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Enabling micro-credential provision in the technological university sector:

Engineering a coherent and sustainable approach to meet the diverse needs of learners

N-TUTORR Stream 3, May 2024
Prepared by The Department of Technology Enhanced Learning, Munster Technological University, on behalf of the N-TUTORR Project

Green Paper

About this document

This document is an output of Stream 3 of the National Technological University TransfOrmation for Recovery and Resilience (N-TUTORR) project. N-TUTORR is an innovative collaboration across the technological higher education sector in Ireland. It aims to transform learning, teaching and assessment by focussing on transforming the student experience and developing the capabilities of all staff, to address a sustainable pedagogical and learning environment, informed by the UN Sustainable Development Goals.

The N-TUTORR programme is funded by the European Union and Next Generation EU, as part of the National Recovery and Resilience Plan (NRRP) and is co-ordinated by the Higher Education Authority (HEA) and the Technological Higher Education Association (THEA).

This document is a green paper, designed for discussion rather than as a final policy statement, and intended to serve as a foundation for dialogue and collaboration. We welcome and value feedback and suggestions in shaping the evolution of the concepts and ideas presented here. We thank N-TUTORR Stream 1 data analyst Dr Sarah Carroll for their contribution to the executive summary, Figure 1, formatting and minor edits of this report.

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How to cite: Department of Technology Enhanced Learning, MTU (2024). *Enabling micro-credential provision in the technological university sector: Engineering a coherent and sustainable approach to meet the diverse needs of learners.* N-TUTORR. ISBN: 978-1-7395019-4-5

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Version 1, May

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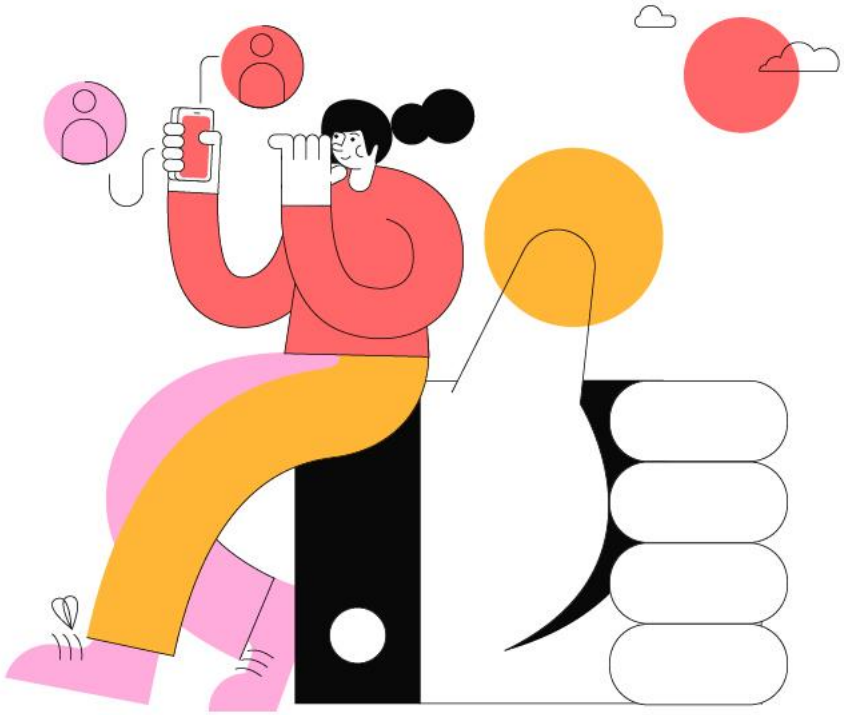


List of Abbreviations

ATU	Atlantic Technological University
CPD	Continuous Professional Development
DkIT	Dundalk Institute of Technology
ECTS	Electronic Credit Transfer System
HEA	Higher Education Authority
HEI	Higher Education Institution
IADT	Dún Laoghaire Institute of Art, Design and Technology
IUA	Irish Universities Association
MTU	Munster Technological University
NRRP	National Recovery and Resilience Plan
N-TUTORR	National Technological University TransfOrmation for Recovery and Resilience
QA	Quality Assurance
QQI	Quality and Qualifications Ireland
RPL	Recognition of Prior Learning
SETU	South East Technological University
SIS	Student Information Systems
THEA	Technological Higher Education Association
TU	Technological University
TU Dublin	Technological University Dublin
TUS	Technological University of the Shannon
URL	Uniform Resource Locator

Executive Summary

1

1 Executive Summary

The term micro-credential has been used for some time in the context of education, training, and continuous professional development (CPD). However, there remains a degree of confusion as to the definition and purpose of micro-credentials. The terms micro-credential and digital badge, for example, were, in the past, often used interchangeably, but more recently, the term micro-credential has been adopted in higher education to refer to provisions below the level of major academic awards. Within the technological university sector in Ireland, micro-credentials have gained significant attention due to their potential to offer flexible, accessible, and industry-relevant learning opportunities. it is worth emphasizing that the technological sector has a strong track record in delivering micro-credentials (e.g. minor and special purpose awards) in response to the requirements of industry stakeholders and human capital and labour market activation initiatives (e.g. Springboard).

This green paper is an output of Stream 3 of the N-TUTORR programme which aims to enable digital ecosystems through the development of digital assessment, digital campuses and improved flexibility and accessibility of learning resources**.** The National Technological University TransfOrmation for Recovery and Resilience (N-TUTORR) programme aims to develop and embed a Digital Literacy & Citizenship Student Competency Framework based on international good practice and TU/IoT sectoral needs. The overarching aim of N-TUTORR is to transform learning, teaching, and assessment by focussing on transforming the student experience and developing the capabilities of all staff to address a sustainable pedagogical and learning environment. N-TUTORR is funded under the National Recovery and Resilience Plan (NRRP), supported by the EU Next Generation Fund. The programme is a partnership between the five technological universities (Atlantic Technological University, Munster Technological University, South East Technological University, Technological University Dublin, and the Technological University of the Shannon), and two Institutes of Technology (Dundalk Institute of Technology and the Dún Laoghaire Institute of Art, Design and Technology), supported by the Technological Higher Educational Association (THEA).

