

# Unravelling Challenges of Higher Education Institutions in Implementing Effective Micro-Credentials: A Multi-Stakeholder Qualitative Study

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<https://doi.org/10.24191/ajue.v20i1.25698>

*Received: 15 July 2023*

*Accepted: 31 December 2023*

*Date Published Online: 14 February 2024*

*Published: 14 February 2024*

**Abstract:** In response to the evolving educational landscape where employers are searching for individuals with specific skills aligned with the swiftly changing market needs, universities worldwide, including those in Malaysia, are increasingly interested in micro-credentials. Identifying challenges in micro-credential adoption is crucial for various stakeholders, including course developers, policy makers, government agencies, and industry bodies. This research aims to examine the challenges faced by multi-stakeholders in higher education institutions while adopting micro-credential as viable alternatives and formal credentialing systems. This qualitative study employed semi-structured individual interviews involving 20 higher education stakeholders. The interviews were audio-recorded, transcribed, and analysed using structured qualitative content analysis in MAXQDA, with Lincoln and Guba's criteria guiding the analysis process to ensure rigour. The study identified five factors that challenge the adoption of micro-credentials: learners, developers, organisational, industries, technological factors. Based on these factors, recommendations for addressing these challenges were proposed. It is hoped that a more informed and nuanced understanding of these challenges will enable Malaysian educational institutions and policymakers to devise effective strategies to overcome barriers and create a robust micro-credential ecosystem that addresses the needs of learners and future employers.

**Keywords:** Challenges, Malaysia, Micro-Credentials, Higher Education, Stakeholders

## 1. Introduction

The educational landscape has witnessed a surge in the popularity of micro-credentials (MCs) around the world, including Malaysia (Kumar et al., 2022). The growing adoption of MCs can be attributed to their ability to cater to the ever-increasing demand for skilled and adaptable workers, crucial for filling critical skill gaps and staying competitive in the age of rapid industrial revolution. This shift in the global workforce requirements has led employers to actively seek out individuals equipped with up-to-date competencies and expertise (McGreal & Olcott Jr, 2022). MCs offer a targeted approach to learning, focusing on small, specific competencies that address the emerging need for a

more competent and work-related curriculum (Ralston, 2021). Thus, MCs have emerged as a plausible solution to effectively address the challenges posed by evolving industries and their demand for highly skilled workers (Kato et al., 2020).

Common key features of MCs are (MQA, 2020; Oliver, 2019): (a) typically shorter and less expensive than traditional qualifications, (b) focused on specific skills or competencies, (c) awarded based on assessment of learning outcomes, and (d) portable enough to be shared across different platforms. In this study, the conceptual definition of MCs is credentials that are awarded digitally, and can be used to demonstrate skills and knowledge that have been acquired through formal or informal learning. Additionally, MCs can be earned through a variety of methods, including online courses, in-person workshops, and workplace training (Oliver, 2019). They encompass different skill levels and are aligned with existing qualifications or standards framework (McGreal & Olcott Jr, 2022).

In the rapidly evolving educational landscape, MCs have gained significant importance in higher education institutions (HEIs). Many HEIs have adopted digital badging particularly in undergraduate programs like MOOCs, resulting in improved workforce readiness, increased student engagement and positive effects on student retention (Kiiskilä et al., 2023). Students can build a portfolio of stackable credentials that demonstrate their skills and knowledge, making them more appealing to employers (Kato et al., 2020; O'Leary et al., 2022). Learners can access flexible MC courses online and find a tailored learning journey aligned with their career goals (Brown et al., 2021; McGreal & Olcott Jr, 2022). Employers find MCs helpful for identifying skilled workers and promoting upskilling and reskilling in the workforce, thereby improving productivity and the economy (Ermicio et al., 2021).

With the expanding market of MCs, HEIs face the challenge of meeting the demands of learners and employers. To stay relevant, HEIs must offer MCs that align with the industry standards and guide learners to build a valuable portfolio of stackable credentials (MQA, 2020; McGreal & Olcott Jr, 2022). However, there is limited empirical research on the readiness of HEIs to embrace MCs. Ahsan et al. (2023) and Brown et al. (2021) pointed out that it is important to consider the perspectives of key stakeholders within HEIs when designing and implementing MCs, as research on how HEIs adopt MC are lacking. Varadarajan et al. (2023) reminded that HEIs should be mindful of critical stakeholders in the MCs ecosystem, including students, educational institutions, governments and employers. Before deciding whether to offer MCs, HEIs should meticulously analyse the opportunities and challenges presented by the ecosystem.

