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THE VALUE OF MICRO-CREDENTIALS FOR HIGHER EDUCATION STUDENTS

ABSTRACT

Arttu Kukkonen: The value of micro-credentials for higher education students
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Student population is diversifying, which has increased the need for more flexible and personalized learning paths. Micro-credentials have been considered one of the enablers of these personalized learning opportunities. Micro-credentials have been studied from perspectives of professionals and employers, but students' point of view has been missing. This thesis is meant to fill this research gap.

The objective of this thesis is to study if higher education students perceive that micro-credentials offer value to them. Finding out the perceived value of the users is important, as technologies which are perceived to offer low value are adopted more slowly and not as widely than technologies which are perceived to offer high value.

Expectancy-value theory was chosen as the theoretical framework to examine the value of micro-credentials, as it enables breaking down the value into smaller examinable constructs. Data for the research was gathered by conducting in-depth interviews with nineteen higher education students from Tampere University.

The results of the study indicate that higher education students perceive many ways how, and situations where, micro-credentials can be useful to them. Micro-credentials were perceived to create value in searching for work and in verifying skills and competences.

Generally, students perceived they possess either adequate or good skills to use micro-credentials and perceived the costs of using micro-credentials as small. These results indicate that micro-credential adoption among higher education students likely is not due to these factors.

The most important finding is that students perceived that general lack of awareness and appreciation of micro-credentials, especially from industry, significantly decreases the value of micro-credentials to them. This decreased value can slow down the speed and rate of adoption of micro-credentials among higher education students, unless dealt with accordingly.

Keywords: Micro-credentials, Digital credentials, Higher education

The originality of this thesis has been checked using the Turnitin OriginalityCheck service.

TIIVISTELMÄ

Opiskelijakanta on monimuotoutumassa, mikä on lisännyt tarvetta joustavammille ja räätälöitävämmille oppipoluille. Mikrokredentiaaleja pidetään yhtenä räätälöitävien oppimismahdollisuuksien mahdollistajana. Mikrokredentiaaleja on tutkittu valmistuneiden ammattilaisten sekä työnantajien näkökulmasta, mutta opiskelijoiden näkökulma on puuttunut. Tämän diplomityön on tarkoitus paikata tätä aukkoa tutkimuksessa.

Tämän diplomityön tavoitteena oli tutkia kokevatko korkeakouluopiskelijat mikrokredentiaalien tarjoavan arvoa heille. Käyttäjien havaitun arvon selvittäminen on tärkeää, sillä teknologiat, joiden havaitaan tarjoavan vähän arvoa, otetaan käyttöön hitaammin eikä yhtä laajasti kuin teknologiat, joiden havaitaan tarjoavan paljon arvoa.

Korkeakouluopiskelijoiden havaittu arvon tutkimiseksi teoreettiseksi viitekehykseksi valittiin Expectancy-value theory, jonka avulla havaittu arvo voidaan pilkkoa pienempiin tarkasteltaviin osiin. Tietoa tutkimusta varten kerättiin haastattelemalla yhdeksäätoista korkeakouluopiskelijaa Tampereen yliopistosta.

Tutkimuksen tuloksena voidaan todeta, että korkeakouluopiskelijat havaitsivat useita tapoja sekä tilanteita, joissa mikrokredentiaalit olisivat heille hyödyllisiä. Mikrokredentiaalien havaittiin tuottavan arvoa eniten työnhakutilanteissa sekä taitojen ja kompetenssien verifioinnissa.

Yleisesti opiskelijat kokivat, että he omistavat joko tyydyttävät tai hyvät taidot käyttää mikrokredentiaaleja ja eivätkä kokeneet mikrokredentiaalien käyttämisen vievän vain vähän resursseja. Nämä tulokset indikoivat, että korkeakouluopiskelijoiden mikrokredentiaalien käyttöönotto ei todennäköisesti jää kiinni näistä tekijöistä.