The focus of this paper was to facilitate the development of a coherent approach to micro-credentials across the technological university sector in Ireland. In outlining the future strategic role of micro-credentials within the technological university sector, it is crucial to develop a comprehensive micro-credentials framework that captures the shared understanding of the nature and purpose of micro-credentials provision. This framework will provide guidance with respect to the policies, procedures, and infrastructure necessary to support the implementation of micro-credentials across the sector. This paper follows on from a comprehensive needs analysis carried out in the context of the N-TUTORR project. This report, titled *Unlocking pathways: a needs analysis of micro-credentials offered by the TU sector to address industry skill needs in Ireland*, provides a detailed overview of the micro-credentials landscape (Carroll et al. 2023). Herein, the focus is specifically on the importance of aligning micro-credentials' provision with the technological university sector's overall strategic priorities.

Section 2 discusses this strategic alignment and explores the benefits that micro-credentials can bring to the sector and its stakeholders. Following that, Section 3 outlines the proposed micro-credentials framework tailored to the needs of the technological university sector in Ireland. The finding highlights are as follow

- **Benefits of micro-credentials for stakeholders** include enhanced access and participation, increased pathways for engagement, improved institutional responsiveness and flexibility, improved employee retention, and facilitation of co-creation and co-delivery
- **Five potential positions that micro-credentials may play in the university ecosystem** were identified: (1) complementary to mainstream education, (2) alternative provision to mainstream education, (3) bridge or pathway to access mainstream education, (4) facilitate the delivery and acquisition of knowledge in the workplace, and (5) facilitate a broad range of learning activities
- Drawing from the literature, **micro-credentials may be divided into three sub-categories**: (1) minor, supplemental and special purpose awards, (2) other credit-bearing micro-credentials between 1-9 ECTS, and (3) non-credit bearing micro-credentials
- To be considered a micro-credential, **digital badges** should be issued with the following meta-data: badge earner, badge name, description, criteria, issuer, evidence of achievement and expiry date
- **Enablers** of micro-credential provision include alignment with institutional strategies, strong partnership with stakeholders, quality assurance, flexibility, and technological infrastructure
- **Barriers** of micro-credential provision include lack of standardisation, resistance to change, lack of recognition, and financial and technical challenges
- Technological universities should adopt the following **guiding principles in to ensure micro-credential quality:** enable comprehensive feasibility review, aligning programme development and approval processes with pedagogical advancements in teaching and learning, promote a learner-centred approach, ensure that recognition and accreditation mechanisms are in place, and ingrain continuous improvement in the quality assurance processes.
- **Appropriate design and implementation of digital systems** composed of a credential issuing platform and learning management system play a crucial role in the proposed TU working framework for micro-credentials. Such a system should also facilitate flexible content authoring and learning analytics

Finally, Section 4 presents recommended next-steps towards the implementation of this comprehensive framework.

Implications for Institutional and National Strategies

2

2 Implications for Institutional & National Strategies

This section explores the strategic implications of micro-credentials within a university context, focusing on their role in achieving strategic objectives and the benefits they offer across various stakeholder groups. It discusses different strategic positions for micro-credentials and their potential contributions to the university's key strategic themes. Additionally, it contextualizes micro-credential provision within the framework of the technological university sector in Ireland, highlighting their significance in advancing lifelong learning, workforce development, and regional economic growth.

2.1 Positioning micro-credentials

Brown and Nic-Giolla-Mhicil (2021) suggest the following list of drivers for micro-credential development and provision:

- Enhancing employability
- Supporting continuous professional development (CPD) and workplace training
- Improving learning flexibility
- Addressing skills gaps due to the changing nature of work
- Encouraging lifelong learning
- Expanding access and pathways to formal education
- Reducing education and training costs
- Promoting equity for underrepresented groups
- Boosting institutional revenue and reputation
- Advancing sustainable development goals
- Responding to demographic shifts
- Building learner confidence, especially for those who have been disengaged from formal education for a while
- Fostering a culture of continuous improvement where learning is promoted and acknowledged
- Facilitating greater access to learning through the widespread adoption of online technologies in all aspects of life and work, accelerated by the COVID crisis

These drivers and their salience for the strategic priorities of individual universities, the sector and the broader tertiary education landscape, help to identify and inform the strategic positioning of micro-credentials. Below, the potential role of micro-credentials within a university strategy is explored, considering the five strategic positions for micro-credentials which it is believed are most relevant for the sector.

2.1.1 *Position 1: Micro-credentials as complementary provision to mainstream education (embedded provision)*

Integrating micro-credentials within existing degree programmes or courses allows universities to offer additional pathways for learners. This approach enables students to customise and enrich their learning experiences by acquiring specialised skills and enhancing their employability or competitiveness in the job market. A study by Oliver (2019) highlights the growing demand for tailored learning experiences, as employers increasingly value specific skills and competencies over traditional degrees.

For example, Deakin University offers micro-credentials as part of their regular degree programmes, allowing students to specialise in areas such as digital marketing, project management, and data analysis (DeakinCo, 2020). This approach allows universities to adapt to the rapidly changing needs of the workforce and equip students with the skills necessary to succeed in the modern job market (Davies et al., 2019).

2.1.2 *Position 2: Micro-credentials as alternative provision to mainstream education (parallel provision)*

Offering micro-credentials as standalone options for learners not interested in enrolling in full-time programmes provides a flexible and convenient approach to professional development. This model allows professionals to update their skills without committing to a full degree or course, while still having the possibility to articulate their learning through Recognition of Prior Learning (RPL). Research by Shah and Whittle (2020) indicates that parallel provision can help universities attract a more diverse range of learners, including working professionals and adult learners. This positioning of micro-credentials also enables the University to reduce the risks and/or costs associated with developing novel or nascent educational offerings because it allows interest and feasibility to be assessed without the overheads of developing a major award offering.

2.1.3 *Position 3: Micro-credentials as a bridge or pathway to access or re-access education*

Micro-credentials can serve as stepping-stones for learners pursuing further education or re-entering the educational system after a hiatus. By providing small, achievable learning blocks with low stakes, micro-credentials can help reduce the fear factor and encourage individuals to continue their educational journey. A study by Davies et al. (2019) highlights the potential of micro-credentials as a means of increasing access to higher education, particularly for underrepresented groups such as first-generation students, individuals from low socio-economic backgrounds, and those with disabilities. This approach provides a low-risk pathway for learners to build their skills and confidence before transitioning to a more traditional degree programme (Gallagher, 2020).

2.1.4 *Position 4: Micro-credentials facilitating delivery and acquisition of knowledge in the workplace*

Collaborations between universities and enterprises enable the development, delivery, and accreditation of micro-credentials tailored to workplace contexts. This approach supports learners in acquiring relevant skills in their work environment (i.e. work-based learning) and creates a unique selling proposition for the institutions involved. Research by Caspersen et al. (2018) highlights the benefits of these partnerships, including improved employee retention and upskilling of the workforce.

