

Content analysis for Micro-credentials development framework

APPENDIX A

Legend Theme codes

Online Certificate = [OC] Credit after Exam= [CAE] Work Related= [WR] Short Course =[SC] Unknown= [UN]

Table 1 Participants were defining micro-credentials.

What do you understand about the term micro-credentials?	Condensed meaning	Code	Category	Theme
OK, I know that. Micro-credentials are like those online certificates, digital certificates that you acquire online. You learn something on LinkedIn and Coursera, so you get those certificates. They are like your proof that you did this course, and then this is what you acquired. So, that is what I understand about micro-credentials.	Micro-credentials are like those online certificates, digital certificates that you acquire online.	Online certificates, Digital certificates	Online certificates, Digital certificates	[OC]
So, with the first question regarding what micro-credentials are, you know, I think it is all sort of those complex then broad concept, you know, just to get that definitive description it is well, I do not say it is hard or something but let me just maybe just tell you what my understanding of what I think these micro-credentials. So, I think micro-credentials are around the upskilling and reskilling of an individual in that sense.	I think micro-credentials are around the upskilling and reskilling of an individual in that sense.	upskilling and reskilling	Upskilling and reskilling	[OC]
I take from what you described in your introduction to your research topic, so this is where I learned about a word called micro-credential, so I believe it is something that umm. Once you have learned a particular course, written an exam, and passed it, I believe those are the credits you get after.	Once you have learned a particular course, written an exam, and passed it, I believe those are the credits you get after.	Credit after exams	Credit after exams	[CAE]
All right, I think what I understand about my micro-credentials is that it is an educational approach where an individual learns a skill, gains knowledge and eventually tries to apply it to a specific area or task. Most of the time, we take micro-credentials just to understand work-related tasks. Another way that I would say what micro-credential is short courses, and I think the platforms or companies commonly offer them like you did me, LinkedIn and Coursera. I see universities have also joined the club, so I guess that is what I understand about micro-credentials.	Micro-credentials are a sort of educational approach where an individual learns a skill, gains knowledge and eventually tries to apply it to a specific area or task. Most of the time, we take micro-credentials just to understand specific work-related tasks.	Educational approach, Micro-credentials just to understand specific tasks that are work-related	Work-related	[WR]
I do not understand anything.	I do not understand anything.	unknown	unknown	[UN]
Micro-credential is a way to gain your qualification online without going to school to get a diploma or degree.	qualification online	Online qualification	Online certificates, Digital certificates	[OC]
It is the short courses that everyone is excited about now; uh, yes, that is my understanding. However, I prefer them over going back to school and wanting to upskill by doing a degree or diploma because neither is more efficient.	These are short courses that everyone is excited about now.	Short courses	Short courses	[SC]
I think it was about student information.	Student information	unknown	unknown	[UN]
I do not know much about micro-credentials, but I believe it is part of biometrics.	I do not know much about micro-credentials,	unknown	unknown	[UN]
I Have not heard of this term.	I have not heard of this term.	unknown	unknown	[UN]

APPENDIX B

Legend Theme codes

On-demand = [OD] Work Related= [WR]

Table 2 Experience with online courses

Have you taken any online courses?	Condensed meaning	Code	Category	Theme
Yes, I have on Udemty and then even on LinkedIn; you get those online courses about leadership. I have done SQL and Python. There are So even in Coursera, you get courses on different skills. If you want to acquire different skills. So, I have done online courses.	I have on Udemty, and then even on LinkedIn, you get those online courses about leadership. I have done SQL and Python	I have done SQL and Python	on-demand	[OD]
I have done some online courses I have done online courses around cybersecurity, like the basics of cybersecurity. So, it was offered by the Cybersecurity Institution Institute.	I have done some online courses on cybersecurity	I have done online courses on cybersecurity	work-related	[WR]
Yeah, I have taken several online courses. Firstly, it is what it was work-related, and it was also to build my profile and the skills I acquired. Some things were related to my work at the time.	Firstly, it is what it was work-related, and it was also to build my profile and the skills I acquired. Some things were related to my work at the time.	work-related, and it was also to build my profile and the skills I acquired	work-related	[WR]
Yes, I have, and I think I was recently targeting cybersecurity awareness.	I was targeting the cybersecurity	targeting the cybersecurity	On-demand	[OD]
Yeah. I have taken them.	Yeah. I have taken them.	Yes		
Yes, I did several of them through LinkedIn and Udemty.	Yes, I did several of them through LinkedIn and Udemty.	Yes		
I am enrolled on two of them, but one took precedence over the other, so I am currently busy with one that is a program and project management, and it is roughly 8 to 9 months long.	I am enrolled on two of them, but one of them took precedence over the other, so I am currently busy with one that is a program and project management	I am currently busy with one that is a program and project management	on-demand	[OD]
I did take a Udemty writing course online.	I did take a Udemty writing course online	course online		
Yes, I have	Yes, I have	Yes		
Yeah, I have taken one.	Yeah, I have taken one	Yes		

