

Micro-credentialling in University Education: A Conceptualization and Operationalization

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Abstract

This conceptual paper examines micro-credentialling as an emerging strategy in university education, focusing on its role in enhancing employability, flexibility, and labour-market responsiveness. Micro-credentials are generally known as short, competency-based learning units that certify specific skills through authentic assessment and transparent evidence. The study proposes three core dimensions, namely skill signalling, relevance, and stackability for the purpose of explaining their educational value. Contextual implications for Sri Lanka highlight the potential to widen participation, support upskilling, and strengthen university–industry collaboration. The paper outlines managerial considerations, governance requirements, and avenues for future research, offering a foundation for systematic empirical exploration.

Keywords: *Employability, Higher education, Micro-credentialling, Skill signaling, Stackability,*

1. Introduction

Within the higher-education sector with special focus on university education, currently extensive attention is given to micro-credentialing as a result of the rapid changes in the labour market, it has become a mandatory factor to demonstrate workforce relevance and updated knowledge. Traditional university education being within the boundaries of fixed modular learning, has intensified the call for micro-credentials, which are responding to the evolving skill demand and prompts for more flexible and timely skills and knowledge (Narayanaswamy *et al.*, 2024a). Micro-credentials are commonly known as short, competency-based certifications issued upon assessed learning and they focus on specific skills or knowledge which are either stand-alone or expansions of the broader aspects of knowledge and contribute to broadening of qualifications of learners ((Moodie and Wheelahan, 2021a; Martín-Gilete and Blanco-García, 2024)). In terms of within university contexts, these micro-credentials consist of digital badges, micro-masters, nano-degrees, short industry certifications and massive open online courses (MOOCs) which serve the purpose of validating the relevant competencies (Moodie and Wheelahan, 2021a; Ahsan *et al.*, 2023) and nowadays majority of the university students prefer these micro-credentials in order to complete their profiles with certain high demand skills (Narayanaswamy *et al.*, 2024b). Not only that but also, as micro-credentials are known for flexibility, stackability, lower cost, shorter completion time, and direct alignment with industry needs, which makes them further likable for the university students and these in particular supports them to showcase relevant competencies, differentiate themselves in competitive labour markets, and adapt to shifting career trajectories (Kiiskilä, Kukkonen and Pirkkalainen, 2023). Some of these micro-credential offering platforms offer personalized learning experiences, opportunities for rapid reskilling, and verifiable digital evidence of achievement which makes the university students more attracted to them as this helps to strengthen their employability profiles (Wihendro *et al.*, 2024). With this background, it is safe to confirm the gaining popularity of micro-credentialing across university education systems as they quickly adopt and respond to the rapid changes in the labour market and the micro-credentialing platforms are strengthening the graduate employability (Varadarajan, Koh and Daniel, 2023). When focusing on the Asian context, in order to enhance upskilling and reskilling, quality assurance bodies often encourage the university students to engage in flexible short learning programmes (Hou *et al.*, 2025). However within the boundaries of Sri Lanka, pressures in similar gravity and extent are intensifying the workforce competitiveness, and university outputs are in dire need of aligning with the industry expectations (Wihendro *et al.*, 2024). This study in particular is important contextually and helps to support the process of recognition and standardization of evolving university education systems. However, based on the previous research, the following findings are either based on the Sri Lankan context or generally applicable to the Sri Lankan scenario.

1. Universally, micro-credentialling is known to be very beneficial to the university students to compete in the evolving labour markets backed by short termed, competency-based and industry aligned capabilities (Varadarajan, Koh and Daniel, 2023).
2. Students place much value upon the flexible and personalized pathways offered by the self-paced support systems of micro-credentials which align with the increasing student demand for flexible skill development (Narayanaswamy et al., 2024b).
3. Signalling value can be enhanced by the verifiable digital credentials and this gives the students more benefits with the evidence of achievements which are quite supportive of strengthening recruitment profiles (Kiiskilä, Kukkonen and Pirkkalainen, 2023).
4. Despite of all advantages, due to unclear quality assurance frameworks and inconsistent definitions, there are challenges with standardization and this imposes student confidence and employer recognition issues within the Sri Lankan context (Wihendro et al., 2024; Hou et al., 2025).
5. Students view micro-credentials as add-ons or complementing units for the degree programmes and they do not comprehend them as replacements for degrees, thereby the integration of micro-credentials in the Sri Lankan university systems have been feasible (Selvaratnam and Sankey, 2021a; Gamage and Dehideniya, 2025)