Notable examples of this type of collaboration include the AIB Data Analytics Graduate Programme which was developed in cooperation with DCU and the Cyber Skills project which is led by MTU in collaboration with the cyber security sector.

2.1.5 Position 5: Micro-credentials facilitating a broad range of learning activities (informal, non-formal, etc.)

Micro-credentials enable universities to cater to diverse learning needs across various contexts, including enterprise, community, and alternative pedagogical models (e.g., experiential, digital/online, blended learning). By offering micro-credentials that recognise and validate a wide range of learning experiences, universities can support the development of well-rounded, adaptable learners with a diverse skill set.

For instance, a university may offer a range of micro-credentials that recognise learners' participation in informal and non-formal learning activities such as workshops, webinars, and online courses. These credentials provide learners with a tangible way to showcase their skills and accomplishments, both to potential employers and within their professional networks (Glover et al., 2020).

Moreover, alternative pedagogical models such as experiential learning, digital/online learning, and blended learning can be integrated into micro-credential programmes, enabling universities to reach a wider audience and support diverse learning preferences. This approach provides learners with a comprehensive and flexible learning experience that can be customised to suit their needs and preferences (Mulder et al., 2020).

2.2 Benefits of micro-credentials for stakeholders

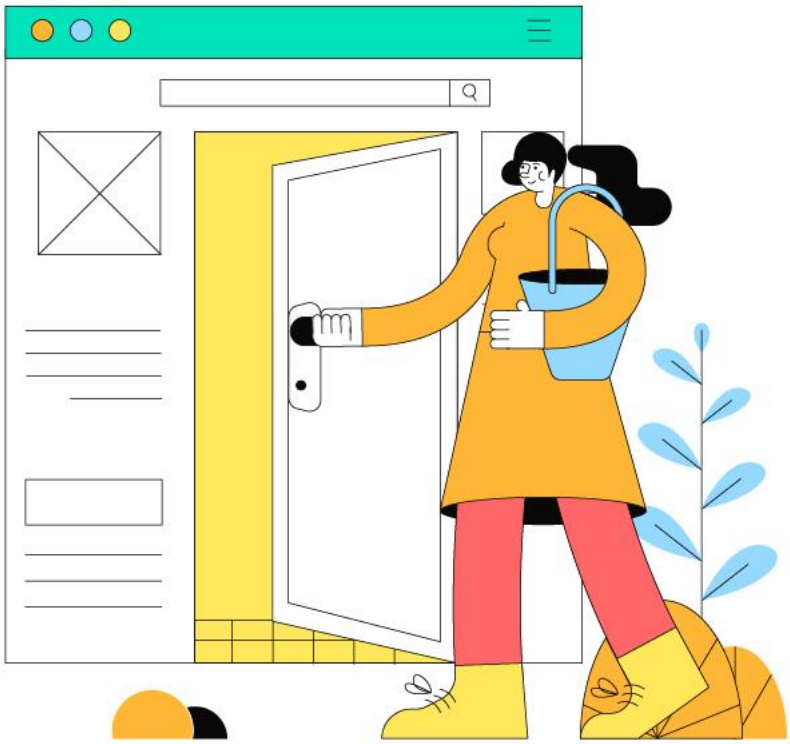
Another useful perspective, when considering the strategic importance of micro-credentials, is the significance of micro-credentials for various stakeholder groups associated with the technological university and wider tertiary education sectors, particularly focusing on external stakeholders.

Micro-credentials offer numerous benefits at the national, regional, and institutional level in various economic and education strategies. These benefits include:

- **Enhanced Access and Participation:** Micro-credentials enable a broader cohort of learners to access education and training opportunities, including those who may have been previously excluded or underrepresented. This increased access promotes social inclusion and contributes to bridging the digital divide (Thi Ngoc et al., 2022).
- **Increased Pathways for Engagement:** Micro-credentials facilitate engagement between learners, enterprises, public bodies, and communities. They provide opportunities for collaboration and partnership, enhancing the relevance and value of educational offerings (Gallagher, 2020). For instance, the Australian National Framework and Micro-credentials Marketplace enable stakeholders to collaborate and develop tailored learning pathways aligned with industry needs (Davies et al., 2020).
- **Improved Institutional Responsiveness and Flexibility:** Micro-credentials offer institutions the opportunity to respond more rapidly to changes in the labour market, evolving industry needs, and emerging technologies (Fong et al., 2020). They enable institutions to develop and deliver more agile and adaptive educational programmes, enhancing their responsiveness and flexibility (Adams Becker et al., 2017). For example, the HCI projects in Ireland have contributed to a more flexible higher education system by developing micro-credentials in response to identified skills gaps (QQI, 2021).
- **Employee Retention:** Offering micro-credentials can support employee retention within organisations. By providing opportunities for continuous professional development (CPD) and upskilling, employers can demonstrate their commitment to employee growth and career progression, increasing job satisfaction and reducing turnover (Cedefop, 2020).

- **Co-creation and Co-delivery:** Micro-credentials facilitate co-creation and co-delivery between learners, employers, and providers, fostering collaboration and enhancing the quality and relevance of educational offerings (Gallagher, 2020).
- **Flexible Opportunities for Progression:** Micro-credentials provide flexible opportunities for progression, allowing learners to balance their work, personal lives, and further learning or upskilling (Oliver, 2019). They enable learners to access education in smaller, more manageable units, without the need to commit to full-time or lengthy programmes. This flexibility contributes to increased participation in lifelong learning, ultimately enhancing individual employability and economic growth (Cedefop, 2020).

Despite these benefits, it is crucial to consider the challenges and shortcomings of micro-credentials in the broader strategic and educational context. These challenges include excessive fragmentation of learning, proliferation of valueless credentials, and difficulties in quality assurance. Furthermore, challenges such as currency, cohesion, and consistency, underpinned by robust quality assurance and assessment processes, must be addressed alongside the evolution of online and blended delivery and assessment methods. It is only by overcoming these challenges and fostering collaboration among stakeholders, that the full potential of micro-credentials can be realised.



2.3 Conclusion: Embracing Micro-credentials for Strategic Success

The technological university sector in Ireland should take a strategic approach to adopting and implementing micro-credentials, pursuing the strategic positioning outlined earlier in this section. By adopting this approach, the sector can achieve the many benefits identified throughout the report.