Tärkein löydös oli se, että opiskelijat kokivat, että yleinen tietoisuuden sekä arvostuksen puute mikrokredentiaaleja kohtaan, etenkin yritysten puolesta, heikentää merkittävästi mikrokredentiaalien arvoa heille. Tämä heikentynyt arvo voi hidastaa mikrokredentiaalien käyttöönoton nopeutta ja laajuutta korkeakouluopiskelijoiden keskuudessa, ellei siihen puututa.

Avainsanat: Mikrokredentiaalit, Digitaaliset kredentiaalit, Korkeakoulutus

Tämän julkaisun alkuperäisyys on tarkastettu Turnitin OriginalityCheck –ohjelmalla.

PREFACE

With the completion of this thesis, my studies will be completed, at least for the time being. During my time at Tampere University's Hervanta campus I learned a lot, but most importantly, I had the chance to meet some great people, who made my time there unforgettable.

I would like to express my deepest appreciation to my instructor, Henri Pirkkalainen for providing me the opportunity to write this thesis. I am deeply indebted to the guidance and valuable advice he provided during the whole writing process. I also want to thank my colleagues for their words of encouragement and advice. I also wish to show my gratitude to all the interviewed students for providing great insights and making this thesis possible. Thanks also to Teemu for proofreading this thesis.

I would like to pay my special regards to my family and friends for their continued support and for providing distractions to rest my mind outside of this thesis. I am especially grateful to my mom for being so patient with me and providing me with encouragement throughout the duration of my studies. Finally, I cannot begin to express my thanks to Ilona, for sharing the joys and sorrows of (related and unrelated to) writing a master's thesis with me.

Tampere, 27 April 2021

Arttu Kukkonen

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LIST OF SYMBOLS AND ABBREVIATIONS

ECIU   European Consortium of Innovative Universities
EVT   Expectancy-value theory
MOOC   Massive Open Online Course

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1. INTRODUCTION

Student population is becoming more diverse, which in turn has increased the need for more flexible and personalized learning paths. Micro-credentials have been considered one of the enablers of more personalized learning opportunities. (European Commission, 2020b). Micro-credentials are considered a proof of learning, skills and/or competences (ECIU, 2020; European Commission, 2020a) or as a short learning offering (Pickard, Shah and De Simone, 2018) or both the credential and the learning activity that leads to the credential (Cirlan and Loukkola, 2020).

In this thesis the common European definition of a micro-credential is used: *A micro-credential is a proof of the learning outcomes that a learner has acquired following a short learning experience. These learning outcomes have been assessed against transparent standards* (European Commission, 2020a). In addition to enabling more flexible learning paths, micro-credentials enable offering a wide variety of learning opportunities to both students and professionals, but also to individuals who possibly do not have access or resources to take part in traditional education degree programs. Micro-credentials also enable individuals to upskill or reskill themselves with skills that are in high demand on the labor market, and prove their competences and knowledge to employers and other parties, (European Commission, 2020a), which over half of EU workforce is going to have to do by 2025 (ECIU, 2021c). It should also be noted that although micro-credentials can be issued on paper or digitally (Oliver, 2019) and the common European definition presented above does not specify the form in which micro-credentials are issued in, this thesis will focus on digital credentials, and will discuss micro-credentials as *digitally issued proof of learning, skills and competences.*

Although micro-credentials are clearly an important subject, they have not yet been the subject of wide scientific research. Views on micro-credentials have been researched from the perspective of employers (Young, West and Nylin, 2019; Gauthier, 2020) and professionals (Young, West and Nylin, 2019) but there has been no research on how higher education students view micro-credentials, and more specifically digital credentials. The aim of this thesis is to fill this research gap and to investigate what aspects affect higher education students' intentions to use micro-credentials. To ensure widespread adoption of micro-credentials among higher education students, it is mandatory

to find out how students view micro-credentials. Applications that are perceived by users to offer high value from the beginning are adopted more rapidly than applications which are perceived to offer low value. The latter are also not likely to gain widespread adoption, even during a long period of time. (Jurison, 2000)

The aim of this thesis is to investigate if higher education students find that micro-credentials offer value to them. To fulfill this goal, the main research question is:

- Do higher education students perceive that micro-credentials offer value to them?