Therefore, it is important to study the stakeholder's views as it is an important step in the design and implementation of MCs. By understanding the needs and expectations of different stakeholders, we can ensure that MCs are designed and implemented in a way that is effective and relevant for everyone involved. As part of a larger postgraduate project, the present study aims to gather insights from various stakeholders, such as students, instructors, developers and industries, on challenges faced by these stakeholders in adopting MCs and propose effective solutions for overcoming these barriers and challenges.

The fundamental question to be answered is:

1. What are the perspectives of key stakeholders, including students, MC developers, industry stakeholders and employers, regarding the role and value of MCs in HEIs?

Sub-research questions include:

2. What factors promote or hinder the effective adoption of MCs in HEIs?
3. What are the perspectives of key stakeholders regarding the suitability of MCs as alternative learning pathways within the formal credentialing system?

This study hopes to contribute valuable insights to the existing knowledge base while offering practical recommendations for the adoption of MCs in HEIs.

## **2. Review of Literature**

The movement towards MCs in Malaysia began with the Malaysia Education Blueprint 2015-2025, which highlighted the importance of improving online learning, promoting lifelong learning, and transforming higher education delivery. In March 2019, the Malaysia Qualifications Agency (MQA) took significant steps to make education more accessible through the introduction of micro-credentialing. MQA launched the "Guideline on Micro-credentials" to provide HEIs and stakeholders with essential information and best practices for implementing MCs effectively. Since then, some universities in Malaysia have embraced MCs and begun offering certification programs to current and prospective students.

### **2.1 Challenges in adopting Micro-Credentials in Higher Education Institutions**

Due to its emerging nature, MCs lack clear quality guidelines. Additionally, their standalone design limits stackability and transferability. Unpacking and combining MCs is complex due to uncertain outcomes, posing challenges for learners building portfolios or transferring them to other HEIs for larger qualifications (McGreal & Olcott Jr, 2022; Kato et al., 2020). Additionally, employers look forward to more explicitly stated skills by MCs. The lack of standardisation makes it difficult to compare the MCs from different providers (Selvaratnam & Sankey, 2021).

In order for MCs to be widely adopted, HEIs also need to address several key aspects including the need for reliable and secure platforms, staying abreast of technological changes and tackling various challenges faced by learners. MCs need portfolio management that provides different pathways for learners to organise credentials and visualise the skills acquired, and platforms which are equipped with verification technology and user interface and recognition (Kiiskilä et al., 2022). Past studies also highlighted the challenges faced by HEIs in keeping up with the pace of technological change, due to the constant emerging of new technologies, and HEIs can take a long time to develop new courses and programs to teach these technologies (Kumar et al. 2022; Selvaratnam & Sankey, 2021). In addition, they also argued that self-motivation and self-organisation can be a challenge for micro-credential learners. Not all employers support or allow employees to learn during work time, which means learners need to find time to learn outside of work (Perkins & Pryor, 2021).

In addition, the adoption of MCs is riddled with challenges even when the HEIs are keen. For instance, it is difficult to anticipate and control the processes when institutions need to adjust beyond the institutional level in the MC ecosystem, especially when there is a lack of strategic appreciation and understanding within the ecosystem (Pirkkalainen et al., 2023). Furthermore, spreading awareness and validating MCs is also arduous (Pirkkalainen et al., 2023). Some factors behind the challenges of developing MCs may be due to limited resources including time, incentives and guidance, in addition to the extensive effort and time required by the developers in preparing and producing online teaching and learning materials for MCs (Che Amat et al., 2022).

HEIs need to collaborate with the industry to develop the potential of digital badges as a valuable tool in MCs for employers and learners (Brown et al., 2021). Perkins and Pryor (2021) highlighted employers preference for digital badges that demonstrate specific skills and competencies. Kiiskilä et al. (2023) highlighted the significance of verifiable digital credentials in providing value to learners and their potential for broader use in various learning offerings and industry contexts. They also highlight the importance of co-designing MCs with governments and industries to bridge the skill gap and increase industry recognition of digital credentials.