These benefits can be grouped under two main headings: (1) Learner-centred educational opportunities leading to enhanced access and participation, and (2) Responsive, flexible, and situated workplace-based learning.

Micro-credentials facilitate learner-centred educational opportunities by enhancing access and participation for a diverse range of learners. As the report has noted, these opportunities contribute to bridging the digital divide and fostering social inclusion, while providing increased pathways for engagement between various stakeholders.

Moreover, the report highlights the importance of the contextualised nature of micro-credentials, which differentiates them from other educational offerings. Micro-credentials closely link the university and the practice domain, enabling learning to be gained and applied in workplace settings. Recognising the workplace as a valid centre for learning, micro-credentials promote a strong connection between educational institutions, learners, and employers. Traditional educational systems have been criticized for their slow response to rapidly changing market conditions. Micro-credentials offer a solution by providing a more agile response. Employers are increasingly seeking short-duration, competency-based learning opportunities for their employees, particularly in sectors where time is a constraint. Micro-credentials address this need, delivering responsive, flexible, and situated workplace-based learning.

This strategic focus for micro-credentials, particularly in respect of workplace-based learning, constitutes a crucial component that will empower the technological university sector in Ireland to fulfil its mission as a leading educational institution. To successfully position micro-credentials and achieve the desired benefits, a purposeful and systematic approach to developing, promoting, and delivering micro-credentials is necessary. Section 3, below, will outline a recommended framework to help the sector implement such an approach, ensuring the institutions are well-equipped to embrace the opportunities and advantages that micro-credentials can offer.

Proposal for the Technological University Micro-Credentials Framework

3

3 Proposal for the TU Micro-Credentials Framework

This section presents a proposed framework for the provision of micro-credentials within the broader technological university sector in Ireland. Firstly, it discusses the definition of micro-credentials and some aligned concepts. Additionally, this section investigates the essential factors that enable or inhibit the successful adoption of micro-credentials, emphasising the importance of strategic alignment, strong partnerships, quality assurance, flexibility, and technological infrastructure. The report also identifies barriers that may impact the implementation process. Finally, it presents the key elements that are believed to be essential to provide a robust and sustainable micro-credentials framework that meets the needs of the technological university sector in Ireland.

3.1 Defining micro-credentials

In order to begin to develop a framework for the provision micro-credentials across the university, it is important, in the first instance, to arrive at a shared understanding of what is meant by micro-credentials and to determine where micro-credentials belong within the broader landscape of programmes or courses offered.

Based on a review of the literature and examples of custom in practice, it is proposed that micro-credentials can be further divided into three sub-categories. Table 1 an overview of the different categories and sub-categories. In practice, the boundaries between the different categories may not be as clearly defined and may include a degree of overlap. The three categories are described as follows:

- The category of **minor, supplemental and special purpose awards** is well understood and the sector has a significant track record in this area of provision. Provision in this category has been used in recent years to address specific economic or societal skills or human capital needs. Commonly, but not always, these awards are articulated with a major award or awards and therefore, while they have value as standalone awards, they may also be viewed as part of a larger learner pathway.
- The next category refers to other **credit-bearing micro-credentials which are below the 10-credit minimum volume set by QQI for awards**. There is a more limited track record with this category of provision in the sector. Based on existing QA guidelines and programme structures, it is envisaged that provision in this category will primarily consist of 5-credit single module certifications. Similar to the micro-credential awards described in the previous category, this category of provision will have value as a standalone micro-credential but may also articulate with another award or micro-credential award thus forming part of a larger learner pathway.
- Provision which falls within the **non-credit-bearing micro-credentials category involves a quantum of learning** (learner workload) which does not meet the threshold for awarding ECTS credits. However, there is some learner workload and, more importantly, defined and evidenced learning associated with this provision. Therefore, while this learning does not attract ECTS credits, the fact that it is evidenced/assessed means that it can be accredited at a later stage via relevant processes such as Recognition of Prior Learning (RPL).

Table 1. Proposed taxonomy of micro-credential definitions for the Irish Technological University Sector.

Category of micro-credential award		Examples	ECTS Credits	Learner Workload (hours)
Major awards		PhD, Masters Bachelor degrees	≥ 60	≥ 1200
Micro-credentials	Minor, supplemental and special purpose awards	Certificates Diplomas, etc	≥ 10 & < 60	≥ 200 & < 1200
	Other credit-bearing micro-credentials	Single module certification	≥ 1 & ≤ 9	≥ 20 and ≤ 200
	Non-credit-bearing micro-credentials	Digital Badges, etc	0	≥ 10 (i.e. there is a quantum of learning which has been evidenced)
Non-credit-bearing, non-assessed, non-accredited provision		Personal-Interest Courses	0	NA (i.e. while learning may have occurred this is not evidenced)

As well as examining the categories within the taxonomy it is also useful to explicitly note the elements which will not be included in the proposed approach and taxonomy. There is a category of provision which does not attract any ECTS credits and does not require that learning is evidenced. A wide range of CPD, knowledge-sharing and personal-interest activities/courses may fall into this category. Typically, such provision is recognised via certificates of attendance. It is proposed that this provision is not included in the micro-credentials definition/taxonomy. The implication of this proposal is that such provision, while still valid and useful, does not attract formal accreditation from the provider and as such it does not require formal QA approval or review.

In addition to the categories described by the taxonomy, it is useful, in the context of the development of a micro-credential framework, to understand two further concepts, namely, digital credentials and the stackable property.

3.1.1 Digital credentials

Initially, the terms digital badge and micro-credential were used interchangeably. This is no longer the case as many providers seek to provide micro-credential offerings that they consider more substantial than the label ‘badge’ implies. However, the desire to drop the term badge has meant that the term digital is also dropped and this is inadvisable because the digital aspect is far more salient. Crucially, digital badges were intended to describe a standard for digital credentials which would be acquired, understood and communicated or shared across a range of contexts. Therefore, going forward it is important to ensure that micro-credentials and digital badges comply with a range of defined technical standards that allow them to be displayed or shared online via a range of platforms, be those LMS, E-portfolios, HR Management systems and social media platforms like LinkedIn.

These standards would mean that an issued badge or credential has meta-data contained in it such as:

- **Badge earner**.
- **Badge name** recalls the content of a skill or achievement in few words.
- **Description** provides the details of achievement: describes the context, specifies the achievement, refers to completed tasks, explains the assessment procedures.
- **Criteria** tells about the tasks set by badge issuer and completed by badge earner to qualify for specific badge.
- **Issuer** maybe an organisation, company, institution or private person that issues a badge to recognise learning and achievements.
- **Evidence** is an optional but very much encouraged data to enrich and backup the claim for specific achievement. It can be of variety of formats: text input, file upload, image, video, badge code or even another badge.
- **Expiry** is optional and may be used if the learning needs to be renewed/reattained.

