning micro-credentials as ‘outside’ of the mainstream and those advocating a more ‘inside’ perspective. These two broad positions help frame the current literature on micro-credentials.

Surprisingly, despite comments appearing in blogs, vendor claims or short media pieces that micro-credentials are a disruptive innovation and potential game changer in terms of traditional recognition models, this perspective is not strongly reflected in the published literature. Indeed, only three publications were singularly coded under this category. A handful of publications coded as ‘Other’ are worthy of mention as they position the micro-credential movement as a threat to the formal education and training system. For example, a joint Trade Union position paper states:

We are deeply concerned that the strong focus on micro-credentials can lead to bypassing formal education systems, while the recent public health crisis has shown how important education is (ETUC/ETUCE, 2020, p. 3).

However, this view is somewhat at odds with the number of existing older micro-credentials and the prevalence of non-degree qualifications. The above mentioned critiques of the micro-credential movement also reflect a degree of university elitism and protectionism. As already mentioned, the literature is dominated by the higher education sector, and at times the positioning of micro-credentials through the language of alternative or supplementary offerings gives the impression that it serves to protect the high status of traditional macro-credentials. This point is evident in an opinion piece from a senior Australian university leader:

As we enter the age of post-COVID digital learning I’ll keep considering micro-credentials. But, I’ll be prioritising making part-time and full-time online study ever more accessible, and carefully guiding students to and through proper degrees (Crossley, 2021).

Having said that, concern about the fit-for-purpose nature of university education is a common thread in the literature. For example, deLaski (2019) suggests that in the United States, degrees are no longer the most valuable workforce currency as more nuanced competencies are gaining traction. The so-called ‘sheepskin’ effect of higher education where ‘the intrinsic worth’ has little to do with the time and effort that students devote to their studies, but rather the parchment

obtained at the end, is believed to be losing its employability value (Technológico de Monterrey, 2019). Whether or not this is true, this concern identifies one of the reported benefits for higher education institutions from developing a micro-credential implementation strategy. By analogy there is evidence from around the globe that some institutions and university consortia are embracing micro-credentials as a digital Trojan Horse for redesigning the traditional curriculum to prepare more work-ready students and graduates (see for example, ECIU, 2020; Selvaratnam & Sankey, 2020; Technológico de Monterrey, 2019). Cote and White (2020) expand on why educational institutions need to develop micro-credentials to help modernise the curriculum:

First, traditional teaching and learning models have not adapted adequately to changing student demands and labour market needs. Higher education — particularly the university sector — has been confronted with a growing list of critiques to the still-dominant, campus-focused program models: long and relatively inflexible programs; inadequate recognition of prior learning; slow or limited innovation in pedagogy; insufficient student supports for career-readiness; weak alignment to labour market needs; and a limited commitment to online and digital-enabled learning (p. 8).

It is important to note that these positions are somewhat more fluid than suggested in the above quantitative analysis and there is evidence of changing thinking and cross pollination of definitions in response to new developments in the area. The influence of Beverley Oliver's work is apparent where wording from her umbrella definition for micro-credentials in a seminal report (Oliver, 2019) appears in government initiatives in Malaysia as well as the definition provided by Colleges and Institutes Canada (2021). A UNESCO report reflecting the value of a more connected credential landscape makes the point that the term 'micro-credential' is an umbrella term that "...encompasses various forms of credential, including 'nano-degrees', 'micro-masters credentials', 'certificates', 'badges', 'licences' and 'endorsements'" (Chakroun & Keevy, 2018, p.10).

The work in 2020 of the European Commission's Higher Education Consultation Group on Micro-credentials to develop a common definition and European-wide approach to the area is unprecedented elsewhere in the world. The following definition proposed by the Consultation Group goes some way to addressing some of the confusion and lack of common language around micro-credentials:

A micro-credential is a proof of the learning outcomes that a learner has acquired following a short learning experience. These learning outcomes have been assessed against transparent standards (European Commission, 2020, p. 10).

This definition makes it explicit that a micro-credential is a documented statement awarded by a trusted body to signify that a learner upon assessment has achieved learning outcomes of a small volume of learning against given standards and in compliance with agreed quality assurance principles (Brown, et al., 2021b). Implicit in this working definition is that micro-

credentials should be referenced to, or embedded within, the European Qualification Framework (EQF) as well as National Qualification Frameworks.

While there is no equivalent comparison to the way Europe is responding to micro-credentials, valuable lessons can still be learned from the international literature. The need to engage employers, the VET sector and more of the key stakeholders identified in the next section will be crucial to building a more connected path and future-fit credential ecology. A recent global initiative by UNESCO is also worth noting as it is attempting to address the challenge of “...coming to a consensus on a common proposed definition, in the hope of assisting the field to move towards a common definition” (Oliver, 2021, p. 4). A preliminary report published in September 2021 proposes a definition arrived at through a consensus-building process working with a panel of 47 global experts. Oliver (2021, p. 5) writes that the proposed definition is not intended to replace national or regional definitions, but rather is an attempt to distil what experts “agree that they agree on” about micro-credentials. Importantly, the preliminary UNESCO report and following proposed definition is intended to support a global conversation towards a universal definition rather than the last word.

A micro-credential:

- Is a record of focused learning achievement verifying what the learner knows, understands or can do;
- Includes assessment based on clearly defined standards and is awarded by a trusted provider;
- Has stand-alone value and may also contribute to or complement other micro-credentials or macro-credentials, including through recognition of prior learning; and
- Meets the standards required by relevant quality assurance (Oliver, 2021, p. 4).