The challenges of adopting MCs in HEIs can be understood from the perspective of students as well. For the student, the transition from free MOOC courses to paid micro-credential courses presents a financial dilemma (Parsons et al., 2023). The pricing of MCs varies widely, and some may even cost more than regular academic credit credentials on a per unit basis (Kato et al., 2020). Micro-credential landscape is extensive, confusing, and challenging for both students and employers to navigate, and terms like nano degrees, micro-certifications, alternative credentials used in different contexts add to the confusion (Parsons et al., 2023). Learners value MOOC but are hesitant to pay for MCs due to their unclear definition, pricing and lack of recognition. Learners' reluctance to embrace MCs might stem from their perceived lack of usefulness. A study found learner satisfaction hinges heavily on perceived

value (Hashim et al., 2023). Just like online learning, learners' buy-in relies heavily on value. Doubts about their benefits and recognition can significantly hamper adoption.

Review on the challenges of adopting MCs in HEIs indicate that particularly lacking are qualitative studies that consider the perspectives of key stakeholders, which is a critical gap to address (Varadarajan et al., 2023, Ahsan et al., 2023). Existing research has focused on various aspects, such as recognising prior learning, digital badge stackability, employability, skill enhancement, and lifelong learning (eg. Ashcroft et al., 2021; Kiiskilä et al. 2023; Ralston, 2021). Given this gap in the literature, this study gathers insights from various stakeholders; including learners, instructors, developers and industries, to identify challenges these stakeholders encounter when adopting MCs and suggest practical solutions.

### 3. Methodology

This study uses a qualitative approach to understand the experiences of stakeholders by examining their perspectives on MCs. Through purposive sampling, the first author identified 20 respondents from multi-stakeholders of HEIs - which are learners, instructors, developers and industries. Table 1 shows their demographic profiles.

**Table 1.** Demographic profile of respondents

<b>Respondent (R)</b>	<b>Stakeholder</b>	<b>Designation</b>
R1	Student/ MC Developer	Lecturer
R2	Student	Freelancer
R3	Student	Assistant Manager
R4	Student	Customer Service Associate
R5	Student	Senior Lecturer
R6	Student	Deputy Director
R7	Instructor/ MC Developer	Lecturer
R8	Instructor/ MC Developer	Senior Lecturer
R9	Instructor/ MC Developer	Senior Lecturer
R10	Instructor/ MC Developer	Senior Lecturer
R11	Instructor/ MC Developer	Senior Lecturer
R12	Industry	Trainer
R13	Industry	Managing Director
R14	Industry	Hiring Director
R15	Industry	Hiring Director
R16	Instructor/ Administrator	IT Coordinator/ Trainer
R17	Industry	ICT Manager
R18	Industry	Manager
R19	Instructor/ Administrator	eLearning Coordinator
R20	Industry	Assistant Manager

Participants were selected based on their experience with MCs, having either completed micro-credential modules, developed or trained others using micro-credential modules within their institutions or organisations. From 30 potential candidates who were identified through LinkedIn, 20 replied and accepted the interview. The interviews which were semi-structured and in-depth were conducted and recorded over Zoom or Google Meet (lasting 40 - 70 minutes) with the informed consent of participants following ethical guidelines. All recordings were transcribed using Whisper; an Open AI tool. These transcriptions were then checked verbatim through the VLC media player before they were sent to the participants to validate.

Lincoln and Guba's (1985) criteria for establishing trustworthiness were employed to increase the consistency and accuracy of the qualitative analysis. To address the credibility and confirmability criteria, member-checking was employed where transcriptions were shared to the participants before coding was conducted. Then, method triangulation was utilised, combining information from the literature with interview transcriptions. To ensure dependability, the coding process involved two researchers. For transferability, both sampling diversity and purposive sampling methods were

employed with the hope of achieving a broader range of perspectives and ensuring potential applicability of the results to other contexts.