Based on the range of literature reviewed for this study, an increase in pressure is noticed on the universities to align their educational programmes with the evolving skill demands of the employer expectations (Thi Ngoc Ha et al., 2023). However, a universally accepted definition is not available and stakeholder confusion is abundant due to the inconsistent credit structures which limits the potential of the micro-credentials (Wihendro et al., 2024). Most of the existing studies are systematic reviews and empirical evidence is lacking in the specific discipline (Ahsan et al., 2023), and especially in the Sri Lankan context, proper groundwork is needed prior to further studying this construct which is evidence for literature gap. When considering the resource-constrained higher education sector in Sri Lanka, comprehension of the micro-credentialing is yet under-researched ((Wei and Chou, 2020; D. Rosario, 2025) and this paper aims to propose a Sri Lankan contextual conceptualization to bridge the existing contextual gap. The conceptualization is supposed to integrate competency-based, stackable design with rigorous quality frameworks and university–industry collaboration, aiming to enable inclusive talent development, credible signaling, and sustainable ecosystem alignment, while avoiding the pitfalls of ad-hoc, market-driven credential proliferation.

1.1. Purpose Statement

This conceptual paper aims to provide a holistic view of micro-credentialling in the university education system in the context of Sri Lanka. Also the study lays the foundation for future systematic empirical studies on micro-credentialling in university education. The objectives of the study are to,

1. Canvas a working definition of micro-credentialling
2. Identify categories and typologies of micro-credentials
3. Operationalization of the construct
4. Relevance and importance of micro-credentialling in Sri Lanka

1.2. Research questions

The study will be aimed at addressing the following research questions,

1. How do university students in Sri Lanka perceive the dimensions of micro-credentialling (skill signalling, relevance, and stackability), and do these dimensions form a valid and reliable measurement model?
2. To what extent does micro-credentialling influence perceived graduate employability among Sri Lankan university students?
3. How do employers in Sri Lanka interpret and evaluate micro-credentials as signals of job-relevant competencies?
4. How does the integration of stackable micro-credentials within degree programmes influence students' academic progression and lifelong learning intentions?

2. Method – Sources of Data

This study follows the conceptualization methodology followed by Iddagoda and Opatha (2017) by initializing the study with a desk study using a large number of research publications from 2005 to 2025 covering 20 years of work. The study is limited to the given period as micro-credentialling is a relatively new topic emerged from mid 2000s and the system accelerated post 2018 along with the system frameworks and pandemic era adoption (Brown et al., 2021; Educational Sciences, 2024; Wheelahan and Moodie, 2022). The articles were extracted from Taylor and Francis Online, Sage Publications, Springerlink, Emerald and Wiley Online Library adopting the style by Iddagoda and Opatha (2017).

3. Literature Review

3.1. Introduction to Micro-credentialling

Micro-credentialling in terms of the education system of universities has been identified as an important factors and it simply refers to the design, delivery, assessment, and recognition of short, competency-based learning units that certify specific, verifiable skills and knowledge and these often can be linked with digital badges or in certain cases portable records which are aligned with the relevant quality and credit recognition frameworks (Wheelahan and Moodie, 2022; Chakroun and Keevy, 2018). When it comes to the early identification of micro-credentials, they only considered the generic short-courses, whereas the later versions of the terminology recognizes the explicit learning outcomes, authentic assessment of competence, and transparency of metadata describing level, workload, issuer, and evidence, which basically covers up the limitations of the traditional transcripts and brings in granular capabilities of the learners which helps them with the employment and signals for employer attention based on competency based achievements (Brown *et al.*, 2021b)

Further elaborating on the term ‘micro-credentialling’, there are major variations in pinning a definition for the construct and under different jurisdictions, it may reflect various implications. However the modern points of view consider micro-credentials as stackable building blocks that can “stand alone” for targeted upskilling or “stack into” larger awards when mapped to qualification frameworks, credit systems, and institutional policies on recognition of prior learning ((Alenezi, Akour and Alfawzan, 2024; Gamage and Dehideniya, 2025)). Moreover, the better clarity is given when it comes to the proper rationale of micro-credentialling becomes two-fold. First it targets to improve the relevance and responsiveness of universities to rapidly evolving labour-market needs by enabling just-in-time, flexible learning pathways and then second, it aims to widen participation through modular access points that reduce time and cost barriers for diverse learners, including working adults (Brown *et al.*, 2021a; Ahsan *et al.*, 2023; Thi Ngoc Ha *et al.*, 2023b)

However, based on the field research or empirical studies, it has come to the attention of the stakeholders that micro-credentialling can actually strengthen the perceived employability via human capital factors and provide more transparent and clearer signaling when it comes to the job-specific skills and this also draws attention on the fact that benefits depend on credible assessment, employer recognition, and alignment with industry-validated standards(Wei and Chou, 2020; Moodie and Wheelahan, 2021b; Zou *et al.*, 2024). Simultaneously some authors elaborates on the fragmentation, variable quality, and credential inflation if micro-credentials proliferate without robust assurance, coherent typologies, and interoperable recognition mechanisms across institutions and borders (Moodie and Wheelahan, 2021a, 2021c; Wheelahan and Moodie, 2022). Thereby, the modern frameworks not only focus on the competency-based design, transparent outcomes and rubrics and workload but also emphasize on the

factors such as level equivalence, external moderation, and machine-readable metadata to support portability and trust at scale (Selvaratnam and Sankey, 2020).

