

Higher Education

Governance & Policy

ISSN: 2717-8676

Volume: 2 Issue: 2

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Article Type: Research Article

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Cite as: Yilik, M. A. (2021). Micro-credentials, higher education and career development: Perspectives of university students. *Higher Education Governance & Policy*, 2(2), 126-139.

Access: <https://dergipark.org.tr/tr/pub/hegp/issue/67725/1031047>

Micro-credentials, Higher Education and Career Development: Perspectives of University Students

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Abstract

Emergence of micro-credentials, digital qualifications less than a degree, is rooted in an increased demand for quality and digitalized higher education, and a growing demand for skilled human capital tailored for the industry. There is now a wider acceptance of micro-credentials by the industry as proof of necessary skills set developed by employees, either as a supplement or an alternative pathway to traditional college diplomas. However, within the context of higher education, an enlarging ecosystem of micro-credentials is also raising concerns over the potential of micro-credentials in career development. This phenomenological study projects an in-depth understanding of the phenomenon of micro-credentials within the context of higher education by involving experiences and interpretations of key participants- university students. Participants involved 11 junior and senior students enrolled in an advanced communication skills course focused on preparing students for their careers. Data was collected using semi-structured interviews, and they were analysed using content analysis technique and MAXQDA software. The findings show that the employability and accessibility factors enable participants to adopt micro-credentials more in their career development. Additionally, participants' belief that the university education is being more theoretical or fragmented, and the changing mindset of the participants towards higher education after the COVID-19 pandemic also facilitate the adoption of micro-credentials in building their careers. Participants are also deterred from embracing micro-credentials in their career pathways. This is due to participants' discontent with the dominance of data science or computer engineering fields, perceived low prestige attributed to micro-credentials, and reservations about any possible prejudice against micro-credential holders. Another finding is that participants seem to perceive micro-credentials more as a supplement to traditional university degrees rather than an alternative pathway to career development. Finally, participants frequently related their adaptive career behaviour (using micro-credentials to advance in career) to setting specific career goals and enacting them with persistence. An additional finding is that participants' display of this adaptive career behaviour is also contingent upon the personality traits of being entrepreneurial, conscientious, and extraverted. The findings have been discussed in the light of the existing literature on micro-credentials, higher education and the career self-management model, and some implications have been provided.

Keywords: Micro-credentials, higher education, career development, social cognitive career theory, career self-management model

Introduction

A micro-credential (MC), in its simplest form, "is a certification of assessed learning that is less than a formal qualification" (Oliver, 2019, p. 19). A micro credential may include skills or competency in the form of "nano-degrees," "micro-masters credentials," "certificates," "badges," "ratings," "licenses," "endorsements," or "memberships" (Milligan & Kennedy, 2017, p. 43). While obtaining MCs, learners complete shorter bits of learning and earn certification as compared to traditional college level diplomas (Chakroun et al., 2018; Wheelahan & Moodie, 2021). In other words, learners that aim to obtain MCs enrol in, complete, and earn certification of shorter modules of industry-oriented subject matter; these credentials may also bear credits towards a conventional higher education (HE) degree (Resei et al., 2019).

Emergence of MCs or short-term digital qualifications owes much to three mega trends: high demand for quality university education in developing countries, digitalization of the industry, and digitalization

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(Research Article) Cite as: Yilik, M. A. (2021). Micro-credentials, higher education and career development: Perspectives of university students. *Higher Education Governance & Policy*, 2(2), 126-139.

Received: December 1, 2021; **Revised:** December 19, 2021; **Accepted:** December 30, 2021; **Published:** December 31, 2021

of HE sector according to Simon Nelson, the CEO of a leading global provider of micro credentials (as cited in Horton, 2020). Similarly, Gallagher (2018) highlights the growing need for technological demands and skills gap in the workplace in that employers today value on-the-job learning and educational programs that relate to the demands of the businesses; thus, they can verify and benefit the skills and competency of their employees. Such pressures on higher education institutions (HEIs) were mostly responded until recently by the inauguration of distance learning, hybrid classes in HEIs, and partnerships with global providers of online content at tertiary level. However, the fast-paced growth of MOOCs-massive open online courses- by universities during the past decade were soon challenged by private companies' platforms such as Coursera, edX etc. These global providers now operate in ways that they offer short-term courses as well as degrees. HEIs have now also started to close on-campus programs to offer degrees online as a result of partnerships with global providers. One example to this university-micro credential provider cooperation is the on-campus residential MBA program of the University of Illinois, Urbana-Champaign (Oliver, 2019). Oliver also affirms a MC ecosystem in which social sciences contents such as leadership and management also count as micro credentials; this shows that social sciences are also part of this phenomenon in addition to commonly cited micro credentials in natural sciences and information technologies.