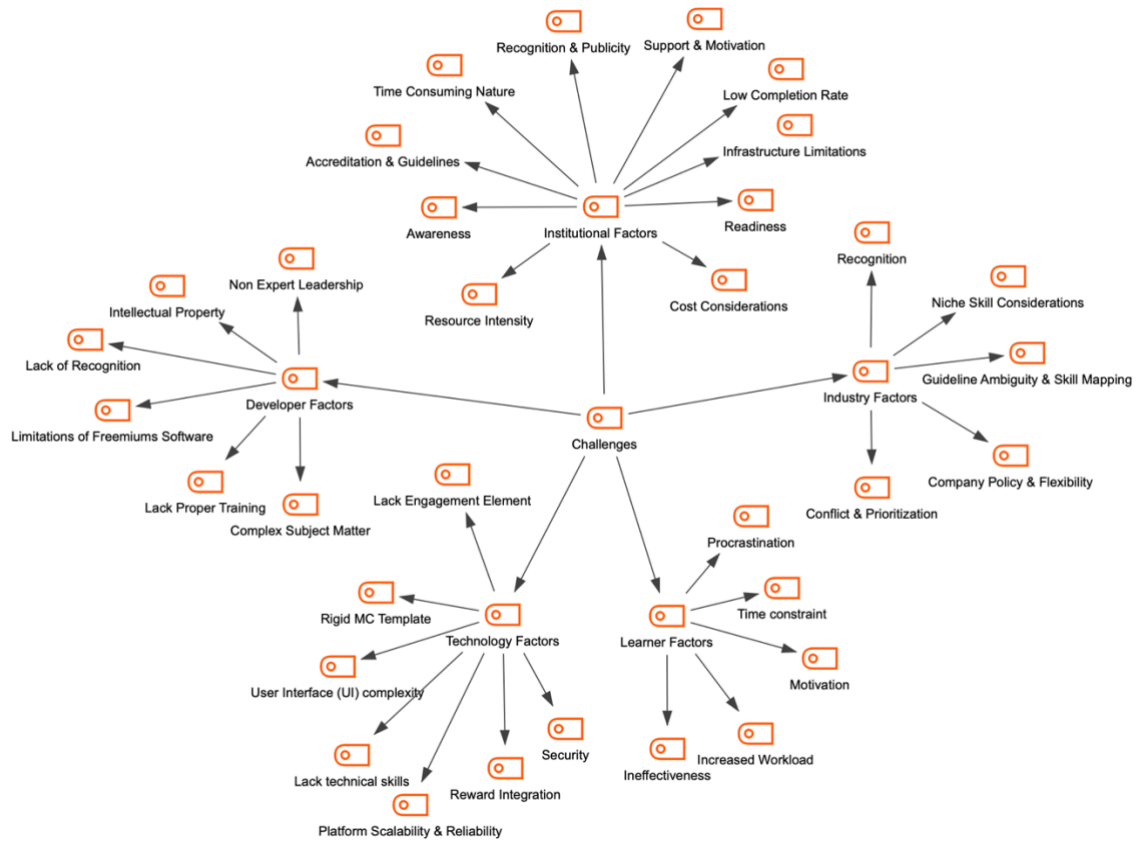
#### 4. Results and Discussion

Data analysis revealed five main themes, which were presented as learner factors, developer factors, instructional factors, industry factors and technology factors, all of which are challenges to adopting micro-credentials in HEIs (See Table 2). Figure 1 depicts the visualisation of challenges to adopting micro-credentials in HEIs by MAXQDA.

**Table 2.** Themes, their corresponding codes and frequencies

Theme	Code	Frequency
Learner Factors	Motivation	15
	Time constraint	3
	Ineffectiveness	2
	Increased Workload	1
	Procrastination	1
Developer Factors	Lack Proper Training	4
	Lack of Recognition	2
	Intellectual Property	2
	Non-Expert Leadership	2
	Complex Subject Matter	1
	Limitations of Freemiums Software	1
Institutional Factors	Readiness	16
	Awareness	12
	Support & Motivation	12
	Recognition & Publicity	10
	Accreditation & Guidelines	3
	Time Consuming Nature	3
	Cost Considerations	3
	Low Completion Rate	1
	Resource Intensity	1
	Infrastructure Limitations	1
Industry Factors	Recognition	12
	Company Policy & Flexibility	6
	Conflict & Prioritization	5
	Niche Skill Considerations	3
	Guideline Ambiguity & Skill Mapping	3
Technology Factors	Lack technical skills	13
	Reward Integration	6
	Rigid MC Template	4
	Lack Engagement Element	3
	User Interface (UI) complexity	2
	Security	1
	Platform Scalability & Reliability	1

Based on frequency counts, the most common challenges facing the adoption of MCs in HEIs are related to learner motivation (15), institutional readiness (16), awareness (12), support and motivation (12), institutional lack of recognition and publicity (10), lack of technical skills among developers and instructors (13) and industry recognition (12). The following sections will elaborate and analyse the challenges with detailed insights from the participants who are the stakeholders in MCs in HEIs. Due to the limited space of the publication, only several pertinent findings can be explained in this article.