3.1.2 Stackable micro-credentials

Within the relevant literature micro-credentials are sometimes described as stackable or non-stackable. This stackable property is defined as follows:

- Where a micro-credential attracts ECTS credits and where it formally aligns or articulates with an award (i.e. the micro-credential has been purposefully designed such that it constitutes a subset of the requirements for the award) then it is said to be stackable. A stackable micro-credential may be utilised as part of a pre-defined learner pathway towards another award without recourse to additional processes such as RPL. Note that in this context an award may be a major award or a micro-credential award.
- Where a micro-credential attracts ECTS credit but does not align or articulate formally with a programme, or where it does not attract ECTS credits, then it is considered non-stackable. In this case the learning may still be used as part of a larger learner pathway but will do so via an additional process such as RPL.

A taxonomy such as this can provide a useful framework for determining factors such as teaching, learning, assessment and the related quality enhancement/assurance activities and policies that should apply to each category. It is suggested that, while certain academic principles apply across all types of programmes, specific approaches are required in order to effectively deliver and accredit or recognise the offerings in the different categories.

3.2 Micro-credentials Enablers and Inhibitors

When developing a framework for the provision of micro-credentials, it is important to understand the necessary factors which will result in a successful implementation of that provision as well as the factors which may impede such an implementation. These enabling and inhibitory factors must be taken into account in the design of the elements of the framework in order to ensure the suitability and/or sustainability of micro-credential provision.

3.2.1 Enablers for the Successful Implementation of Micro-credentials:

- **Alignment with Institutional Strategies**
  For micro-credentials to succeed, they must be strategically integrated into the overall goals and objectives of the university (Ferlie et al., 2017). This alignment ensures that micro-credentials support the university's mission, values, and academic programmes, ultimately enhancing the institution's reputation and value proposition. By aligning micro-credentials with institutional strategies, the university can create synergies that contribute to the achievement of objectives and enhance overall effectiveness.
- **Strong Partnership with Stakeholders**
  Effective implementation of micro-credentials requires robust partnerships between universities, industry, and other stakeholders. Collaborative relationships can help the university to understand and respond to stakeholder needs, ensuring that micro-credentials address relevant skills gaps and market demands. By fostering strong partnerships, the sector can position micro-credentials as valuable and relevant learning opportunities that support both individual and economic growth.
- **Quality Assurance**
  Maintaining quality standards is critical to the success of micro-credentials (Fong et al., 2020). Universities must ensure that their micro-credential offerings align with established quality standards and implement rigorous assessment processes to maintain credibility and value. In Europe, the European Quality Assurance Register (EQAR) provides guidelines for assuring the quality of micro-credentials, promoting transparency, and trust among stakeholders (EQAR, 2021). By insisting on proportionate yet rigorous quality assurance processes for micro-credentials, the university can protect its reputation and ensure the value of these credentials to learners, employers, and enterprise partners. Therefore, quality assurance is critical to the overall success and sustainability of micro-credential programmes.
- **Flexibility**
  Flexibility enables the university to capitalise on new opportunities and address emerging challenges, ensuring continued relevance and value for learners, employers, and enterprise partners. Consequently, the university must continually evolve its offerings in response to stakeholder requirements (Adams Becker et al., 2017). By embracing flexibility, universities can ensure the long-term success and impact of their micro-credential initiatives.
- **Technological Infrastructure**
  Successful micro-credential implementation relies on robust technological infrastructure, providing the necessary support for the design, development, and delivery of these learning opportunities (Hilpert et al., 2021). Universities, government, etc must invest in systems for tracking, verifying, delivering, and assessing micro-credentials, enabling seamless integration with existing academic and administrative processes.

3.2.2 Major Barriers to the Successful Implementation of Micro-credentials:

- **Lack of Standardisation**
  Without a uniform framework, it is difficult for learners to compare micro-credential value and for employers to assess their worth in the labour market (Rahimi et al., 2020). This lack of standardisation undermines the credibility of micro-credentials and raises questions about their labour market value. Therefore, any framework must include measures to ensure that the vocabulary, the award artefacts (e.g. parchments, badges, etc) and other elements associated with micro-credential provision do not confuse the relevant stakeholders (i.e. prospective students, employers, professional bodies, etc) and as a consequence undermine the standing of not only the University's micro-credentials provision but also the University's educational provision more broadly.
- **Resistance to Change**
  Educators and academic administrators may view micro-credentials as a threat to traditional educational provision, leading to resistance against their implementation (Newman et al., 2016). This reluctance to invest time and resources in developing and delivering new micro-credential programmes can impede their widespread adoption and success.
- **Lack of Recognition**
  Employers may be uncertain about the value of micro-credentials in the labour market, hesitant to accept them as equivalent to traditional degrees, and unsure about the skills and knowledge they certify (Milligan & Kennedy, 2017). Concerns about assessment reliability and consistency may also contribute to this lack of recognition, limiting the opportunities available to micro-credential holders.
- **Financial and Technical Challenges**
  Implementing micro-credentials can require significant financial and human resources, such as the investment required into new technology platforms and systems to support their delivery and assessment. This can have the effect of limiting their adoption where resources and budgets are limited. Careful consideration should be given to putting in place a resourcing model which is aligned with the needs of micro-credentials provision.

3.3 Proposed micro-credentials framework

The proposed Technological University Micro-credentials Framework is designed to facilitate the integration of micro-credentials into the offerings of the technological university sector in Ireland, aligning their provision with the strategic priorities of the sector. This framework encompasses four key elements to ensure the success and sustainability of micro-credentials within the technological university sector (Figure 1).