Expectancy-value theory (EVT) was chosen as the theoretical framework to answer the research question. EVT is a helpful framework because it allows to explain different aspects which affect the perceived value of an activity, like using micro-credentials. EVT proposes that an individual's intentions to take part in an activity are determined by how the individual perceives the value of the activity, their skills related to completing the activity and the costs of taking part in the activity. EVT further breaks down the individual's perceptions of their skills and the value and cost of the activity. (Eccles *et al.*, 1983) As micro-credentials and their perceived value to higher education students have not been yet researched, a way to examine this value in detail was considered useful. EVT also determines the relationship between beliefs and choices to take part in an activity (Eccles *et al.*, 1983) and can be used useful in innovation adoption processes to understand and predict the intentions to start using an innovation (Wozney, Venkatesh and Abrami, 2006).

The research was conducted as a qualitative study with 19 interviews of higher education students from Tampere University from Finland. The data for this thesis was collected in an ECIU University project (ECIU, 2021c), where different micro-credential platforms were piloted. Main contribution of this thesis are that it is the first empirical study that studies higher education student's views on digital credentials. It is also the first study to use EVT to investigate the intentions of higher education students implementing a technology, as teachers have been the examined target group in technology implementation themed previous EVT research.

The thesis is structured as follows. First the theoretical background is introduced in chapters 2 and 3. In chapter 2 micro-credentials and their characteristics are presented. Current state of micro-credentials in higher education are also discussed, in addition to the value that they can offer to students according to literature. In chapter 3 the framework to examine value and focuses on expectancy-value theory and its concepts in more detail are presented. The case study organization and research methods are described In Chapter 4. In chapter 5 the results of the data collection and data analysis are presented.

Research question and the research results are examined against the theoretical background in chapter 6. The theoretical and practical contributions of this thesis are also presented. As digital credential adoption is still in its infancy, two propositions are formed with further research in mind. At the end of the chapter the research limitations of the thesis are described and areas for future research are suggested.

2. MICRO-CREDENTIALS

In this chapter several definitions for micro-credentials will be introduced, as no largely shared definition as currently exists (Rossiter and Tynan, 2019; Cirlan and Loukkola, 2020). This chapter will also introduce the concept of micro-credentials in subchapter 2.1. Subchapter 2.2 will focus on digital credentials within higher education context and why they are worthy of research. Subchapter 2.3. will discuss what kind of value digital credentials are thought to offer students based on literature.

2.1 Overview of micro-credentials

Micro-credentials are certifications that validate either new or prior knowledge and skills. They can be issued by traditional education institutions, industry providers or private providers and they can be issued from learning that has happened either online, onsite or both. The certifications are mostly digital certificates, but they can also be in a form of a digital badge or a paper certificate. Micro-credentials can either be a stand-alone certification, or they can be a part of a formal qualification. (Oliver, 2019) Like stated in the introduction, this thesis will consider micro-credentials as digitally issued proof of learning, skills, and competences.

While interest towards micro-credentials has been growing (Ellis, Nunn and Avella, 2016; Krauss, 2017; Rossiter and Tynan, 2019), a lack of a largely shared definition of micro-credentials is causing confusion (MicroHE Consortium, 2019; Oliver, 2019; Rossiter and Tynan, 2019). The most common perspective on micro-credentials is that they are proof of learning, skills and/or competences (Ellis, Nunn and Avella, 2016; Oliver, 2019; Rossiter and Tynan, 2019; ECIU, 2020; European Commission, 2020a; New Zealand Qualifications Authority, 2021), while other perspectives see micro-credentials as learning offerings (Pickard, Shah and De Simone, 2018) or define micro-credentials as both the credential itself and the learning activity leading to the credential (Cirlan and Loukkola, 2020).