Gallagher (2018) also suggests that the growing trend of more learners turning to online credentials is now more visible among human resources managers, with 61% holding the idea that online credentials are equally of quality compared to those obtained in physical settings. This finding is further supported in today's businesses; leading actors in private sector now even go one step further to bypass HEIs, and sometimes cooperate with global MC providers or use their own in-built training centres to offer certificates. One example is Google (Google, 2020); Google's career certificates have recently been announced to be equivalent to college degrees as these career certificates will be used to fill entry-level positions in Google that require a college degree. According to Fain (2018), previously Google also started working with a network of other companies that agreed to employ holders of Google certificates.

Literature review

The industry has posed challenges to HEIs by voicing the growing need for a tech-savvy and skilled work force that can meet the instant demand and cloze the skills gap in the workplace. These challenges posed to HEIs by the industry have now been coupled with COVID-19 measures that led the way to a non-programmed strategic decision by HEIs to initiate distance education and to offer all classes online in the past few years. As Wheelahan and Moodie (2021) put it, MCs had growing popularity even before the Covid-19 pandemic. However, due to the pandemic they have gained more ground among people who were unemployed after the pandemic started. The pandemic also hit student enrolments, especially international students who were barred from travelling to their universities. As European Commission (2020) notes, the pandemic motivated more learners to boost their skills set through MCs, and better prepared them for a post-pandemic labour market. If COVID-19 measures continue or the world witness outbreaks of other pandemics, will that downgrade universities to providers of online tertiary education like other global platforms that offer MCs? Will this dilemma uplift global platforms and providers of MCs? Will MCs be a supplement to traditional HE as foreseen by Oliver (2019) and Resei et al. (2019) or an alternative pathway to success in career? Fong et al. (2016) add to this discussion with the role that they believe alternative credentials play in HE; courses taken in non-traditional settings and programs that offer MCs have gained momentum and are becoming mainstream among HEIs.

Regarding the intersection of university and the industry, how much intervention into HE is acceptable given the growing human capital needs of the industry? MCs are believed to promise an even more 'tailored' league of graduates for the industry. The Organization for Economic Cooperation and Development (OECD, 2019) also projects some mega trends in education around the idea of complex and fast pace of change that is taking place. To OECD, future education needs to be ready for socio-economic and technological changes; this change affecting education extends into in formal and informal learning environments, and entails taking a different perspective to how and what is taught. To Oliver (2019), similarly, societies and economies in the twentieth century valued formal qualifications and certified learning; however, those in the twenty-first century have become more demanding as to work, life and citizenship, thereby necessitating novel educational systems.

Thus, an evolved twenty-first century educational model may offer a blend of formal and non-formal learning in which MCs align with the non-formal education side of the continuum. Accordingly, learners in the twenty-first century tend to take control of their own learning. Through upskilling and reskilling offered by MCs, learners make more informed and proactive decisions about their careers. As suggested by Social Cognitive Career Theory (SCCT), the career self-management model guides learners to engage in career related behaviours to develop their careers and eventually achieve their specific career goals. These career-oriented behaviours are termed adaptive career behaviours (Lent & Brown, 2013). In their model, Lent and Brown suggest that learners' display of adaptive career behaviours is influenced by cognitive-person factors, and contextual and personality factors. Specifically, learners exercise adaptive career behaviours such as exploring career options or engaging in job search under the influence of their:

- self-efficacy beliefs (personal beliefs about one's ability to display particular career behaviours)
- outcome expectations (personal beliefs about a positive career outcome after displaying a particular career behaviour)
- goals and actions (specifically stated career related goals that facilitate career behaviours)
- contextual factors (environmental support with minimal barriers) and personality traits (such as being conscientious, extraverted, openness to experience etc.).

Regarding SCCT, in simplest terms, participants' adaptive career behaviour is explored in this study. This adaptive career behaviour can be interpreted within the context of MCs as follows: Participants decide to engage in using MCs as a career exploratory and decision-making behaviour. During career exploration, participants possess favourable beliefs regarding the use of MCs in their career development; they expect positive outcomes that result from their engagement in their efforts to use MCs to build a desirable career; they set specific goals to engage in this adaptive career behaviour; they have a supporting environment and minimum barriers to succeed in building their careers based on MCs; they also have personal characteristics fitting with the use of MCs in their career paths.

Previous research

Previous studies on MCs and their potential implications on HE used surveys that lacked the depth of qualitative insight into MCs as in Gallagher (2018) who aimed to understand the prospect of credentials and how they translate to work settings. Fong et al. (2016) explored the current marketplace for alternative credentials with a survey and concluded that they are becoming an indispensable part of income for HEIs, and that they are vital for the success of these institutions in the years to come. Some researchers used multiple units of analysis in qualitative nature as in Resei et al. (2019) who interviewed key informants in the MC ecosystem (HEIs, MOOC platforms, and companies) with the goal to depict the current landscape of MOOC-based MCs in the EU and around the globe. They concluded that MCs are quite promising regarding the benefits companies, learners and universities may enjoy; however, there is still ambiguity over micro credentials especially in Europe; they also stated that micro credentials are still viewed as complimentary to HE rather than alternative pathways to certified formal education.