**Fig. 1** Challenges of adopting micro-credentials in higher education institutions

#### 4.1 The Learner Factor

The participants highlight various challenges related to learner motivation which were connected to fear and lack of initiative. While the use of rewards, badges, and certificates emerged as effective motivators, MC platforms lacked sufficient motivating elements. As expressed by R8:

For my students, I have to tell them to enrol. I need to assign (them). They don't go on their own, look for micro-credential, no.

Learners also face challenges related to time management which jeopardised completion of MCs, specifically when synchronous lessons and face-to-face sessions were held at inconvenient times. These responses elaborate on the issue:

Looking at the workload that we have currently is preventing us from sitting in a room for six hours just to get one certificate. (R6)

In my experience, Google gave free vouchers for teachers to take exams, but many of them did not take the exams because of fear and time constraints. (R2)

Reluctance towards MCs was often tied to concerns about additional workload without corresponding salary increments:

...some employees don't want to go, reluctant to go for training, because they're already comfortable. So, to them, If I do it (attend training), I'll learn more, then I have to do it (apply what I learned), then I'll have more workload, (but) the salary won't go up either. So, that is resistance from the employee. (R13)

This study pointed out that many learners lack motivation to complete MCs due to the lack of motivating elements on current MC platforms such as rewards, badges and certificates. This is an area that HEIs should strive to improve on since badges as rewards boost completion for low-performing students and serve as intrinsic motivation for high-performing students (Abramovich et al., 2013).

## **4.2 The Developer Factor**

MC developers are responsible for designing, developing and implementing MC certification modules. Their challenges include training gaps, lack of recognition and the complexities associated with subject matter. One primary issue is the absence of specialised training for micro-credential developers. Specialised training is essential as there are instances when assigned members lack the necessary expertise. R11 commented:

... as the team leader, I am not an expert in [subject], unlike the other members who specialise in that subject matter. So it's difficult for me to provide specific directions because my knowledge is limited. If we were experts in the subject matter, it would be easier for us to distribute tasks and ensure that the content aligns with the objectives.

Many developers struggle to effectively transfer traditionally delivered content onto the MC platform, especially for instructors who recently transitioned to developer roles. The following is an example:

I have taught my colleagues, ... how to create a simple Google site to create a micro-credential. And even that is a struggle. Google sites is the most friendly platform to create micro-credentials. But I think the problem is they don't see how they can put whatever they are teaching into that form yet. (R1)

A notable challenge surfaced pertaining to developing MCs for complex subjects. Such challenges arise due to the specific elements required, such as video production quotas, which might not be supported by current micro-credential templates. R7 elaborated:

The writing structure involves summarising, but when it comes to converting it into a micro-credential, it becomes a bit difficult. It requires creating videos and other elements. However, due to the limitations of our micro-credential template, it doesn't fully support this subject, making it more challenging to develop.

The process of developing MCs is time consuming, largely due to the need to navigate unclear guidelines and adhere to specific requirements, such as video production quotas. For instance, R10 was frustrated that the department managing MCs is not providing clear and consistent guidelines:

When they give it (to us), it's not clear. Some of us are ready (almost complete), then we have to redo everything. But they have their progress (timelines). They give the guideline progressively. So, sometimes we know we have to submit by July. So, we are ready by February. But suddenly, by April, they told us (something new). Oh, there's something else that needs to be added.

Finally, the issue with freemium software emerges when free versions, such as the popularly used Canva, fall short in delivering the quality needed for high-quality MCs, potentially compelling developers to subscribe for premium versions, thereby incurring additional costs.

This study shows that in the perspective of developers, there needs to be specialised training planned for them to create impactful and high quality MCs since they lack the necessary technical and pedagogical skills. Low quality materials is reported to be the most common challenge (Che Amat et al., 2021), apart from the lack of institutional training (Hasnan & Mohin, 2021). Kin et al. (2022) study showed that instructor skills in Education 4.0 lead to positive views on change. This translates to MC development; skills like digital literacy, pedagogical psychology and assessments are key to high-quality MCs.

### **4.3 The Institutional Factor**

A significant challenge lies in the readiness of HEIs looking to integrate MCs mainly due to the absences of established procedures and credit transfer mechanisms. R10 explained:

I don't think it has reached that level. The reason is because, to transfer credit from a topic, you take (graduated from) a diploma to a degree is a big process. .... This is something you just have a certificate. So, we will see its weightage. The procedure is too detailed and I think for now we don't have that yet.

Furthermore, due to accreditation policies, adhering to guidelines for credit hours and learning outcomes add complexity, and recognizing MCs from other HEIs present significant challenges.