The differences between definitions do not stop there. There are many other characteristics of micro-credentials that can be taken into consideration, like the type of provider of the micro-credential (traditional educational, industry, private), size, purpose, the degree of formality as education units and are they considered stand-alone validations or do they interact with a formal qualification. (Cirlan and Loukkola, 2020) Some definitions

even argue that the skills and competences that micro-credentials verify answer to societal needs (New Zealand Qualifications Authority, 2021). One common characteristic can be found though, and that is that micro-credentials are mainly considered to be in digital form, although other forms are also possible. (Oliver, 2019; Cirlan and Loukkola, 2020; Kato, Galán-Muros and Weko, 2020). Providing a universal definition for micro-credentials is not easy, as some of the current definitions are more general in nature, while some definitions are a lot more specific about what is considered a micro-credential, like the before mentioned definition from New Zealand Qualifications Authority.

Another factor causing confusion are the many different forms which micro-credentials can take. Paper certificates, digital certificates and some digital badges are able fulfill the definitions of micro-credentials (Oliver, 2019). While the term digital badge is every so often used interchangeably with the term micro-credentials (Elliott, Clayton and Iwata, 2014), the terms should not be mixed up as there are differences between them. Micro-credentials are awarded upon acquiring certain knowledge or demonstrating competence by distinguished professional bodies or educational institutions, who maintain the conditions of the awarding. Digital badges on the other hand are awarded for taking part in activities or progressing in them, and while a summative award can ensue from a collection of badges, the main purpose of digital badges is to encourage taking part or progressing in the activity. (Elliott, Clayton and Iwata, 2014) To be clear, while some digital badges can fulfill the definition of a micro-credential, not all digital badges are necessarily micro-credentials and vice versa.

2.2 State of micro-credential adoption in higher education

Higher education institutions are requested to offer education of the highest quality to learners and expected to offer experts for the job market, while also being cost-efficient (Puhakka, Rautopuro and Tuominen, 2010; Lemoine, Wilson and Richardson, 2018). Offering high quality education while keeping the costs low is not the only challenge higher education institutions face these days. Student population has diversified, and the learning needs of this population are becoming more diverse (European Commission, 2020b). Employers are starting to value job applicants' skills over the degrees they have (Lam, 2015; Purbasari Horton, 2020) and there is a growing demand for reskilling and upskilling the workforce (Lewis and Lodge, 2016; Cirlan and Loukkola, 2020; Kato, Galán-Muros and Weko, 2020).

The above-mentioned factors have caused higher education institutions look into micro-credentials and start experimenting with them (Milligan and Kennedy, 2017), as micro-

credentials provide flexibility compared to conventional degrees. They can also complement bachelor, master and doctoral level curriculums while also providing value to professionals who already hold degrees (Oliver, 2019; European Commission, 2020b). The typically digital nature of micro-credentials can also drastically reduce the costs of providing learning offerings (Kato, Galán-Muros and Weko, 2020).

Australia and New Zealand have both updated their qualification frameworks, named AQF and NZQF respectively, to take micro-credentials into account and to assure a level of quality and harmonization between each country's higher education institutions (New Zealand Qualifications Authority, 2018; Noonan, 2019)

Recent literature on micro-credentials, where micro-credentials are treated as digital credentials, is scarce. Selvaratnam and Sankey (2019) conducted a survey which investigated Australian higher education institutions' approaches to micro-credentials, and they found out that while the institutions' awareness was high and intent and even planning for micro-credentials existed, implementation levels were low. Ghasia, Machumu and DeSmet (2019) explored the role of micro-credentials in Tanzania by conducting interviews with lecturers, students, and educational technologists from four Tanzanian universities. Their findings were that micro-credentials were viewed as a positive phenomenon that could benefit both learners and institutions, but policies and infrastructure needs to be put into place to ensure successful implementation of micro-credentials. (Ghasia, Machumu and DeSmet, 2019) Study of Jirgensons and Kapenieks (2018) does deal with digital credentials, but focuses mainly on the technologies that enable the trustworthiness of credentials, like verifying the credentials with blockchain technology. Raish and Rimland (2016) surveyed 114 employers from the United States about their attitudes towards digital credentials in the form of badges, with encouraging results, as 33 per cent of the respondents said they would be interested in using a digital badge as a form of evaluating skills of recent college graduates. Results still revealed that there is need for raising awareness of badges and other digital credentials, as 62 per cent of the respondents answered "maybe" and 5 per cent answered "no".(Raish and Rimland, 2016)