Other studies used qualitative data collection techniques as in Carey and Stefaniak (2018) who interviewed with 11 key informants who manage digital badge projects within HE system. They found that skill-based badges were prioritized over participation badges. Similarly, Ghasia et al. (2019) used interviews with faculty and students to delve into teachers' perception of MCs as well as to grasp student perspectives. They found that both participant categories were optimistic as they thought MCs would boost learning and challenge university's authority. Others have used multiple-case studies or mixed-method research. Stefaniak and Carey (2019) conducted a multiple-case study of faculty and students from three universities to demonstrate the challenges and solutions in the implementation of badges. They concluded that complexity was a barrier to implementation; usability, workload on faculty, and insight issues needed to be worked on. In another multiple case study design, Cheng et al. (2020) aimed to understand students' use of digital badges to help with their goal setting. They found that digital badges facilitate self-regulated learning in HE settings. Dyjur and Linsdstrom (2017) used a mixed method design, a survey and interviews, to measure the perceptions of students and prospective uses of

digital badges. They found that students viewed digital badges authentic and innovative. However, some viewed them as less prestigious than formal certification.

Research on career self-management model in connection to MCs is even scarcer. Healy (2021), in a theoretical commentary, argues that learners are aware of the employability aspect of MCs and also they have the will to control their own career paths; still, learners need guidance to integrate MCs into their job search or career building activities so that they can communicate their skills and qualifications better to the job market. In a more concentrated and empirical work, Wendling and Sagas (2020) examined college athletes' career planning after quitting active sports life by using career self-management model of SCCT in a Structural Equation Modelling design with 538 respondents. Among the variables they tested were career decision self-efficacy, career goals, perceived career planning support from coaches, perceived career planning barriers, and some personality factors. They reported significant direct, indirect, and moderating relationships of the cognitive, contextual, and personality variables on career planning; and also implications of cognitive factors, contextual factors and personality factors on career planning were discussed. In another set of studies, Lent et al. (2016) earlier provided an application of career self-management model of SCCT on 180 undergraduate college students regarding their career exploration and decision-making behaviours; their study validated the career self-management model with the addition of decisional self-efficacy.

Significance

Oliver (2019) points to the scarce research on micro credentials or its derivatives, and stresses the ambiguity over micro credentials on behalf of the learners, the target consumers, or the employees. This research study projects an in-depth understanding of the phenomenon of MCs within the context of HE by involving experiences and interpretations of key participants (university students) during their career development initiatives. This research also joins MCs framework and career self-management model in SCCT. This makes it a unique design; as a result, this research study is likely to give a more focused and original picture of MCs regarding career development of tertiary level students. Moreover, MCs is a growing phenomenon in the USA; although there is available research from the USA (Gallagher, 2018), Europe-in comparison to the US and other countries (Goglio, 2019; Resei et al., 2019) and Australia (Milligan & Kennedy, 2017; Oliver, 2019), there is even scarce research in the periphery of these locations like Turkey where unique conclusions regarding the field of HE can be drawn as students with diverse backgrounds enrol in MCs in their career development ventures, and still target the skills sets required by the companies in the USA.

The main research question is:

How do university students, one of the main stakeholders of micro-credentials, view micro-credentials within the context of higher education?

Sub-research questions:

-What are the facilitating factors and barriers of MCs in terms of career development?

-To what extent do university students see MCs as a supplement or an alternative pathway to conventional university degrees?

Method

This research study is designed as a phenomenological study, one of the qualitative research methods. In phenomenology, while researching various responses or perceptions to a particular phenomenon, the researcher aims to get an idea of the world of its participants and to define their perceptions and reactions; the researcher tries to describe and explain in detail the characteristics of each participant's perceptions and reactions regarding their own experience (Fraenkel et al., 2012). In this study, the aim is to understand how key participants from main stakeholders (university students) perceive MCs, and to describe how their interpretations may help better understand the implications MCs may have on HE and career development.

Participant characteristics and sampling

As Fraenkel et al., (2012) explain, in the purposive sampling procedure, participants who have knowledge and experience about the phenomenon being studied are determined by the researchers, and these selected participants are included in the sample. Accordingly, while determining the participants in this study, the purposive sampling method was used; for this purpose, participants who are informed about or have experience with MCs were selected. The most lucrative setting to recruit the most engaged and diverse participants for the study would be a career related course. To this end, the participant group was formed from junior (3rd graders) and senior (4th graders) undergraduate students who are currently enrolled in an undergraduate must course focused on advanced communication skills for career preparation (This course itself is not a micro-credential offered to the participants.) at an international research-intensive university in Turkey with English-medium instruction and a high ranking in international rankings. Participants come from a variety of countries and backgrounds. All participants have either completed some form of internship related to their majors earlier or are planning to apply for internship soon. Senior participants are actively looking for a job. Most participants have obtained a form of MCs or are planning to do so soon.