APPENDIX C

Job-embedded = [JB] Industry Driven= [ID]

Table 3 Micro-credentials response to organisational needs

Did the course you enrolled online respond to the organisations' needs?	Condensed meaning	Code	Category	Theme
OK, so I think it does because if I am efficient, right? It will help the organisation because I can fulfil my responsibilities. I think they respond to the organisational needs because I need to learn them to be able to do my job.	I think they respond to the organisational needs because I need to learn them to be able to do my job.	Respond to organisation needs	Job-embedded	[JB]
Yeah, I like to think so because, with these courses and the fact that you are not getting the whole degree, you are focusing on many different aspects. The online courses only focused on cybersecurity, so some of the stuff that I learned there on that course was handy to the organisation.	The online courses only focused on cybersecurity, so some of the stuff I learned there on that course was very useful to the organisation.	The online courses only focused on cybersecurity. Useful in the organisation	Industry-drive Job-embedded	[ID][JB]
Yeah. So, when I join an organisation or a company, I am there to learn. I am willing to be open to anything. When you go to a particular company, they have tools related to their processes. Once I go there, I ensure I do not just memorise or get information from old senior staff on how they do what they do. I want to understand why they are doing it and how they are doing it. That is why I enrol in courses on applications that companies work with. I customised my learning according to the organisation I am with, and that is helpful. It simplifies my job because I understand your tools. There is no need for me to be running around trying to find what I need to get.	That is why I enrol in courses on applications that companies work with. I customised my learning according to the organisation I am with, and that is helpful. It simplifies my job because I understand your tools. There is no need for me to be running around trying to find what I need to get.	Customise according to the organisation.	Industry-drive	[ID]
I think with the previous question, like saying I was targeting. Micro-credentials that are aligned or closely related to my task. I would say it is a yes for me because then, whatever I am learning, I must apply.	Micro-credentials that are aligned or closely related to my task. I would say it is a yes for me because then, whatever I am learning, I must apply.	Aligned or closely related to my tasks	Job-embedded	[JB]
In one of the courses that I have taken, I did mention that it was how to construct a good dissertation. So you find out that you have to write many documents at work, even if it is not a dissertation. However, it somehow teaches you how to write clearly because few people write clear and straightforward things, which assisted me a lot when it comes to writing, like conference papers, writing reports and writing instructions for specific systems.	In one of the courses that I have taken, I did mention that it was how to construct a good dissertation. So, you find out that you must write many documents at work, even if it is not a dissertation, but it somehow teaches you how to write clearly.	Aligned to the work	Job-embedded	[JB]
Yeah, If I can say like you like, for example, our centre has a scarcity of pen testers. So, I took one of these courses for pen testing to be ready to join the team.	In our centre, there is a need for more pen testers. So, I took one of these courses for pen testing to be ready to join the team.	Ready to join a team	Job-embedded	[JB]
Yes, they do; you know I am in the Project Management Office, right? I am also a project manager for specific projects, so all courses contribute to something that I do to make high use of the projects that I am working on and the work I carry out daily.	All courses contribute to something that I do to make high use of the projects that I am working on and the work I carry out daily.	Contribute to something I do	Job-embedded	[JB]
Yes, the Security Plus one, because I am a cyber security researcher, it is aligned with my work. Moreover, I said it is aligned with your current work.	Security Plus one. I am a cyber security researcher; it is aligned with my work.	Aligned to my work	Job-embedded	[JB]
Yes, I would say yes, because as a client-facing employee, you will find these skills I have attained. It can be used on one client and be used on project engagement as well. You know, it is usable skills that the organisation can benefit from.	You will find that these are skills that I have attained. It can be used on one client and be used on project engagement as well. You know the skill is usable so the organisation can benefit from it.	Used on project engagement	Job-embedded	[JB]

The course that I learned was C sharp. I still need to code or work with my colleagues. If I do not have that skill, then I am not. I will not be able to work with my colleague instead, so there is a need for an organisation like it.	I still need to code or work with my colleagues. If I do not have that skill, then I will not be able to work with my colleagues, so it is a need for the organisation.	Need to code or work with my colleague	Industry-drive Job-embedded	[ID][JB]

APPENDIX D

Fixed Learning = [FI] Flexible Learning= [FL] Both=[B]

Table 4 micro-credentials learning experience.