Oliver's (2019) extensive white paper on micro-credentials presents different drivers which are pushing the development of micro-credentials and lays out recommendations on how to ensure the spread of micro-credentials. Main recommendations were to build trust by agreeing on a definition of micro-credentials and standards, add value by offering work-related micro-credentials and achieve sustainability by reallocating resources towards micro-credentialing. (Oliver, 2019)

Kato, Galán-Muros and Weko (2020) investigated emerging alternative credentials, including micro-credentials. Their paper was aimed at policy makers of Organisation for Economic Co-operation and Development (OECD), and focused on defining and characterizing alternative credentials and examined how employers and governments perceive them. Earners of these alternative credentials were examined briefly, focus being on their demographics.

Gallagher (2018) surveyed the use and value of micro-credentials to companies in hiring decisions. He found out that majority of HR leaders that answered the survey are already starting to prioritize skills over degrees, with 23 per cent reporting a formal effort towards this and 39 per cent contemplating doing so. At the time of the study, the relative value of micro-credentials in hiring has also increased over the last five years by in the eyes of 48 per cent of the employers. (Gallagher, 2018)

2.3   Value from learner perspective

Views on micro-credentials have been researched from the perspective of employers (Young, West and Nylin, 2019; Gauthier, 2020) and professionals (Young, West and Nylin, 2019) but there has been no research that focused only on how higher education students view micro-credentials, and more precisely digital credentials. Studies where micro-credentials' value has been investigated from students' perspective have tended to treat micro-credentials as both the learning event and the proof of learning.

Calonge *et al.*, (2019) studied massive open online courses (MOOCs) and what value awarding micro-credentials could provide for the students who take them, but the paper only scratched the surface of digital credentials as their main focus was MOOCs. In the paper micro-credentials were treated as both the learning event and the verification of that learning. Study by MicroHE Consortium (2019) had a similar focus on the learning event. In the study, students (and other stakeholders) were interviewed about micro-credentials, but the study was more pragmatic than empirical, and micro-credentials were considered as both the credential and the learning activity leading up to the credential, with the focus on the latter. In their study they discovered that students thought that micro-credentials enable them to personalize their studies, obtain skills that are in high demand on the labor market, obtain up-to-date information and help offer them more focused content. (MicroHE Consortium, 2019)

The findings of the MicroHE's study concur with other studies. According to Cirlan and Loukkola (2020) micro-credentials enable students to access interdisciplinary skills and knowledge. Interdisciplinary skills answer to the labor market's needs, as increasing

share of employees need to have expertise in more than one area (Lewis and Lodge, 2016). Acquiring and verifying competences are the most important reasons to obtain micro-credentials according to a study carried out by Kato, Galán-Muros and Weko (2020). Oliver (2019) presents that micro-credentials that are work-related, and lead to work opportunities, are the ones that offer the most value. Kato, Galán-Muros and Weko (2020) concur with Oliver, as they posit that students seek digital credentials because of work-related reasons.

Students are not yet adopting micro-credentials in masses, which could result from the perceived uncertainty of the benefits of using micro-credentials. In order for micro-credentials to add value, they need to contain skills that are important for employers. (Oliver, 2019) Kato, Galán-Muros and Weko, (2020) note that lack of standardization and employers' lack of familiarity and recognition restrict the impact that digital credentials can have on the labor market.

3. THEORETICAL FRAMEWORK TO EXAMINE PERCEIVED VALUE OF DIGITAL CREDENTIALS

In this chapter both value and expectancy-value theory and their importance regarding digital credentials are discussed. Values in general and the value of an information system and its importance to the user is discussed in the subchapter 3.1. In subchapter 3.2 the foundations of empirical research, expectancy-value theory and are presented. The concepts of the expectancy-value theory are discussed in subchapter 3.3.