Main aim of micro-credentialling is to build a central body integrating university- industry collaborations therefore advisory boards, co-design, and work-integrated assessment can ensure that content and verification reflect real occupational standards while preserving academic integrity and equity in access (Baruch, Bell and Gray, 2005; Jackson and Chapman, 2012; Brown *et al.*, 2021a). When considering the context of Sri Lanka, this collaboration is widely present, yet it is mostly characterized by the resource constraints, massification pressures, and urgent employability goals (Gamage and Dehideniya, 2025; Ngoc Ha, Van Dyke and Spittle, 2025). When it comes to such scenarios micro-credentialling provides a safe ground for the university students to provide agile, stackable pathways that complement degrees, scaffold lifelong learning, and strengthen university–industry linkages. Though with this stable promise, realizing these benefits requires a context-sensitive conceptualization that integrates design principles with governance, quality assurance, and recognition policies to avoid ad-hoc, market-driven proliferation (Wheelahan and Moodie, 2022; Pal’ova and Zoricakova, 2025) Therefore in a nutshell, micro-credentialling can be identified as a structured credential ecology as at now and it can make learning more visible, portable, and responsive. If the universities embed rigorous standards, interoperable recognition, and stakeholder alignment from the outset these are supposed to create massive opportunities and drastic alterations in the field of higher-education (Brown et al., 2021a; Hou et al., 2025).

Table 1: Definitions of Micro-credentialling

Author	Year	Definition	Comments
Wheelahan and Moodie	2021	Micro-credentials are short, outcomes-based credentials that certify specific competencies and should be embedded in coherent credentialing systems to avoid fragmentation and skills fetishism.	Elaborates the competency and skill development and certification of credentials
Hou et al	2025	Digital credentials that record evidence of learning, with transparent metadata on issuer, outcomes, level and assessment to enable cross-border recognition.	More focused on the evidence based learning, portable evidence and recognition of the micro-credentials

Hart, Stewart and Jimerson	2011	Stackable, flexible credentials that certify granular skills and can stand alone or contribute to larger awards within an emerging “credential ecology” for lifelong learning.	This discusses how the micro-credentials adds more value to the degree programme as well as bring out synergetic outcome when stacked together with traditional learning
Barush, Bell and Gray	2005	Institution–industry co-designed credentials that certify job-relevant capabilities and empower learners and universities through shorter forms of learning.	Discusses the facts on job-relevant course designs where up-skilling and re-skilling are facilitated

Source: Compiled by author

Through the summarized information with regards to micro-credentialling based on previous research, the author narrowed down three main components which makes up the full term of micro-credentialling

1. Skill signaling – discusses the evidence based practice by micro-credentials and the competency based certifications to attract employers
2. Relevance – task relevance, skill development through up-skilling or re-skilling to create job relevance
3. Stackability – capacity to add more value through synergizing with the degree programme and bringing in more recognition

When considering all relevant factors, micro-credentials can be best known through the three interlocking components that determine their value in higher education and labour markets. Starting off with skill signalling which covers how the competency-based assessment and transparent evidence make capabilities visible to employers. If the micro-credentials are well designed and they can publish explicit outcomes. As a result of it these outcomes including issuer/level/workload metadata, which together strengthen the credibility and portability of the signal across contexts (Baruch, Bell and Gray, 2005; Thi Ngoc Ha *et al.*, 2023b). Therefore the skill signalling component can be backed by strong literature and it is directly linked to enhance perceived employability because it translates learning into verifiable, job-relevant competences that employers can readily interpret, addressing the limitations of opaque transcripts (Brown *et al.*, 2021a; Zou *et al.*, 2024). Then comes the relevance which is all about aligning the tasks and developing the skills to match the job market and shape the learner through up-skilling and re-skilling to secure better positions when it comes to jobs. These are usually achieved by