The management does not seem to have an effective process in publicising MC projects. As expressed by R11:

I'm not sure about the specific methods used by top management to recognize these projects. It might be the initiative of the developers themselves, such as the lecturers who promote their projects. It's not like [organisation] directly promotes or informs us about it, as I haven't seen any promotional activities.

The ineffective publicity has led to low awareness of the value of MCs among the faculty members:

Our participants, they don't know about these micro credentials... We are planning to offer (courses on) developing simple apps. But the students don't know how to register. They don't know what a micro credential is. (R17)

A recurring challenge common to both MOOC and MCs is consistently low completion rates. Despite high enrolment numbers, R19 suggested the need to incorporate gamification elements to enhance completion rates:

...Even to achieve 50% completion is quite hard... Because in terms of the reward, in terms of the badges, we don't fully utilise it. When it comes to gaming, it's powerful. When students want to complete gaming, they play with the elements. (R19)

Lastly, the resource-intensive nature of micro-credential implementation should not be overlooked. This becomes particularly evident in comments about inadequate network coverage, and when integrating microlearning elements. The following is a perspective to consider:

The effort to do microlearning back end is big. The QR code may look simple. But the QR code sticker must be long-lasting/ durable. If in 7-8 years, it's difficult to find, you can't scan it. That QR code must lead you to somewhere, that online platform that requires investment, resources to maintain. To put up the video, to put up the LMS, that requires recording of the trainer and all. So actually, it looks small, but it's costly. But the potential is huge. (R13)



From the institutional perspective, HEIs demonstrated unpreparedness in adopting MCs largely due to the absence of foundational requirements, established procedures and credit transfer mechanism. The study affirms a common institutional challenge which is the lack of infrastructure (Kiiskilä et al., 2023; Ralston, 2021) which hinder e-learning adoption (Hasnan & Mohin, 2021). Furthermore, common misconceptions about MCs undermine the acceptance of MC certification programs (Vandarajan et al., 2023), where in this study the lack of awareness is quite significant among staff and students.

#### **4.4 The Industry Factor**

Recognition of MCs is a recurring challenge - while some HEIs do not fully acknowledge these certifications, some companies prioritise certifications linked to innovation or project completion. Here are two contrasting responses:

Malaysians need to do a lot more work on this - acknowledging. Those teachers in the Ministry of Education, sorry to say, the ministry doesn't really recognise you. There's no salary increase, so teachers don't have the drive. (R2)

Some companies have different policies. For instance, they look at the target of a project. For projects that I've done, if it's completed, I am eligible for a promotion. It's normally like that. For some, the HR, ... can be included for their KPI. You might have two papers (MC certificates) one for soft skill, and one is for hard skill, something like that. (R20)

The dilemma when hiring for niche skills is expressed thus:

So for now, I don't see that there's a change of direction, but I will say that some of the very niche skills or the skills that are still very new, I think we will consider depending on the needs of the projects or the role that's fitting. (R15)

Considering the cost of adopting MCs raises significant points. For example, the requirement by HRD Corporation for MCs in all training programs could lead to cost implications, as explained here:

Because if I were to send all my people to go for MCs, all of them would increase (qualification), the salary would always increase, my cost of operation would increase. So, when my cost of operation increases, it will be difficult for me. So, there is a hesitation. (R13)

Unclear guidelines for MC stacking and skill mapping pose additional challenges. The requirement for yearly certification renewals, for instance, can lead to certificate clutter. R13 explained:

If training is to maintain, every year you have to renew, renew, you have to attend training, renew, you have to attend training. How many certificates do you want to pile up? For example, first aid (training)? First aid certifications will last for up to three years, if I'm not mistaken. So, after that, you have to renew. Now, piling up first aid certificates for 20 years, does that make you a doctor? It can't, right? Because the scope of the knowledge is limited. The flaws of MCs at this point of time, what I see is you cannot stack it up just like that. The question is, 'who wants to see the whole vast range of knowledge and map it out to?' If it's stacked like this, plus this, plus this, it can actually go here. And that bite-sized learning earlier, it's already good. But you imagine a whole galaxy, right? A whole bunch of stars. But if you continue, it becomes what is it? The Big Dipper. So, the question is, who wants to map that out?