In summary, there is strong consensus in the literature that the lack of a shared definition is currently the most substantial barrier to further development and uptake of micro-credentials (Shapiro Futures, Andersen & Nedergaard Larsen, 2020). The status of these credentials is unclear in many countries as they are positioned as being alternative or supplementary to traditional macro-credentials. Only in a few jurisdictions are they embedded in formal qualifications frameworks. As noted by the OECD:

Despite an increasing volume of these new credentials, great uncertainty persists. Definitions and taxonomies to structure these new credentials have not been widely agreed. The extent of their offer remains uncertain, evidence of their impacts is scant, and the response of governments to these new offerings has not been systematically documented (Kato, Galán-Muros & Weko, 2020, p. 7).

What’s Not in the Box?

We have shown that worldwide there has been a tendency for higher education institutions to dominate the micro-credential literature and the related discourse tends to ignore many

different types of non-degree credentials that attest to what people know and are able to do in a range of work and community settings. This finding illustrates how despite pressures to disrupt the traditional degree many universities are responding to the micro-credential in a similar way to the MOOC by enculturating the movement, which serves to retain their status and cultural privilege. The voice of the VET sector is relatively silent in the literature along with the role of employers and employees/learners. The analysis presented earlier in the report paints a broad picture of the key stakeholders, which is largely mirrored in Table 10 reporting the main sources of empirical data collected on the use or potential of micro-credentials. It shows that Educators (and their institutions) have been the main source of data with nearly 55% of publications from the wider sample reporting they were the focus of research. Learners and Employers make up the next largest group with each roughly one-quarter of the publications.

Table 10: Publications by Source of Empirical Data

Data Source	All publications		Highly Relevant	
	<i>n</i>	%	<i>n</i>	%
Educators	39	54.9	18	72.0
Employers	20	28.2	13	52.0
Employees	13	18.3	6	24.0
Learners / Students	19	26.8	2	8.0
Government	5	7.0	5	20.0
Accreditation bodies	4	5.6	2	8.0
MOOC Providers	6	8.5	3	12.0
Supra-national bodies (e.g., OECD)	3	4.2	3	12.0

The idea that micro-credentials are a vehicle or disruptive force to encourage higher education institutions in particular to forge new industry links or partnership models was not prominent in the positioning revealed by this analysis. As previously shown, fewer than 20% of the publications had any industry or corporate sector focus. While micro-credentials were seen as a way for colleges and universities to better prepare work-ready graduates, and engage in more continuous professional development, there were few examples in the literature advocating a codesign model with industry. Moreover, several high-profile industry initiatives which in the case of Google have an explicit goal of disrupting established education models do not feature prominently yet in the published literature. Other notable stakeholders that receive scant attention in the literature or whose potential influence appears to be underestimated in shaping the discourse around micro-credentials include trade unions, industry and professional regulatory bodies, HR agencies, and specialist career advisors.

What stands out from the analysis of the published literature on micro-credentials is a dearth of in-depth data and empirical analysis. Micro-credentials are largely data deserts when it comes to understanding tangible individual benefits and wider societal impact. Adelman (2017) comments that most analysts would agree we know very little about learner benefits in the micro-credential universe. The paucity of data for Adelman (2017) is a genuine concern of public policy. Presumably, Adelman (2017) goes on to write, governments will increasingly want to account for these learners in national data portraits, if for no other reason than to better document the full extent of engagement in these new and emerging types of credentials. Carnevale, et al. (2020) express a similar concern that we are missing a lot of information from what they call the ‘alternative credential’ universe that potentially involves millions of learners. This sentiment is shared by Kato, et al. (2021) who report:

Comprehensive public data on the provision of alternative credentials are not yet available. National labour force surveys identify years of schooling or levels of educational attainment among survey respondents, but do not contain information about alternative credentials. Administrative data collected by national authorities likewise focus on traditional academic awards conferred by HEIs. Information about participation in the new learning opportunities rests with the providers themselves, among whom large-scale learning platforms appear to offer the most extensive evidence about participants (p. 23).

Conclusion

The micro-credentialing movement does not appear to be losing momentum and is likely to continue to grow over the foreseeable future. While the global micro-credential landscape is currently disconnected across national boundaries, recent efforts by UNESCO and the European Commission are uniquely placed to help develop more clarity and coherence in the development of the architecture of recognition, standards, platforms and related building blocks.

What is clear from the literature, however, is that other key stakeholders are important in shaping this future. Accordingly, consultation exercises, future-focused scenarios and further research needs to be more inclusive by mapping out and actively engaging these actors to determine, ‘possible’, ‘probable’, and ‘preferable’ futures. Broader social, economic, political, cultural and historical norms will also colour and nuance these futures along with key socio-technological ‘tensions’ in the underlying drivers/attractors for micro-credential development. In attempting to ‘unbox’ the micro-credential phenomena and illustrate how universities in particular have appropriated the discourse for their own ends, this paper has shown that better understanding where older and newer types of micro-credentials fit on either the ‘inside’ or ‘outside’ of the education and training system is crucial to building a more connected future-fit credential ecology. There are important policy choices that need to be discussed and understood as part of a wider change agenda.

As the dialogue continues and wider micro-credential implementation progress, a useful bases for shaping the trajectory, engaging in critical dialogue, and planning for unintended

consequences are the following questions that Facer (2021) challenges politicians, policy-makers, educational leaders, and others, to consider:

What and whose knowledges are being used to create these ideas of the future and where are the absences? What processes were used to make these ideas of the future, and why? How does this work address the necessity of decline as well as the possibilities of the new? What are the injustices upon which futures are being envisaged and how are these being addressed? How do principles of intergenerational justice inform the practice? Who will attend to the consequence of these ideas of the future being put into the world and how? What is the role of these futures in creating hopeful politics and practices in the present? Might these futures be used for pathological and extractive speculation, if so, how might this be prevented? How can the distinctive temporality of education be preserved not subordinated to the futures proposed? (p.2).

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