concise, just-in-time content and authentic tasks embedded in micro-credentials and if the assessments are valid and properly moderated they support the job and create long-lasting learning pathways (Moodie and Wheelahan, 2021b; HALIM, Luaran and Jill, 2023; Zhang and Alasmari, 2025). Relevance is maintained through systematic engagement with industry and the publication of outcomes that map to current occupational standards, ensuring that attainment reflects contemporary workplace practice rather than abstract knowledge alone (MacCallum and Brown, 2022; Education Sciences, 2024). Last but not least, the third component is stackability which means the structured pathways that let learners combine multiple micro-credentials and, where appropriate, receive credit recognition toward larger awards which is more like a synergizing effect. Through proper completion of academic levels, workload and credit equivalence, micro-credentials can complement degrees, enrich graduate profiles with granular capabilities, and gain wider recognition within qualification frameworks (Hart, Stewart and Jimerson, 2011b; Brown *et al.*, 2021a; Pal'ova and Zoricakova, 2025). Altogether with all three components, redible signalling, authentic relevance, and recognised stackability, micro-credentials can become portable proofs of competence which clearly elevates the profile values of the university students once they enter the job market (Jackson and Chapman, 2012; Moodie and Wheelahan, 2021b; Wheelahan and Moodie, 2022).

3.2. Micro-credentialling – Working Definition

Micro-credentialling is the design, assessment, issuance, and recognition of short, competency-based learning units that certify clearly defined skills through transparent evidence and quality-assured processes, published with machine-readable metadata on outcomes, level, workload and issuer to support employer signalling, portability, and stackable pathways that complement formal degrees and enable targeted upskilling and reskilling.

3.3. Categories of Micro-Credential Practice

3.3.1. Foundational/stand-alone

Through foundational micro-credentials, they certify a single, discrete competency with clearly published learning outcomes, assessment criteria, workload, and level, functioning as targeted upskilling instruments and precise labour-market signals for narrow role (Selvaratnam and Sankey, 2020; Santally *et al.*, 2024a; D. Rosario, 2025). Their value lies in evidencing one capability to a valid standard without requiring program-level commitment, which supports rapid talent deployment and recognition in specific tasks or technologies (Sharma *et al.*, 2024; Zhang and Alasmari, 2025). Effective stand-alone designs include authentic assessment artefacts and machine-readable metadata so

employers and credential evaluators can verify attainment quickly, thereby improving trust and portability across contexts (Pirkkalainen et al., 2023; Alenezi, Akour and Alfawzan, 2024).

3.3.2. Clustered/skill bundle

These means the micro-credentials assemble related competencies into role-aligned bundles. Some can come in the form of a “learning designer” or “data analyst” capability set (Alenezi, Akour and Alfawzan, 2024). These are usually co-designed with relevance to the industries to cover the currency and compatibility with the jobs (Pirkkalainen *et al.*, 2023). When it comes to bundling, it helps to get cumulative evidence of practice across tasks, (Ngoc Ha, Van Dyke and Spittle, 2025) enabling learners to demonstrate breadth and depth beyond a single skill, while preserving agility and short completion cycles (Ngoc Ha, Van Dyke and Spittle, 2025). High quality clusters articulate internal progression, shared assessment rubrics, and mapped performance levels, which help employers read the whole capability profile and strengthen recognition in recruitment and internal mobility (Selvaratnam and Sankey, 2021b).

3.3.3. Stackable/credit bearing

Stackable micro-credentials are mapped to qualification levels and credit values, with explicit articulation into certificates, diplomas, or degrees under institutional policy and recognition of prior learning (RPL) (Ahsan *et al.*, 2023). Stackability allows learners to accumulate credit over time, converting targeted upskilling into formal progression while retaining labour-market responsiveness (Ali *et al.*, 2024; Wihendro *et al.*, 2024). Critical design features include workload equivalence, moderation, and documented pathways that specify which combinations stack and how credit transfers, thereby preventing ad-hoc accumulation and ensuring academic integrity and comparability across programs (Ma and Bennett, 2021).

3.3.4. Regulated/assured

Regulated micro-credentials mean that they operate under the explicit quality assurance (QA) and they have proper frameworks (Ma and Bennett, 2021; Ali *et al.*, 2024). These cover the assessment validity, issuer accountability, metadata standards, and external moderation, thereby they secure legitimacy, portability, and employer trust. In diverse systems, clarity on regulatory status and interoperable standards mitigates fragmentation, prevents credential inflation, and supports cross-institution and cross-border recognition (Moodie and Wheelahan, 2021a; Wheelahan and Moodie, 2022). Effective assurance models couple institutional QA with sector or national guidance, linking digital credential infrastructure to governance so learners’ achievements remain verifiable and durable as they stack or transition across institutions and labour markets (Hart, Stewart and Jimerson, 2011a).

3.4. Operationalization of the Variable of Micro-credentialling

3.4.1. Dimensions of micro-credentialling

Micro-credentialling is conceptualized via basic constituents of the three dimensions: skill signaling, relevance and stackability.