3.1 Perceived value

Value of an information system can be evaluated from different point of views and typically the most influential ones are the managers' and the system providers' perspectives. (Kujala and Väänänen-Vainio-Mattila, 2009).

When evaluating a public sector information system, system provider and user of the information system can have very different perspectives on the value of the said system, but the perspective of the consumer is easily left unexamined (Bannister, 2001). Usually the user's perspective considers other aspects in addition to financial point of view, as the information system can be useful or important to the user for other reasons (Kujala and Väänänen-Vainio-Mattila, 2009).

Disregarding the user perspective is problematic, as users are important stakeholders, and the value of an information system is generally formed by the user's actions, and therefore the users' perceptions of a system's value are essential for the successful development of an information system. (Kujala and Väänänen-Vainio-Mattila, 2009). In addition, applications that are perceived by users to offer high value from the beginning are adopted more rapidly than applications which are perceived to offer low value. The latter are also not likely to gain widespread adoption, even during a long period of time. (Jurison, 2000) For these reasons considering users' perceived value of an information system when developing a new one is critically important.

Boztepe (2007) defines value as *"the practical or symbolic result created through user-product interaction".* This means that value of a product is not absolute, and value does not stem from the properties of the product, but instead depends on the interaction of the product and user in a specific context. Perceived value stems from the properties of the

product, the user's values and needs and the specific context of the interaction. Figure 1 depicts how perceived value is formed. (Kujala and Väänänen-Vainio-Mattila, 2009)
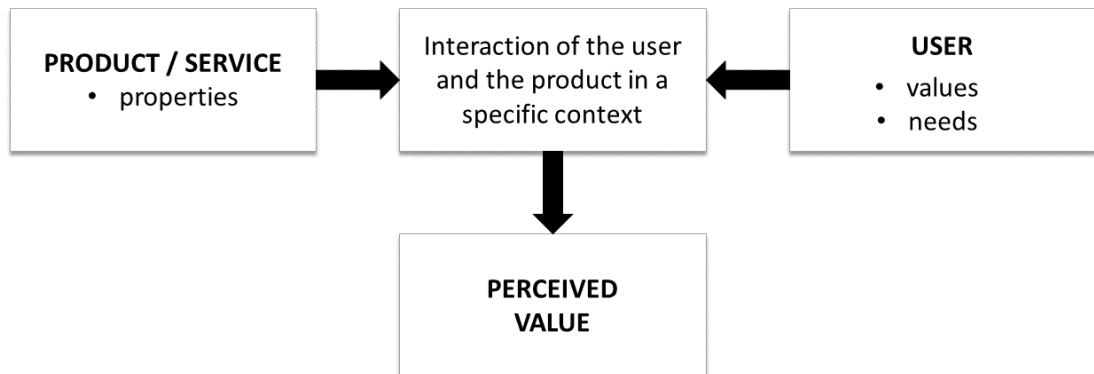

Figure 1. Formation of perceived value (modified from Kujala and Väänänen-Vainio-Mattila, 2009)

As each user has their individual values and needs, users perceive the value of a products very differently. Finding out the differing needs and value perceptions of the of users is required for effective marketing (Pura, 2005), which in turn is necessary for effectively promoting the micro-credentials to ensure their widespread adoption.

3.2   Expectancy-value theory

To address the research gap of how higher education students perceive micro-credentials and the value they provide, Eccles' expectancy-value theory (EVT) (Eccles *et al.*, 1983) was used as a theoretical lens. EVT was considered fitting for the following reasons: First, EVT enables breaking down different aspects of individual's perceived value and perceived competence and it determines the relationships between beliefs and choices to perform an activity, like the intention to use micro-credentials (Cheng *et al.*, 2020). Second, EVT can be used in innovation adoption processes to understand and predict intentions to start using an innovation (Wozney, Venkatesh and Abrami, 2006), which fits this research as micro-credential adoption is still in its infancy and micro-credentials can thus be considered as an innovation.