Table 1. Participants in the study

	Nationality	Gender	Age	Grade	Major Field
Participant 1 (PT1)	Lebanese	Male	20	Senior	Mechanical Eng.
Participant 2 (PT2)	Syrian	Male	24	Senior	Electrics and Electronics Eng. (Minor in Data Science)
Participant 3 (PT3)	Turkish	Male	27	Senior	Physics
Participant 4 (PT4)	Turkish	Female	21	Junior	Chemistry
Participant 5 (PT5)	Egyptian	Female	23	Junior	Statistics (Double major in Mechanical Engineering)
Participant 6 (PT6)	Bangladeshi	Male	26	Senior	Chemistry
Participant 7 (PT7)	Turkish	Male	33	Senior	Psychology (Former degree: Public Administration)
Participant 8 (PT8)	Turkish	Female	22	Junior	Business Administration
Participant 9 (PT9)	Turkish	Female	22	Senior	Foreign Language Education
Participant 10 (PT10)	Turkish	Male	22	Junior	Business Administration
Participant 11 (PT11)	Turkish	Female	21	Junior	Business Administration

As shown in Table 1, most participants are from Turkey while a Lebanese, a Syrian, an Egyptian, and a Bangladeshi participant add diversity into the research group that is in line with their university's founding principle: to attract students from Middle Eastern countries and educate the next generation of leaders in their home countries. The gender composition of the research group is roughly equal while their ages range from 20 to 33; some participants are doing double major or minor degrees while one is a former graduate doing his second degree at this university. Senior students (4th graders) are slightly more than junior students (3rd graders) among the participants while there is a balance of natural sciences and social sciences regarding their educational background.

Data tool

In the study, an interview form consisting of five semi-structured questions was developed by the researcher considering the specific sub-research questions and the literature. The interview questions were reviewed by a faculty with a specialization in Educational Sciences. Interview questions include questions such as "What have you done during your undergraduate years so far to prepare for your career?" and "To what extent does basing/building your career solely on MCs meet your career goals?"; each question had several prompts to guide the interviewee. There are demographic questions at the beginning of the form to collect data on nationality, gender, age, grade level, and major field of study. Upon approval of Human Subjects Ethics Committee, the researcher contacted over 300 students enrolled in a course targeting career development. Those who accepted to be part of the study gave their consent over Google Forms. Later, an average of 23 minute-interviews were conducted with 11 participants over ZOOM. The interviews were audio-recorded upon consent of the participants. The interview data was transcribed verbatim by using Sonix software.

Data analysis

Data was analysed using content analysis technique; this technique analyses data by coding, categorizing, comparing and concluding from patterns of information that emerge in the data (Cohen et

al., 2018). MAXQDA Software helped the researcher with coding and analysis of the data from transcriptions. After the data were deciphered, they were divided into categories, themes and codes, and then they were interpreted by considering the literature (Yıldırım & Şimşek, 2016; Yin, 2009). An initial code list (17 codes) based on SCCT, micro-credentials, and higher education literature guided the researcher at initial data analysis, and this code list was extended (24 codes) as new codes -mostly from micro-credentials, and higher education frames- emerged from the data.

Validity and reliability

In order to sustain validity and reliability in this study, several measures were taken. Evidence was weighted (Cohen et al., 2018) as higher quality data came in more attention was given to ensure richness in data; data and the literature were compared and contrasted frequently to ensure that valid responses were included in the data, and also rich and thick descriptions were provided to support and provide evidence for findings. Additionally, frequent use of direct quotations, and using a preliminary code list based on literature that was later enriched by the data added to the reliability of the findings.

Results

The data revealed superordinate themes such as facilitating factors that motivate participants to take up MCs in their way to career development. Another superordinate theme drawn from the data is the barriers to adoption of MCs that dissuade participants from relying on their MCs in their career development paths. Whether MCs are perceived as a supplement to traditional university degrees or as an alternative pathway to career development is dealt with as another superordinate theme. Finally, adoption of MCs as an adaptive career behaviour in the context of career-self management model is the other superordinate theme.

Table 2. Superordinate themes, subordinate themes and their corresponding codes, and frequencies

Superordinate theme	Subordinate theme	Codes	Frequency
Facilitating factors	MC-induced enabling factors	employability	high
		prestigious MC institution/company	mid
		tailored/self-regulated learning for upskilling or re-skilling	low
		less commitment (time, money etc.) than a full degree	low
	HE-induced enabling factors	skills/competence verification/recognition	low
		accessibility (remote, working people, disadvantaged groups)	mid
		university education is more theoretical/fragmented	high
		lack of quality education at university	low
Barriers	MC-induced barriers	more digitalized (higher) education (after the pandemic)	mid
		less prestigious than formal certification (conventional university degree)	low
		lack of interaction / social learning	low
		dominance of data science or computer engineering fields	low
	Work environment-induced barriers	unpurposed/non-strategic accumulation	low
		focused specialization in MC fails in system level problems	low
		unauthorized in decision making	low
		ambiguity over micro credentials (on behalf of stakeholders)	low
		little chance to advance / get promoted in the work	low
		prejudice against MC holders	mid
Adaptive career behaviour	Cognitive-person factors	self-efficacy beliefs	high
		outcome expectations	low
	Contextual and personality traits	goals/actions	high
		contextual factors	mid
		personality factors	high