Dimension 1: Skill Signaling

Skill signaling describes how a micro-credential communicates verified competence to external audiences through their explicit learning outcomes, authentic assessment artefacts, and issuer/level/workload metadata(Santally *et al.*, 2024b). Once these are transferred to employers can readily interpret for hiring and advancement. Effective signaling relies on verifiable digital credentials that preserve evidence of performance and provide machine-readable details for trust and portability across institutions and labour markets(Wheelahan and Moodie, 2022). These can be measured through the statements which discusses the facts 1) certificates/digital badges and 2) transferability and universal acceptance of the skill signaling.

Table 2: Elements and Statements of the Dimension – Skill Signaling

Element	Statement
Competency certification	I believe micro-credentials (certificates/digital badges) are a good signal to certify potential employers about the specific skills a candidate possesses.
Portable evidence	I believe micro-credentials (certificates/digital badges) are a good evidence for employees to be recognized for skills they have developed.

Dimension 2: Relevance

Relevance reflects the degree of task alignment and the suitability of microlearning-enabled micro-credentials for up- and reskilling (Hart, Stewart and Jimerson, 2011a, 2011b). This facilitates the transferring of day-to-day performance through concise, practice-centered activities and valid, job-embedded assessment. Once these micro-credentials are co-designed with industry, it keeps outcomes current and ensure short learning sequences provide just-in-time knowledge, feedback, and opportunities for application at work(Hou *et al.*, 2025). Statements 3) provision of knowledge for daily performances and 4) developing task relevant skill development and 5) significant focusses of microcrednetials to up and re skill, check the relevance of micro-credentials with regards to the job market.

Table 3: Elements and Statements of the Dimension – Relevance

Element	Statement
Job relevance	I trust microlearning lessons to provide information that learners need to perform their day-to-day tasks
Skill development suitability	I believe micro-credentialling can help me develop my skills to do a job
Upskilling and Re-skilling	I comprehend that micro-credentials micro-credentials hold significant value in showcasing competence in the essential skills required for upskilling and reskilling.

Dimension 3: Stackability

Stackability denotes formal mapping to qualification levels, workload, and credit so micro-credentials can complement degrees and articulate into larger awards via recognition-of-prior-learning and documented pathway rules under institutional quality assurance(Moodie and Wheelahan, 2021b; Thi Ngoc Ha *et al.*, 2023b). Clear stacking metadata, pathway guides, and moderation protect academic integrity and allow employers to read granular capabilities alongside formal qualifications for recruitment and internal mobility(Wei and Chou, 2020; Moodie and Wheelahan, 2021b). 6) Development of skills to complement a degree programme, and 7) adding value to a degree through micro-credentials, are the statements designed to assess the stackability component.

Table 4: Elements and Statements of the Dimension – Stackability

Element	Statement
Degree complementarity	I believe micro-credentials are not an alternative for a degree but they complement the degree programme.
Value addition	I think micro-credentials (certificates/digital badges) are a valuable addition to a degree or diploma, indicating the specific skills a candidate possesses.

Based on the Table 2,3 and 4, an instrument is developed to measure the construct of micro-credentialling. Figure 1, presents the relevant Dimensions (D) and Elements (E) which further refine the model.