Was the micro-credential aligned with your interest, and could you do it at your own pace?	Condensed meaning	Code	Category	The
Regarding the next part, I am interested in the fixed, right, so that helped me, and yeah, so I could just say yes, some, like, did them on my own time.	I am interested in the fixed. Some, I did them on my own time	Fixed Flexible	Fixed Flexible	[B]
OK, so with both courses being timed, they had a timeframe, so we had to do this one about cybersecurity essentials, which was timed for six months. They had a schedule; a calendar was also uploaded on the platform that, by this month, we should be covering maybe the dark web topics. By the following months, we should be covering digital forensics stuff. So, we had to complete assignments. Yeah, they give you an assignment.	They had a schedule; a calendar was also uploaded on the platform that we should cover maybe the dark web topics in the following months.	Fixed	Fixed	[FI]
Yes, I enrolled in courses that I was interested in. I am fortunate enough to find myself in a field that I like. I love. So, whatever course I will be taking related to my work, I will enjoy it. So yes, it relates to my interest because these are mostly online. I did them at my own pace despite failing the Security Plus course; I wrote it three times. However, every day, I sat down and went through the content. I felt I was reading something new and learning more things. If I failed and when I passed, it was like I got 100%, so yeah.	I did them at my own pace	Flexible	Flexible	[FL]
To answer that question, I would like to think that it is more aligned with my career interests because, like I, I have many interests, but some of them are not. So, I would say that most of them are linked to my interest, and I always look for those that I can do at my own pace because it gets hectic and sometimes, and I can imagine it is saying that I need to be done in two weeks where is in two weeks. I have other things to do, so I must do whatever at my own pace. I think that is OK for me. What I like to do is, for example, if I were to open something and it tells me about one of the cybersecurity attacks. Sometimes, I like to read things twice, so you can imagine that if it is long, I will not be able to go over it, extract knowledge, and apply it to my house. So, if it is done in my own time, I can extract whatever I need. I also like research while I am busy doing whatever course that is at the same time.	I always look for those that I can do at my own pace	Flexible	Flexible	[FL]
I have the experience of both. Well, the machine learning course I had to finish it. I think it took about one month or two. Now, I had to finish it within that time frame. I had to attend and then write the practical exam within three months. Then, I did it at my own pace in the IBM course. I prefer the self-paced one because you can decide when to take an exam.	Well, the machine learning course I had to finish it. I think it took about one month or two. Then, for the IBM course, I was doing it at my own pace.	Fixed Flexible	Fixed Flexible	[B]
Yes, they aligned with my interests. I have been interested in pen testing but needed someone to teach me. So, the moment that using the codes like they are in the hands, there may be some commanded side, and I would be able to do the same command and see the output simultaneously.	unknown	Unknown	Unknown	
Everything we do always has an element of personal learning, but we must ensure it is aligned with the organisation's needs and requirements. Moreover, they were self-paced.	They were self-paced.	Flexible	Flexible	[FL]
Yes, the first one is online with your interest, and yes, I am doing them in my time frame. So yes, they are aligned because, like I said, I just joined the cybersecurity team. I joined it because I am interested in learning more about cybersecurity, so yes, it is aligned, and I could do it at my own pace. I can write it whenever I am ready so that part of it will be self-paced.	I was able to do it at my own pace	Flexible	Flexible	[FL]
It was self-paced, but the training was timed, you know, because, like, you have to attend three online courses.	It is self-paced, but the training was timed, you know, because,	Flexible Fixed	Fixed Flexible	[B]

However, the exam was on me to decide when to go and die for another.	like, you have to attend three online courses.			
Yes, they align with my interests; I could do them at my own pace.	I was able to do them at my own pace.	Flexible	Flexible	[FL]