Facilitating factors to adoption of MCs

MC-induced enabling factors: Employability is the most frequently cited enabling factor in that participants have high prospects of being employed after graduation due to holding MCs. To participants:

...The certificate in the CV will make you go to the interview, and it happens to me a lot. Like when I mentioned, for example, my field is electrical engineering, but I was applying for a software development position. Well, software development is mainly for computer engineering students. But I put in my CV, that certificate, uh, I did a course in software training on LinkedIn... using LinkedIn assessment skills. They interviewed me because of this one. They didn't care about electrical engineering diploma at [name of the university]. They didn't care about other skills. But they [the interviewers] said "Oh, did you do it from LinkedIn? "How much did you pay?" [the interviewers decide to seriously consider this candidate with a prestigious MC and say:] "Tell us about your yourself now". (PT2)

...so I can put it [MC] first on my CV? I also I have the skills. I mean, I got the chance to get into like, I think eight courses. I took those courses. Even without my mechanical engineering diploma, I would have been able to find a job in the Gulf countries, for example, or in Turkey or anywhere. Well, it [MC] has much less like validity but I would [find a job]. (PT1)

Participants frequently cited accessibility as another enabling factor as they believe remote access to MC programs makes it preferable for those who study at university or work part-time but at the same time wish to equip themselves with the necessary skills set. These participants believe that these skills sets will be required when they graduate. Moreover, disadvantaged groups may also access MC programs and thus their access and equity barriers to education can be removed. To a participant:

Those courses taken as part of MC programs may help with equity and access in education. Not everybody has the funds to get a four-year university education. Especially in places like Turkey, you may have low schooling expenses but in Europe or in the USA schooling expenses are very high... Thus, MCs may help decrease inequalities in education (PT9)

Participants also equally value MCs if the MC issuing institution or company is a prestigious one. Other enabling factors include the opportunities of tailored and self-regulated learning for upskilling or re-skilling, less commitment (time, money etc.) than a full degree, and that holding MCs may offer skills or competence verification and recognition when it comes to job search.

HE-induced enabling factors: Participants most frequently express their discontent with the education they get from the university as they hold the belief that university education is more theoretical or fragmented; that is, they feel the need to do extracurricular work such as obtaining MCs to compensate for practical experience in real life situations. They also insist that courses at university tend to be either at basic level or fragmented across the curriculum; they enrol in MC programs to see more real-life applications via projects they complete as part of the requirements for the MC program or sometimes they see advanced content in MC programs to cater for the defragmentation of the course content in their enrolled major degree programs. To a participant:

And to be honest, I know [name of the university] is the best university in Turkey. But uh, I realized, like until the third year, I didn't take any four-year courses during my third year. If I finished my third year and go to the second internship, I didn't know anything about the real-world application. All I studied is theoretical. All I studied is something can or cannot be applied. So when I went to the business world, they didn't care at all about which equation you are using. Um, this [result or reference point] is 0.5 or 0.6, they care about what is really in front of them, transformation of your theoretical knowledge to a physical, physical quantity or something physical you can see. (PT2)

Participants often cite the changes taking place in HE after the COVID-19 pandemic noting that teaching and learning settings have been drastically aligned more with digitalization, and that this is removing boundaries between on-site learning and online learning. As a result, participants tend to question whether holding MCs is equal to or sometimes better than on-campus education; also, some participants seriously question the quality of education they receive at the university that gives way to a swifter adoption of MCs in regard to laying the building blocks of their careers. To participants:

I mean you win the university entrance exam and enter [name of the university] after a year of studying. You spend about 5-6 years in total considering your undergraduate studies. I wish the current MC programs I have finished and those I still continue, I wish such programs, bootcamps were more popular long ago... I attended an online bootcamp in the USA, this was only possible due to the pandemic, because of the pandemic the bootcamp turned to online. (PT7)

Now that we have the pandemic, we mostly continue with online education. Before the pandemic, enrolling a MC and getting an online certificate was not that favourable, could be like people would even look down on such a learning experience. Now with the pandemic, we are getting university education in the same manner, I mean our undergraduate education.... We cannot be that negative now, I mean the dividing line between online and on-campus learning is disappearing; we are using similar platforms, teaching and learning techniques. (PT9)

Barriers to adoption of MCs

MC-induced barriers: Participants are also aware that holding MCs may put some barriers to their quest for jobs. To start with, participants often express their discontent with dominance of data science or computer engineering fields in MCs ecosystem. Although such MC programs are not solely and specifically designed for data scientists and computer engineers, but these programs accept learners from all backgrounds, this puts extra burden on learners with backgrounds other than data science and computer engineering in forms of some pre-requisite trainings to be able to start certain MCs. According to participants:

I would say it depends on the department, depends on the job that you want. I mean, I think for mechanical engineering, it's quite hard to make [an alternative career path]. It's more like complimentary but like for computer engineering and computer science [they may take the alternative path] maybe. (PT1)