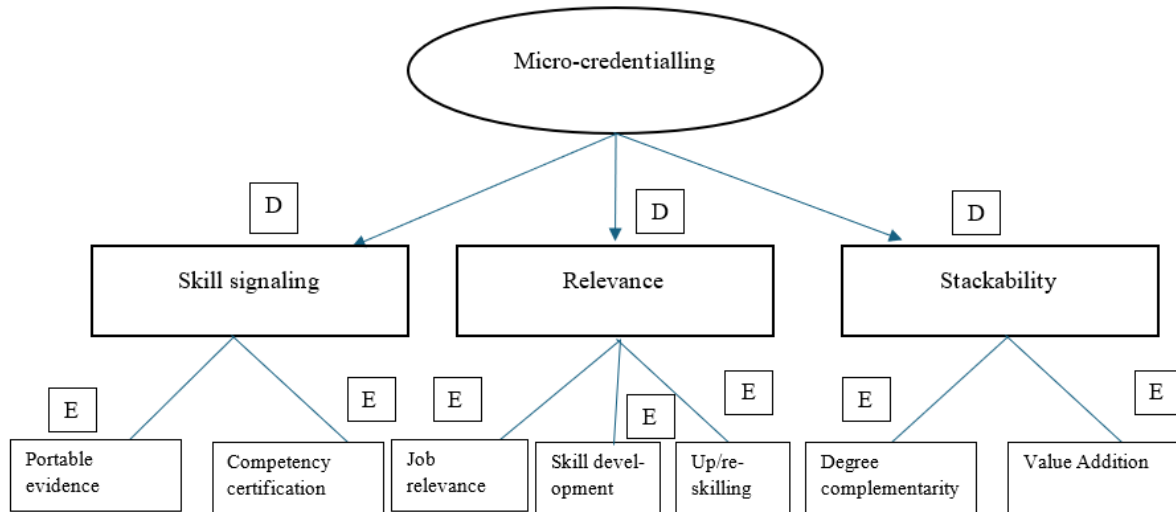


Figure 1: Dimensions and Elements of the Variable Micro-credentialling

Source: Author's creation

3.5. Relevance and importance of micro-credentialling in Sri Lanka

Micro-credentialling as understood by previous literature as a flexible system for designing, assessing, issuing and recognizing short, outcomes-based learning units that verify specific competencies and make them visible to learners, employers and institutions (Moodie and Wheelahan, 2021b; Thi Ngoc Ha *et al.*, 2023b). According to Brown *et al.*, (2021b) micro-credentialling act as portable proofs of mastery linked to explicit outcomes, authentic assessments, workload and level information, rather than loose term 'short courses'. These basically function well in mature ecosystems and the learner based credit mappings allow learners to stack achievements toward larger awards (Baruch, Bell and Gray, 2005; Hart, Stewart and Jimerson, 2011b; Jackson and Chapman, 2012). When these elements align, micro-credentials become both a practical tool for rapid up- and reskilling and an architectural mechanism for modernizing how higher education partners with industry, assures quality, and widens participation.

Micro-credentials usually claims to make a precise claim about competence. When it comes to the learner, what the learner can do, in what context, to what standard can be personalized or chosen as choice (Selvaratnam and Sankey, 2020; D. Rosario, 2025). That clarity prevents conflation with informal participation certificates and avoids inflated claims that erode trust. A well-articulated definition also guides curriculum teams, examiners and registries in choosing appropriate assessment types, workload estimates, and level descriptors, not only that but also it helps external stakeholders understand exactly what is being certified. (Alenezi, Akour and Alfawzan, 2024; Sharma *et al.*, 2024).

Micro-credentialling anchors the policies that determine recognition within programs (Zou *et al.*, 2024), especially in terms of universities, a shared definition curbs duplication, supports inter-faculty collaboration, and provides the foundation for institution-wide quality assurance.

Micro-credentialling can be competency-based design, as in it must be built backward from performance. At this point they start with role-relevant tasks, break them into assessable competencies, and then design learning activities that allow practice, feedback and demonstration (Selvaratnam and Sankey, 2021b; HALIM, Luaran and Jill, 2023; Zou *et al.*, 2024; Gamage and Dehideniya, 2025). Microlearning is useful not just as “bite-sized” content for its own sake, but as a way to sequence deliberate practice and formative checks tightly around specific task demands (Pal’ova and Zoricakova, 2025). This keeps every hour learners invest aligned with a demonstrable skill, increases transfer to day-to-day work, and provides assessors with observable evidence. Critically, competency-based design means rubrics, exemplars and integrity protocols are non-negotiable; without them, the credential’s claim about capability remains unverifiable.

High-trust micro-credentials preserve the artefacts that substantiate achievement and they code repositories, design portfolios, performance videos, workplace supervisor attestations, structured simulations with scoring guides (Ahsan *et al.*, 2023; Narayanaswamy *et al.*, 2024b). They also document who assessed what, against which criteria, at what level which is quite supportive of verifying performance and assuring credibility (Desmarchelier and Cary, 2022; Kiiskilä, Kukkonen and Pirkkalainen, 2023). This evidence trail transforms a digital badge or certificate from a mere symbol into a verifier-friendly record (Desmarchelier and Cary, 2022). If a course is done well, it allows employers to sample the learner’s work product quickly and enables external examiners to re-mark or moderate when necessary (Brown *et al.*, 2021a; Wheelahan and Moodie, 2022). It is also central to fairness: clear rubrics and exemplars improve transparency for candidates and reduce variability between assessors.

Micro-credentialing is known for supporting signaling and portability. Micro-credentials must communicate in a language employers and credential evaluators can read (Hart, Stewart and Jimerson, 2011a; Brown *et al.*, 2021a; Moodie and Wheelahan, 2021a; Wheelahan and Moodie, 2022). That implies machine-readable metadata describing issuer, outcomes, assessment, workload, level and any credit value, linked where possible to occupational standards (Hart, Stewart and Jimerson, 2011a). Portability is strengthened when that metadata follows an agreed schema and when issuers publish verification endpoints. In practical terms, the signal becomes stronger when programs share a typology and naming conventions across the institution or system, so that the same label implies the same standard (Maina *et al.*, 2022; Dennis *et al.*, 2025). Without shared signaling, credentials proliferate but remain opaque, dampening employer uptake.