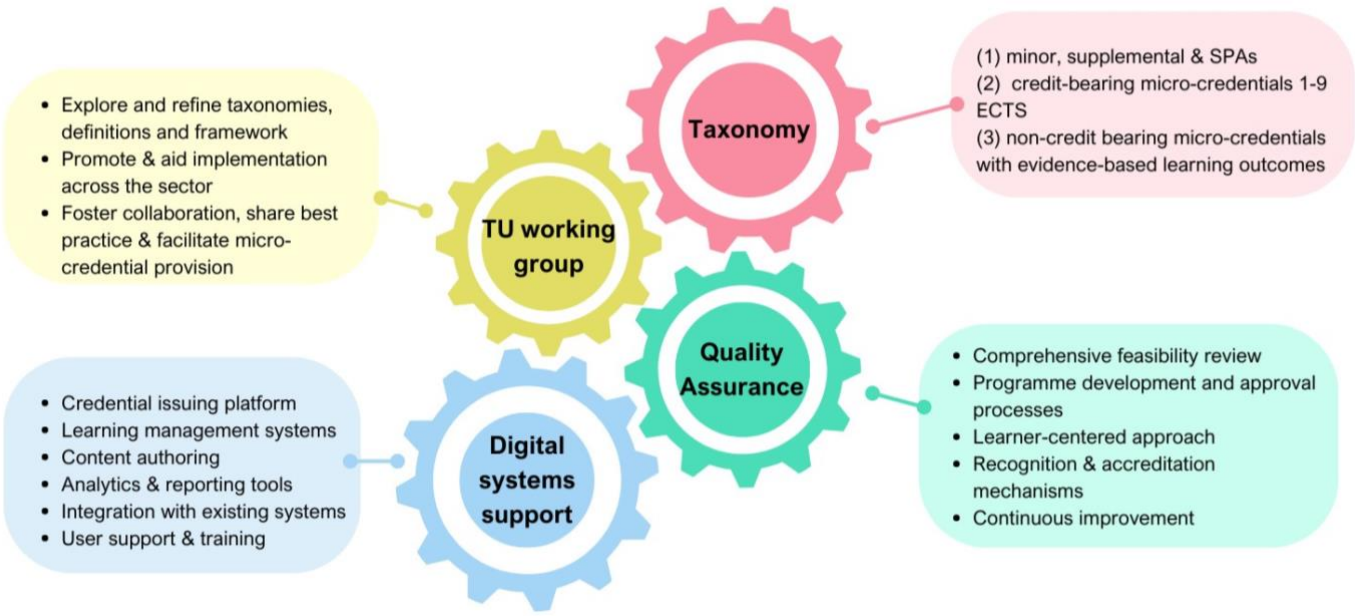


Figure 1. Proposed technological university micro-credentials framework.

3.3.1 Micro-credentials taxonomy:

The framework proposes a taxonomy with three categories of micro-credentials: minor, supplemental, and special purpose awards; credit-bearing micro-credentials below the 10-credit cut-off; and non-credit-bearing micro-credentials with evidence-based learning outcomes. Furthermore, it is proposed that the technological university sector should develop offerings in all three categories. By including provision in each category, the sector addresses a diversity of learning and training needs and enables learners to construct personalized pathways that align with their goals.

3.3.2 TU Sector Micro-credentials Working Group:

In order to explore the possibility of ensuring consistency and collaboration across all technological universities in Ireland and to facilitate the potential development of sector-wide initiatives, it is proposed to establish a TU Sector Micro-credentials Working Group. This group could play a pivotal role in promoting and aiding the implementation of the different elements of the micro-credentials framework consistently and effectively across all technological universities. Membership in the working group could include representatives from each N-TUTORR partner institution (i.e. five technological universities and two institutes of technology) with an independent chairperson agreed and appointed by those partner institutions (Brown et al, 2023).

The primary objective of the proposed TU Sector Micro-credentials Working Group would be to foster collaboration, share best practices, and facilitate the development of micro-credentials offerings within the technological university sector. By working together, the group

could leverage the collective expertise and resources of all technological universities to explore a comprehensive and impactful approach to micro-credentials provision which will articulate effectively with other national (e.g. IUA MicroCreds framework) and international (e.g. EuroPass) frameworks.

One of the key tasks of the working group could be to explore and refine the proposed micro-credentials taxonomy to ensure it aligns with the unique strengths and strategic priorities of each technological university while maintaining a cohesive approach across the sector. This collaborative effort would allow for a diverse range of micro-credentials offerings, accommodating the specific needs and preferences of learners within the technological university sector.

The TU Sector Micro-credentials Working Group could help facilitate the implementation of the micro-credentials framework across all technological universities. This could include exploring how policies, procedures, and quality assurance processes related to micro-credentials could be harmonized and streamlined. The group could also explore how to facilitate communication and collaboration among academic departments, faculties, and administrative units to ensure the effective delivery of micro-credentials offerings.

Furthermore, the working group could serve as a platform for sharing insights and experiences regarding the impact of micro-credentials on learners and stakeholders. By collecting and analysing data from across the sector, the group could identify emerging trends, challenges, and opportunities related to micro-credentials and make data-driven decisions to continuously improve the offerings.

Importantly, if formed, the TU Sector Micro-credentials Working Group would have the opportunity to explore potential opportunities for cross-institutional collaboration and the development of joint micro-credentials initiatives. By pooling resources and expertise, the technological universities could explore innovative and impactful micro-credentials offerings that address the evolving needs of learners and the workforce.

Ultimately, the proposal for the establishment of a TU Sector Micro-credentials Working Group aims to explore the possibility of reinforcing the commitment of the technological university sector in Ireland to embrace micro-credentials as a transformative force in education and training. Through collaborative efforts, the technological universities could explore the opportunity to position themselves as leaders in the micro-credentials landscape, contributing to the advancement of lifelong learning, workforce development, and societal impact.

3.3.3 Fit-for-purpose quality assurance processes:

The framework underscores the importance of establishing quality assurance (QA) processes that are fit-for-purpose and aligned with the aims of micro-credential provision within the technological university sector. While each technological university will independently develop and implement its QA mechanisms, certain guiding principles are useful to help ensure the consistent and credible delivery of micro-credentials across the sector.

The technological universities have a longstanding record of good practice in effective and innovative QA processes. The sector should extend that good practice and adopt a shared approach to maintaining rigorous but proportionate QA processes for micro-credentials that lead to a university credential. These QA processes should aim to uphold academic standards, learner outcomes, and the integrity of the university's reputation.

- One of the guiding principles is to conduct a **comprehensive feasibility review** of proposed micro-credentials. This review should consider factors such as market demands, alignment with existing university offerings, and consultation with relevant stakeholders to define clear and achievable learning outcomes.