The analysis of results highlights the lack of recognition for MCs within the industry sector. Employers are unfamiliar with digital badges and their values (Kiiskilä et al., 2023). Hesitancy to accept MCs is due to concern about quality, content, rigour and comparability to traditional credentials (Vandarajan et al., 2023). The study also indicates that the niche areas of MCs are too specialised, which

limit career flexibility (Vandarajan et al., 2023). The absence of a standardised framework for MCs is echoed by Ermicoi et al. (2021) who suggested that this shortcoming affects employer confidence. The financial cost in MCs which can appear in the form of tuition fees has been reported as a deterrent (Vandarajan et al., 2023).

#### **4.5 The Technology Factor in Challenges**

Technical factors include proficiency gaps, engagement scarcity, and platform scalability and reliability. One considerable challenge is the lack of sufficient technical skills which hinder video creation and micro-credential development. Rigid templates and platforms require multimedia proficiency and video editing knowledge. According to the participants:

But now the template just allows us to upload videos only. But sometimes the video is a barrier to the developer. Yes, we have to make videos, we have to edit. So the process is actually a lot. (R7)

...you need to be skillful, multimedia skillful, you need to know how to edit your video. If you don't have that interest, you don't have that, you are not that type of person, I don't think you will be successful. (R8)

A notable challenge in the current MC platform is the lack of engagement elements, such as digital badges, certificates, tracking mechanisms and communication tools, which ultimately hamper interactive lessons. R19 detailed some of the required needs:

There are a lot of student engagement elements that are not there. If we do any type of online learning, MOOC or MC, towards the end, we want to cater students. But towards the end, we want to have the course completion and student engagement high.

Scalability is a significant hurdle during peak periods, like exams causing accessibility issues due to high user volume. Elaborations of this concern were expressed as thus:

Now, MCs are under the UFuture platform. The only concern using uFuture (platform) is that if too many students (and lecturers) enter, especially during exams, the platform will have problems, or students can't access it at all. One more thing, for UFuture, from 1:00 am - 3:00 am, there's a maintenance process. It [the platform] will automatically be in maintenance mode. So, if you want to access around that time, there will be problems. (R7)

Challenges related to technical aspects are not only linked to creating and delivering MCs, but also to the broader realm of eLearning in HEIs. This includes the need for specialised technical knowledge, the absence of engagement elements, such as those seen in traditional classroom environments. A recent study by Razali et al., (2022) on LMS usage during Covid-19, highlighted the importance of learning accessibility as a key mediator in the effectiveness of blended learning, implying that similar considerations should be made for MCs. Technological issues are common in HEIs when adopting elearning content, such as unstable internet connection and lack of infrastructure, are also critical in the context of MCs (Hasnan & Mohin, 2021). Additionally, the need for adequate planning and awareness among administrative bodies about the necessity of such technologies is crucial (Vandarajan et al., 2023). The lack of proper infrastructure and support systems can severely impede the development and delivery of MCs.