When it comes to stackability and pathways, micro-credentials gain medium-term value when they are mapped to qualification-framework levels, workload equivalences and program rules, making it clear which combinations “stack” into a certificate, diploma or degree credit (Martín-Gilete and Blanco-García, 2024; Dennis *et al.*, 2025). This prevents a scatter of standalone units and instead creates navigable routes for learners and this is from immediate job-ready skill to formal progression (Brown *et al.*, 2021a). For universities, stackability incentivises academic departments to collaborate on micro-credential “ladders,” reduces duplication of assessment effort, and clarifies recognition-of-prior-learning decisions. For learners, it lowers opportunity cost: time spent upskilling today can count toward an award tomorrow.

Micro-credentialling further can establish assurance and legitimacy through robust extensions of existing academic QA rather than bypassing it (Ali *et al.*, 2024). Key elements include externality (moderation or external examiners), integrity checks (identity, proctoring where appropriate, plagiarism detection calibrated to task), grade calibration, and continuous review of outcomes against changing occupational standards (Hart, Stewart and Jimerson, 2011a; Moodie and Wheelahan, 2021a). Governance should specify approval gates, renewal cycles, and retirement criteria, so credentials remain current and do not accumulate as stale catalogue items (Maina *et al.*, 2022). QA also covers learner support and accessibility which is actually ensuring micro-credentials work for busy adults with uneven connectivity and varied prior knowledge.

In terms of the ecosystem governance and co-design, micro-credentialling works best when universities, employers, professional bodies and regulators align on typologies, standards and recognition rules (Selvaratnam and Sankey, 2021a; Varadarajan, Koh and Daniel, 2023; Martín-Gilete and Blanco-García, 2024). Co-design with industry informs task selection, scenario realism and endorsement pathways; partnerships with credentialing platforms ensure verification and interoperability; and policy alignment enables cross-institution recognition (Lyu, 2023; Wihendro *et al.*, 2024; Pal’ova and Zoricakova, 2025). Clear roles prevent market fragmentation: universities safeguard academic standards, employers inform relevance and validation, and regulators set the conditions for portability and consumer protection.

When it comes to measurement and improvement, the institutions should track demand signals, completion and assessment validity metrics, learner satisfaction, employer endorsement, and the rate at which micro-credentials convert to credit or internal advancement (Pal’ova and Zoricakova, 2025). These data feed renewal decisions and help rebalance portfolios toward areas of sustained workforce need (Lyu, 2023). They also surface equity gaps to verify who benefits, who is left out while also targeting and informing focused outreach or support.

Micro-credentialling maps directly onto Sri Lanka’s strategic needs across three fronts which are employability, widening participation, and system agility (Gamage and Dehideniya, 2025).

Employability and productivity is the key point and when it comes to especially the employers, of SMEs and service sectors, they need verifiable, job-ready capabilities in areas like ICT support, data handling, digital marketing, supply-chain operations, hospitality operations and healthcare administration(Baruch, Bell and Gray, 2005; Moodie and Wheelahan, 2021b; Santally *et al.*, 2024a). Micro-credentials allow universities to align learning to these roles quickly, publish exactly what graduates can do, and provide employers with evidence they can scan and trust(Zhang and Alasmari, 2025). This tightens the skills pipeline, reduces hiring friction, and supports on-the-job upskilling without pulling employees out of work for long periods.

Widening participation and equity is one of main requirements of Sri Lankan university educators and learners. Many Sri Lankan learners balance study with work and family responsibilities (Ahsan *et al.*, 2023; Hou *et al.*, 2025). Modular offerings with clear progression reduce time and cost barriers, letting learners advance in manageable increments. When micro-credentials are credit-bearing and mapped to degree pathways, they help first-generation and working-adult students accumulate recognised learning without committing upfront to long programs (Moodie and Wheelahan, 2021b). This can be transformative for regional and under-served communities, where access and affordability are persistent challenges.

A coordinated micro-credential framework can ensure system agility and international alignment and it enables universities to respond to emerging technologies and sector shifts faster than traditional program-approval cycles allow(Wei and Chou, 2020; Brown *et al.*, 2021b; Moodie and Wheelahan, 2021b). Publishing level, workload and credit equivalences in a shared typology also positions Sri Lankan institutions to interoperate with regional partners, supporting student mobility and recognition(Gamage and Dehideniya, 2025). As more systems adopt common metadata and QA conventions, Sri Lanka can plug into cross-border initiatives while retaining local relevance.