- **Programme development and approval processes** should prioritize the alignment of teaching, learning, and assessment strategies with contemporary pedagogical approaches. Utilising digital technologies and ensuring accessibility and inclusivity for diverse learners should be emphasised.
- The technological university sector should promote a **learner-centred approach,** providing adequate learner support, guidance, and access to relevant resources throughout the micro-credential journey.
- **Recognition and accreditation mechanisms** should be in place to ensure that micro-credentials receive due value in the labour market and adhere to established frameworks and guidelines. Collaboration with external bodies, such as professional, statutory, and regulatory bodies, is vital for ensuring industry relevance and recognition.
- **Continuous improvement** should be ingrained in the QA processes, with regular monitoring, evaluation, and adaptation of micro-credentials to meet evolving needs and feedback from learners and stakeholders.

While each technological university will tailor its QA processes to its unique context and priorities, adhering to these guiding principles will foster consistency, credibility, and coherence in the delivery of micro-credentials across the technological university sector.

3.3.4 Digital Systems Support

The Micro-credentials Framework acknowledges the critical role of digital systems in the development, awarding, recognition and quality assurance of micro-credentials. By systematically designing and implementing an appropriate and accessible digital infrastructure built around the needs of staff and learners, the technological universities can create an effective and successful micro-credential system, which also, critically, integrates with new and existing academic and administrative processes and procedures.

The requirements for such an infrastructure can be presented as follows:

- **A secure and easy way for learners to access course materials and other digital content, and to submit assignments and complete other assessment tasks**. From an instructor point of view such a system needs to provide a way to both create and share digital content, and provide learner feedback. Such a system should, in itself or in its integration with another component of the infrastructure, allow instructors to define learning pathways or criteria leading to the award of an associated credential.
- A way for learners and instructors alike to **view progress and activity over time**. While the focus for learners will be primarily on their own progress or their progress relative to their class cohort, instructors will also need to be able to aggregate and analyse individual learner data and to run reports to monitor the progress and performance of multiple cohorts over time.
- A **solution to create, issue, store and share digital badges and micro-credentials** that link back to and verify learner activity and learning evidence. Such a system should allow the university to issue and manage defined collections of badges and micro credentials. Stackability should also be supported. In addition, the system should comply with existing technical standards to ensure they can be shared online – via, e.g. social media platforms, professional networking sites, and digital portfolios – and incorporate verifiable metadata which, e.g., allow employers and others to verify the source and underlying learning evidence behind each award.
- **Advanced learning analytics** to gain richer insights into student activity across various component systems. This will allow institutions to identify and anticipate potential retention and academic performances issues as they arise and similarly to identify areas where individual learners may require additional support or resources. Adaptive and personalised learning pathways can, where appropriate, also be

designed and, to an extent, automated based on learning analytics. Analytics finally will provide the university with critical insights and intelligence to inform the design and implementation of its micro-credential system as a whole in a way that helps to optimise associated processes and enhance the learner experience.

- A way in which to integrate the above and in particular the issuing of micro-credentials and badges with **existing information systems (SIS) and learning management systems (LMS).** Such integration will simplify and streamline process such as enrolment, billing, and reporting which in turn will reduce administrative overheads and enhances efficiency, and ensure a more frictionless experience for both students and staff users. Integration in addition should serve to boost the functionality of all constituent systems and increases the value and quality of associated data and analytics.

Based on the above the following combination of existing and new components are proposed (this is summarised in Figure 2):

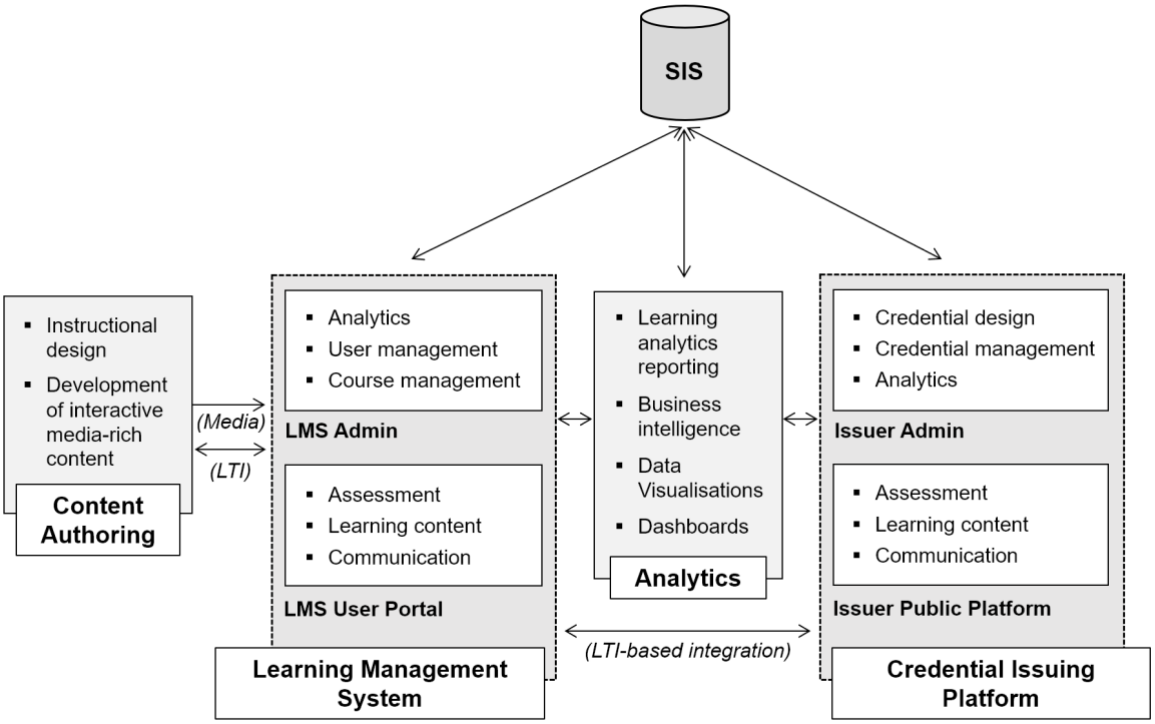


Figure 2: Digital support systems for micro-credentials

A Credential Issuing Platform[1]

A credential issuing platform provides a comprehensive set of tools and features for designing, issuing, and managing digital credentials. Typical features and tools include:

- **Credential creation:** The platform allows administrators to design and create badges using a range of design tools and templates. Includes the ability to upload custom images, add metadata, and define badge criteria.