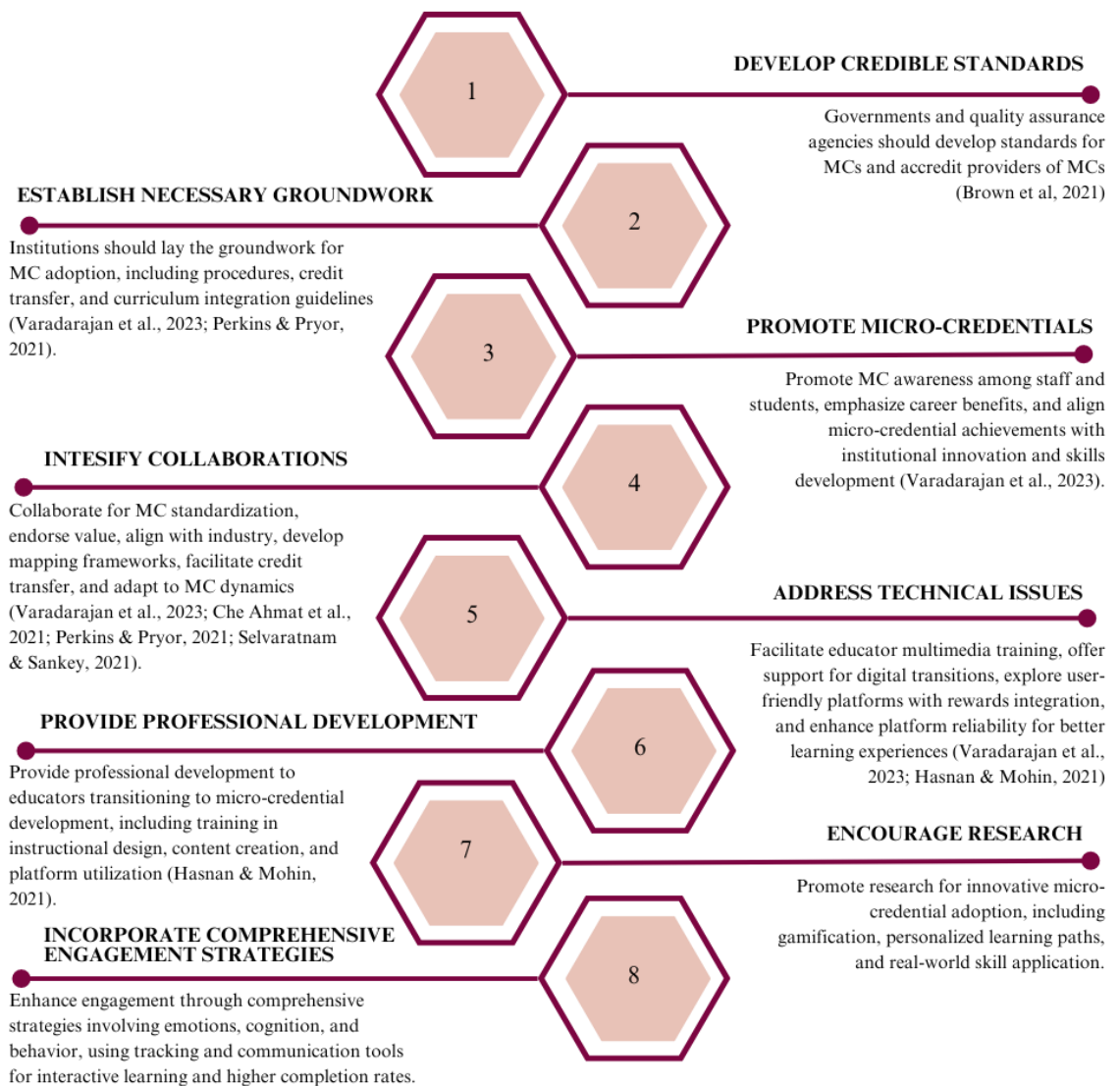
### **5. Conclusion and Recommendations**

This study provides an in-depth examination of the challenges faced by multi-stakeholders in the adoption of MCs in HEIs. The alignment of the findings with previous research reinforces the recurring nature of these challenges (Varadarajan et al., 2023; Ahsan et al., 2023; Perkins & Pryor, 2021; Che Ahmat et al., 2021). Additionally, this study addresses the gaps in the current knowledge by

providing a comprehensive understanding of the challenges faced by all keyholders; students, developers, instructors, and industries, in the adoption of MCs in HEIs. The analysis of lived experiences from participants adds diverse richness and authenticity to the discussion, enhancing the depth of understanding of these challenges.

Nonetheless, the findings are context-specific and may vary across different higher education systems and regions. Future studies may explore successful case studies, innovative strategies, and comparative analyses to provide a different perspective.

Despite the limitations, Figure 2 shows the eight recommendations which are proposed based on the findings:



**Fig. 2** Recommendations for adoption of MCs by HEIs

These recommendations collectively address the challenges identified in this study and provide a roadmap for HEIs to effectively integrate MCs into their educational landscape. By taking proactive steps to overcome obstacles and leverage the opportunities presented by MCs, institutions can offer flexible, relevant and industry-responsive learning experiences to their learners. However, addressing these challenges requires a coordinated effort from various stakeholders to navigate the complex landscape and unlock the potential of MCs as a transformative option for alternative learning pathways within the formal credentialing system.

## 6. Co-Author Contribution

Fauziah Saadah Abdul Halim designed the research methodology, collected and analysed the data and wrote the first draft of the manuscript. Associate Professor Ts. Dr Johan, as the supervisor, provided guidance throughout the research process, including assistance with study design, data analysis and manuscript preparation. Dr Lee Sze Seau, as the colleague, provided intellectual input, and critically revised the manuscript. All authors approved the final version of the manuscript submission.

## 7. Acknowledgements

The authors have declared that no competing interests exist. No specific funding for this research was provided by any public, commercial, or not-for-profit funding agency. The authors extend their gratitude to the panel of experts and participants in the study for sharing their insights and perspectives, and to reviewers of the manuscript.

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