There is a clear-cut distinction between those coming from computer sciences or related fields and those coming from different backgrounds. In the former scenario, they do not take the basic training [maths, statistics] but in the latter scenario, they have to do so. (PT7)

Another barrier induced by MCs is the perceived prestige; some participants believe that holding a MC is still less prestigious than formal certification (a conventional university degree). To a participant:

Going back to my experience and I am quoting with my manager, what he told me. "Yes, you are a skilled person, you know, exactly [what he said to me], you know, better than me." He told me this exactly, "you know, better than me. But the final decision cannot be taken by you because you are not holding a diploma." Okay. Okay. Yes, you know this case. But uh, I was working on the project for three months and when it finished, [it was] taken [from me] and given to the engineer because I am not an engineer yet. (PT2)

Some other participants worry about the lack of social interaction in MC programs adding that the component of social learning or learning from each other in informal settings like coffee-breaks in real life, for example, is missing. Another less frequently cited barrier is the unpurposed or non-strategic accumulation of MCs in that students may be overwhelmed by the MC options available in the MC ecosystem; the advice would be enrolling in MC programs that feeds one's career prospects rather than enrolling in any available and fashionable MC program out in the market, which may actually have repercussions on one's career building.

Work environment-induced barriers: Participants categorize some barriers associated with holding a MC under workplace as they believe these barriers may be evident in the work environment, the most visible one being the prejudice against MC holders. Majority of the participants fear that building a career only on MCs may potentially result in prejudice and discrimination. A participant points to the possibility of prejudice at workplace:

In a competitive environment, university degree holders may have prejudice against those MC holders, especially when it comes to payment [salary] issues. This prejudice may prevail at first but may disappear as MC holders have more experience. (PT3)

Few participants add another barrier that they may have trouble in advancing or getting promoted in workplaces where they will co-exist and work with other traditional degree holders. A participant worries that a traditional degree holder may be favourable over a MC holder in promotions:

From employer's perspective, if the employer must make a decision between a traditional degree holder and a MC holder, I believe a traditional degree holder may be promoted; I am assuming that the employer has not observed both enough, and does not have enough data to compare both, I mean...A traditional degree holder may be more advantageous. (PT3)

Some participants voiced concerns over another barrier in terms of focused specialization in MC. They hold the idea that if one specializes in a field by holding a MC, he or she may fail when a problem occurs at the systems level; this is the point where MC holders might be viewed incompetent in their daily practices or unauthorized in decision making in comparison to an engineer or a conventional university degree holder, for example. Participants add that such ambiguity over micro credentials still exists on behalf of the major stakeholders such as employers.

Supplement vs. alternative pathway to career development

Supplement to traditional university degrees: A great majority of the participants (n=9) view MCs as a supplement to their traditional university degrees in their quest for a successful career. Participants believe that building a career on MCs may be invalid for students with backgrounds other than data science and computer engineering; holding MCs may help with a more refined search on job search platforms provided that one holds a MC complimenting a traditional university degree, and thus, one may stand out among other competitors for a job. Some other participants view MCs as a second chance to reach a desired level of self-efficacy if one has failed to improve himself or herself during undergraduate years; some believe that MCs cannot replace fundamental disciplines like chemistry, physics, and biology but MCs might be useful for students with these backgrounds. In the case of social sciences, MCs may only be complimentary if an entrepreneur with a business administration background wishes to start his or her own business. Moreover, building a career only on micro credentials is likely to require much more investment (time, money, effort etc.) on behalf of the students who are due to graduate soon; one who starts over a career in a new discipline may be scary for some. According to a participant who perceives MCs as a supplement to traditional university degrees:

If I add this (MC) to my diploma, I can support the MCs perspective. Eventually, a traditional university degree and MCs constitute a meaningful whole...If one brings these MCs together with the diploma, then others [hiring managers] may say "the applicant has knowledge of theory with this diploma, and additionally he or she reinforced theory with practice by holding this MC; then, this applicant is competent for the position", this is more valid in my perspective. I support the supplement scenario, but I totally oppose to the alternative [to traditional university degree] scenario as a diploma and a MC are not equals. (PT11)

Alternative pathway to career development: A minority of the participants (n=2) view MCs as an alternative pathway to their career paths. One participant highlights the importance of a role model in taking a career path built only on MCs. A comprehensive MC program with competent trainers who have also walked the MC path before and are knowledgeable about the job market for MC holders may motivate students to consider making a living out of MCs. The other participant has already taken a career path built only on MCs:

In my opinion, MCs can be an alternative pathway to traditional university degrees. I am a psychology major, and this is actually my second undergraduate study, formerly I did a major in Public Administration. I find getting university degree a kind of luxury. I mean one can finish high school and land a job or build a career by taking the MC path rather than going to the university. There is no problem with this; the university is kind of extra but you do not go to university for nothing; if you have the resources and time you may do it but this does not mean you are being career-focused. A university is rather a place where you go on a self-discovery journey or I may even describe those years at university as an extended gap year. That is why I view MCs as an alternative pathway; I mean for job or career MCs are a viable and direct option. (PT7)