Establishing a national typology and shared definitions is again a core requirement within the country's context. Agree on what constitutes a micro-credential, required metadata, and minimal QA expectations. Publish naming conventions and level/workload anchors to standardize signaling (Moodie and Wheelahan, 2021b; Desmarchelier and Cary, 2022). Building competency libraries tied to priority roles and convening sector panels to identify critical tasks and performance contexts, which can then develop competency statements and rubrics that universities can reuse across micro-credentials, is a giant possible leap and can upend the higher education sector(Baruch, Bell and Gray, 2005; Hart, Stewart and Jimerson, 2011b; Selvaratnam and Sankey, 2020). Investing in assessment and evidence infrastructure while enabling easy capture, storage and verification of artefacts can provide rubric management and moderation workflows(Santally *et al.*, 2024a). It is better to support learner e-portfolios that integrate with digital credentialing and make stackability real, not rhetorical. Not only that but also by mapping micro-credentials to credit within programs and publishing pathway diagrams to implement recognition-of-prior-learning policies that specify limits, with residency requirements,

and recency rules can further establish the transparency and validity of the system(Selvaratnam and Sankey, 2020).

Within the Sri Lankan context, it is required to have external moderation, identity assurance aligned to task stakes, and cycle-based review of outcomes against labour-market changes(Gamage and Dehideniya, 2025). When the credentials are no longer meet demand or standards they should be redesigned and the developers are to partner for relevance and scale(Moodie and Wheelahan, 2021b; Thi Ngoc Ha *et al.*, 2023b). By formalizing university–industry advisory structures, Sri Lankan economy actually facilitate the co-development of micro-credential clusters in terms of priority sectors, and pilot cross-institution credit recognition to avoid duplication and accelerate learner progression(Selvaratnam and Sankey, 2020; D. Rosario, 2025; Zhang and Alasmari, 2025).

In summary, micro-credentialling is not a collection of short courses; it is a standards-driven system for making learning visible, verifiable and valuable across education and work. When designed around clear competence, assessed through authentic evidence, signaled with shared metadata, stacked into recognized pathways, and governed through robust QA and co-design, micro-credentials can help Sri Lanka raise employability, expand opportunity, and modernize higher education with speed and integrity.

4. Implications of the Study

4.1. Theoretical Implications

This conceptual study discusses the theoretical understanding by clarifying the structure, boundaries, and functioning of micro-credentialling within university education. Despite of the ambiguity imposed by the existing literature with regards to definitions, typologies, and value claims, this conceptualization delineate the dimensions kill signaling, relevance, and stackability and validates an instrument to fill certain gaps in literature. The study provides a clear understating on how to make best use of mico-credentialling while maintaining academic integrity. he synthesis further integrates competency-based design, metadata transparency, and recognition-of-prior-learning into a unified ecosystem, addressing theoretical gaps in how short-form credentials can articulate into larger qualification frameworks. In addition the conceptualization redefines micro-credentialling as a standards-driven credential ecology rather than a collection of fragmented short courses. Finally, the proposed conceptualization responds to context-sensitive needs in resource-constrained systems such as Sri Lanka, where skill agility, affordability, and employability are critical.

4.2. Managerial Implications

For university administrators, the conceptualization offered in this study provides a proper, theory-backed practical guidance for designing micro-credential portfolios that align with labour-market needs while preserving academic standards. By articulating explicit learning outcomes, transparent assessment rubrics, and issuer/level/workload metadata, institutions can strengthen employer trust and the portability of student achievements. For stakeholders such as, lecturers, micro-credentials offer opportunities to embed authentic work products as assessment artefacts, increasing transparency and fairness and when it comes to the system level, governance structures can coordinate employer endorsement and cross-institution portability, strengthening national workforce pipelines.

4.3. Future Research Implications

This conceptualization sheds light on several promising pathways for future empirical inquiry. First, longitudinal studies are needed to evaluate the long-term impact of micro-credentials on employment outcomes, internal mobility, and wage progression, addressing current evidence limitations. Second, comparative research across disciplines may reveal differing patterns of relevance and stackability, particularly between technical and service-oriented domains. Third, employer perception studies could examine how signaling strength varies based on metadata granularity, assessment artefacts, and issuer reputation. Last but not least, equity-focused research is needed to assess participation barriers for working adults, regional learners, and first-generation students. Such investigations would inform outreach and support strategies.

5. Conclusion

Micro-credentialling is known for providing universities quite a flexible and competency-based approach to strengthening graduate employability, supporting lifelong learning, and responding swiftly to labour-market demands. By emphasizing skill signaling, relevance, and stackability, these short learning units can complement traditional degrees and provide verifiable evidence of capability. When supported by quality assurance, transparent metadata, and industry collaboration, micro-credentials enhance credibility and portability. Within the Sri Lankan context, they offer scalable pathways that reduce cost and time barriers while widening participation. As higher education systems evolve, micro-credentialling represents a strategic mechanism for modernizing curricula, improving workforce readiness, and increasing learner agility.

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