[1] Traditionally referred to as a badging platform

- **Badge/credential criteria:** The platform allows administrators to define the criteria to be satisfied in order to receive or earn a badge or credential.
- **Badge/credential issuing:** Once a badge has been earned, a typical credential issuing platform facilitates the issue of the credential to the learner. This can be done on an individual basis or in bulk. Often platforms will allow the use of a QR code/link to invite learners to accept earned credentials.
- **Badge/credential verification:** A credential issuing platform enables badge or credential verification, allowing third parties to verify the authenticity of a badge or credential. This can be done through the use of a unique code, a verification URL, or other means.
- **Badge/credential display:** The platform typically provides tools for badge or credential display, allowing learners to display their badges on various digital platforms and to choose what specific badges/learning pathways they wish to share.
- **Badge/credential management**: The platform provides tools for badge management, enabling administrators to manage the lifecycle of badges or credentials. This can include the ability to expire badges or credentials, revoke badges, or update badge criteria.
- **Reporting and analytics:** A badging and credential issuing platform provides reporting and analytics tools, allowing administrators to track badge issuance and usage.

A Learning Management System (LMS)[2].

A robust LMS is crucial for the delivery of micro-credential programmes, providing a platform where learners can access course materials, complete learning activities, provide learning evidence and communicate with instructors and peers. Other features include:

- **Course creation and management:** Ability to create courses and course spaces and to manage collections of courses including different versions for different learner cohorts or course delivery instances.
- **Content hosting:** Content can include all kind of different media from plain text and images to media-rich and interactive digital content such as video and animation. Also includes ability to display third party courses or courses developed with third-party tools once they are compliant with common e-learning interoperability standards.
- **User management.**: Creation and management of different user roles. Management of user profiles and enrolments. Ability to manually or automatically assign courses and learning pathways, track learner progress, and generate reports on learner activity.
- **Assessment and testing:** An LMS provides various tools for creating auto-corrected quizzes and other assessment/submission types and will also provide some kind of gradebook feature to input, overview and distribute marks and feedback.
- **Communication and collaboration:** An LMS provides tools for communication and collaboration, allowing learners to interact with other learners, instructors and other user types. It can also be integrated with video conferencing systems for seamless communication.
- **Reporting and analytics:** An LMS provides reporting and analytics tools, enabling administrators to track learner progress and performance and produce a number of different kinds of activity reports.
- **Integration and interoperability:** An LMS can integrate with other systems and tools based on key interoperability standards. This allows for seamless integration with assessments, communication, authoring, and engagement tools.

[2] Also known as a Virtual Learning Environment

Course development and authoring tools

The creation of engaging and effective learning content for micro-credentials within the technological university sector requires e-learning authoring and creative digital media tools that enable the easy creation, editing, and updating of pedagogically effective, engaging, and accessible course content. Such tools need to support the creation of multimedia content, interactive elements, and accessibility features, allowing for the design of digital learning experiences that are inclusive, relevant, meaningful, and aligned with the nature of the learning and the learner cohort. Additionally, it may be beneficial for such tools to integrate directly with the LMS system to facilitate seamless content creation and management by instructors. A number of such tools are currently in use, including open-source content creation solutions that allow instructors to enhance LMS-based courses with more media-rich and interactive content. Facilities also exist for specialist staff in the university's digital learning function to create or facilitate the creation of more bespoke and sophisticated media-rich content, from animation to video and other forms of interactive educational multimedia content.

Analytics and reporting tools

To monitor the performance of micro-credential programs and inform data-driven decision-making, the technological university sector should implement appropriate analytics and reporting tools. An LMS system or other similar analytics solutions can be used to aggregate data from various sources, including the SIS and the Credential-Issuing platform, to bring richer insights to better identify and anticipate potential retention and academic performance issues. Microsoft’s Power BI or other comparable analytics solutions can be employed to connect data from a range of sources, allowing for the generation of reports and creation of interactive data visualizations and dashboards to provide the necessary functionality.

Integration with existing systems

The digital systems supporting micro-credentials should be designed to integrate seamlessly with existing academic and administrative systems across the technological university sector. This integration can help streamline the management of micro-credentials, reduce administrative burdens, and ensure a consistent user experience for learners, instructors, and administrators.

User support and training

To maximize the effectiveness of digital systems, the technological university sector should provide comprehensive user support and training for learners, instructors, and administrators. This may include onboarding resources, help guides, and training workshops, as well as a dedicated support team to address technical and operational issues and questions.

3.4 Conclusion

By incorporating these four elements, the Technological University sector Micro-credentials Framework aims to create a coherent and sustainable approach to micro-credential offerings that meets the diverse needs of learners, employers, and other stakeholders.

Concluding Remarks

4

4 Concluding Remarks

Micro-credentials can play a pivotal role in the strategies of technological universities, not only by providing flexible, accessible, and affordable learning opportunities that cater to the evolving needs of learners but also by aligning with the broader mission of these institutions. This mission involves a strong regional remit, aimed at fostering robust economies and societies in their regions by addressing the needs of industry sectors, public bodies, community organisations and other stakeholders. Micro-credentials offer an effective modality through which technological universities can continue to develop and enhance their responsiveness and adaptability thus allowing them to successfully address both regional and broader educational needs.

By adopting and implementing the proposed micro-credentials framework, the technological university sector can:

- **Enhance the relevance and adaptability of the curriculum**, ensuring that it remains current and aligned with industry trends, labour market demands, and societal needs.
- **Provide personalised learning pathways for students**, enabling them to customise their educational experience by acquiring specialised skills and knowledge in their chosen fields.
- **Foster a culture of lifelong learning** by offering accessible, modular learning opportunities that accommodate the needs of diverse learners, including working professionals, career changers, and individuals re-entering the educational system.
- **Strengthen partnerships with industry and community stakeholders,** leading to mutually beneficial collaborations that drive innovation, workforce development, and economic growth.
- **Increase the attractiveness and competitiveness** of the sector's educational offerings, appealing to a broader range of students and positioning the technological university sector as a leader in the rapidly evolving higher education landscape.
- **Foster greater inclusivity and diversity** within the learner cohort by providing accessible, low-barrier entry points for learners from a wide range of backgrounds and experiences.

In conclusion, the adoption of the micro-credentials framework by the technological university sector has the potential to transform the educational landscape, empowering learners to pursue personalised learning paths and acquire relevant skills for the workforce. By embracing micro-credentials as a strategic tool, technological universities can stay at the forefront of educational innovation, respond effectively to market demands, and empower learners to thrive in an ever-changing world. The sector-wide commitment to micro-credentials will not only enrich the educational experience of students but also drive economic growth and societal development. Through this collective effort, technological universities can ensure that micro-credentials become a cornerstone of the modern learning ecosystem, fostering a culture of continuous learning and providing learners with the tools they need to succeed in the dynamic global landscape.

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