Adopting MCs as an adaptive career behaviour

Cognitive-person factors: Participants display adaptive career behaviour of using MCs to develop their careers based on three pillars of the career self-management model: self-efficacy beliefs, outcome expectations, goals and actions. These three pillars influence the purposive behaviour of individuals: using MCs to develop their careers. Based on the data, goals and goal-directed actions seem to guide participants the most among these three pillars. Participants have set specific career goals and put these goals into action to realize an outcome. In other words, participants have set career goals of obtaining MCs to advance their careers; most of them put this career goal into action by enrolling in MC programs, actually obtaining MCs, or starting to look for career opportunities by using these obtained MCs with the prospect of producing *outcomes/attainments*, the last component of in the career self-management model – that is eventually finding a job or advancing in their careers. To a participant, career goals are quite relevant to MCs:

I will start learning Phyton soon that will count as a MC now that I am a physics major. Not entirely on MCs, but I am planning a career where I will use MCs because my future career will focus on analytics and estimation or even some artificial intelligence applications...In this regard, Phyton will be crucial for me, I mean that will help me stand out in my career. (PT3)

As for self-efficacy beliefs, participants stated their own abilities such as working knowledge of basic programming languages, existing subject matter knowledge in statistics, and researching skills as well as internship experience which led them to the adoption of MCs to prepare for their careers. Regarding outcome expectations, participants emphasized that they are aware of the possible valued and pleasant consequences of adopting MCs in their career preparation. In other words, self-efficacy and outcome expectations are believed to promote adaptive career behaviour of using MCs to develop their careers.

Contextual and personality traits: According to the career self-management model, an individual's purposive behaviour (using MCs to develop one's career) is also shaped by contextual factors and personality factors. Based on the data, personality traits seem to guide participants the most between the two dimensions. Participants state specific personality traits such as entrepreneurial, conscientious, and extraverted that align with using MCs to advance in their careers; in other words, they believe that the adoption of MCs relevant to their personality traits can be translated into a boost in their career development. According to a participant:

Since Preparatory School I have visited several career fairs to network with others. I mean to learn about internship opportunities or job opportunities after graduation...It depends on the person a little as one can be introverted or extraverted, but you grow throughout the years you spend on campus and this kind of determines your options [after graduation] (PT10).

As for the contextual factors, participants seem to be influenced by a supporting environment where MCs are valued as a booster for a desired career and where barriers to career success are minimized.

Discussion and Implications

This study aims to examine the phenomenon of MCs within the context of HE and career development by analysing the accounts of university students regarding their experiences and interpretations. Firstly, two prominent MC-induced enabling factors that motivate participants to device MCs in their way to career development are employability and accessibility. As for employability, data is consistent with Kurt and Fidan's (2021) findings; in their recent study on the role of university in career construction Kurt and Fidan depict the expectations of university students and the realities they encounter. Kurt and Fidan also conclude that university education faces real challenges in providing satisfactory opportunities to increase the employability of university students. As a result, it is not surprising to see students engage in supplementary or alternative career behaviours. Similarly, in his study to understand employer's perspective regarding the use of MCs by potential employees, Gauthier (2020) conclude that MCs can bilaterally be beneficial for the holder and employers, suggesting that MCs increase employability of the applicants. Likewise, Tomlinson and Anderson (2020) confirm that job-seeking graduates may benefit employability capital aspect of MCs as they prove to their potential employees that they possess non-academic, non-formal experiences that are still employment-related credentials.

Regarding HE-induced enabling factors, participants are rather discontent with the university education being more theoretical or fragmented, and as a result, they tend to adopt MCs to cater for the applicability of theory into practice; they value MCs in this sense as participants also have the formal certification of applied knowledge via MCs. This finding in the data is consistent with Gauthier's (2020) study such that university degree and transcripts were questioned by the participants- employers- and also that candidates tended to include MCs as part of their application documents to show proof of certified learning in which they were able to apply their knowledge and skills to everyday problems or situations. Another HE-induced enabling factor is the changing mindset on behalf of the students; participants noted that after the COVID-19 pandemic teaching and learning settings have been drastically aligned more with digitalization. As a result, adoption of MCs in such a redefined digitalized landscape for HE is easier for university students now that the dividing line between on-campus and online learning as well as the one between traditional university degree and MC-based proof of competency and skills is blurring.

Secondly, two leading MC-induced barriers to the adoption of MCs that made participants hesitant to build a career on their MCs are their discontent with dominance of data science or computer engineering fields, and the perceived low prestige. These data are partially consistent with the literature. In their study, Hollands and Kazi (2019) surveyed learners who enrolled and completed programs offered in leading MC providers in topics such as "business and finance...social science, computer science, information science, and business and management" (p.2). In their findings, the learner profile pursued credentials in a variety of professional fields including, "...finance (16%); information technology (10%); business management and administration (9%); science, technology, engineering and mathematics (9%); marketing, sales and service (8%); teaching or education research (7%); education administration (6%); and non-profit management and administration (6%)." (p.6) Their findings in 2019 point to a spectrum of social sciences and natural science or informatics related credentials. Those enrolled in science, technology, engineering and mathematics only account for 9% of learners, and inside this population a relative dominance of learners with a data science or computer engineering background may be considered normal. This inconsistency may be associated with the misconception of the participants in the data that MCs equal to data science or computer science related credentials; only a few participants mentioned business administration related credentials, but a great majority mentioned enrolling credentials related to computer programming languages. Another MC-induced barrier to the adoption of MCs is the perceived prestige. This finding is parallel to Dyjur and Linsdstrom's (2017) study in which non-formal credentials were perceived as less prestigious than formal certification.

Turning to work environment-induced factors, participants have reservations about any possible prejudice against MC holders in the workplace. While some participants hold egalitarian perspectives on MCs in the sense that as long as the MC holder is competent and performs tasks as expected, then, there would not be any prejudice against the MC holder, or the employer would not discriminate one against traditional university degree holders. However, some other participants firmly believe that MCs are a new trend even to employers. In a situation where promotion is the case in the workplace, they fear that they may have trouble in advancing or getting promoted in their career as a MC holder. This belief is partly rooted in the ambiguity as mentioned by Resei et al. (2019) who concluded that there is still ambiguity over micro credentials especially in Europe; Oliver (2019) also emphasized the ambiguity over micro credentials on behalf of the learners, the target consumers, or the employees. Now that Turkey is a country with full membership for the Bologna Process / European Higher Education Area since 2001, and also that MCs are only recently a growing phenomenon in Turkey, this finding is quite consistent with the literature.

Thirdly, students align more with the idea that MCs are a supplement to traditional university degrees rather than an alternative pathway to career development. Their major reasons for being proponents of the supplementary perspective is the belief that students with data science or computer engineering background leave little room for students with other majors to flourish in these tracks. Furthermore, these participants believe that, indeed, traditional university degrees compete during job search while holding a MC is a plus that helps candidates stand out among others. However, being an opponent of

the supplementary perspective rests on the need for role models who have walked the MC path or setting grand career goals as early as freshman or sophomore years; such a role model may be illuminating and inspiring to build a career only on MCs even if one comes from a major other than data science or computer engineering, and starting to build a career on MCs as early as possible would give one enough time before graduation to master another field of study or advance in one's own field of study. The findings in the data are parallel to findings of Oliver (2019) and Resei et al. (2019) rather than those of Fong et al.'s (2016) since a great majority of the participants view MCs as a supplement to traditional university degrees.

Finally, participants' adaptive career behaviour-their adoption of MCs as an adaptive career behaviour in the context of career-self management model as suggested by SCCT- is mostly shaped by the cognitive-person factors of goals and actions. In Wendling and Sagas's (2020) study self-efficacy and career goals were found to be direct facilitating predictors of career planning behaviour of their participants. The findings as to goals and actions in this study are quite parallel to this finding in ways that participants in this study most frequently related their adaptive career behavior (using MCs to advance in career) to setting specific career goals and enacting them with persistence. Additionally, the data revealed that participants' display of this adaptive career behaviour is also contingent upon the personality traits of being entrepreneurial, conscientious, and extraverted. In Wendling and Sagas's (2020) study, "conscientiousness and openness were not directly related to career planning, only indirectly via self-efficacy and goals." (p.8) Wendling and Sagas's personality traits of conscientiousness and openness have been voiced by the participants as conscientiousness and extravertedness in this study with the addition of being entrepreneurial, all of which contribute to participants' adoption of MCs as an adaptive career behaviour in the context of career-self management model.

Regarding implications, this research has implications for research and practice. As for research, this study provides qualitative empirical evidence to MCs literature regarding the enabling factors and barriers to using MCs in career development, the supplementary versus alternative pathway debate, and this research also validates the career self-management model as suggested by SCCT with the introduction of MC adoption as an adaptive career behaviour and entrepreneurial personality as a factor that is shaping one's career behaviour. Considering practice, embedded career development centres of universities and career development professionals must seriously consider ways to include MCs in their career development seminars, workshops or tutorials. In universities where career planning is an undergraduate course, MCs need to be integrated into the curriculum. Results out of this study may be guiding for students enrolled in Turkish universities or abroad while they are deciding on their future career investments. Regarding limitations, some additional measures can be devised to increase the reliability or transferability of findings such as member-check and using other raters. By doing so, transferability of perceptions and experiences can be better achieved in other settings where learners may consider adopting MCs in their career development. Future research may consider involving graduate level students in the research group who may display diverse adaptive career behaviours than undergraduates. Future researchers may include more perspectives from other stakeholders such as employers and academics.

Acknowledgement

This research was approved by Middle East Technical University (METU) Human Subjects Ethics Committee with the protocol number 426-ODTU-2021.

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