According to EVT, an individual is more likely to start using an innovation if they perceive that both the expectancy of success and the value of the innovation are high and that the received value is higher than the expected costs of adopting the innovation (Wozney, Venkatesh and Abrami, 2006; Sipilä, 2011). Valuable information can be obtained by breaking down, examining, and analyzing the different aspects of individual's perceived value and perceived competences regarding micro-credentials.

Contemporary expectancy-value theories are based on concepts of expectancy and value defined by Lewin (1938, cited in Wigfield & Cambria, 2010) and Tolman (1932, cited in Wigfield & Cambria, 2010) in addition to the expectancy-value model of achievement motivation (Atkinson, 1957). A great deal of modern EVT research has concentrated on children and their expectancies and values, and how different activity choices, emotions and performance are related to these constructs (Wigfield and Cambria, 2010). Expectancy-value theory has also been utilized in researching other groups, like higher education students (Feather, 1988), teachers (Sipilä, 2011) and subjects like technology implementation and integration. (Wozney, Venkatesh and Abrami, 2006; Cheng *et al.*, 2020). Most of EVT research has taken a quantitative approach, but there have been some qualitative approaches, e.g. (Chen and Liu, 2009; Matusovich, Streveler and Miller, 2010; Sarah MacDonald *et al.*, 2014; Flake *et al.*, 2015). As this thesis takes a qualitative approach, the intention of higher education students to start using micro-credentials is not measured or defined directly. Instead, the focus is on studying the factors that enable micro-credential adoption.

EVT proposes that an individual's intention to take part in an activity is formed by the individual's value and competence beliefs. (Eccles *et al.*, 1983; Eccles, 2005). Both value beliefs and competence beliefs can be split into smaller constructs, which are defined in the subchapter 3.3. Competence beliefs and value beliefs are both affected by identity factors and environmental factors, e.g., past experiences, socializers (parents, teachers, peers), beliefs about personal identity (parts of ourselves that make us unique) and beliefs about collective identity (parts of ourselves that connect us to others). (Eccles and Wigfield, 2002)

Although relationships between all of these beforementioned constructs are presented in EVT, this thesis will focus on only the competence beliefs and value beliefs, as these constructs are directly related to individuals' intentions to perform an activity (Wigfield and Eccles, 1992; Eccles and Wigfield, 2002; Hulleman *et al.*, 2010) and they are also areas that research most commonly focuses on (Cheng *et al.*, 2020), and they are most important determinants of individual's performance, persistence, and intention to take part in an activity (Wigfield and Eccles, 1992). Reason for focusing on competence and value beliefs stems from the purpose of this thesis: the goal is to find out what kind of value students perceive micro-credentials to offer - not what factors affect the way they perceive micro-credentials.

3.3   Concepts of EVT

The main concepts of EVT, their definitions and micro-credentials related examples of the are presented below. Two of the most important concepts are competence and value beliefs, which themselves contain smaller and more elaborate concepts. Competence beliefs refer to the individual's evaluations of their abilities in different activities and areas. Value beliefs refer to the aspects that affect the individual's intentions and/or desire to take part in an activity. (Eccles *et al.*, 1983)

Eccles *et al.* (1983) define expectancies as how an individual perceives he/she will manage in performing an activity. Expectancies are further divided into two different constructs: ability beliefs and expectancies for success. The former covers the individual's perceptions about their current abilities to perform an activity, while the latter covers perceptions of how well they can perform the activity in the future. (Eccles *et al.*, 1983) The term competence beliefs refers to all of these concepts.

Eccles et al. (1983; 2005) define subjective task values (STV) as an individual's reasons and motives for taking part in an activity, which are affected by how well the activity supports the individual's goals, needs and personal values. Subjective task values consist of four different parts, that all affect the individual's intentions to take part in an activity: attainment value, intrinsic value, utility value and cost. (Eccles *et al.*, 1983; Eccles, 2005)

Attainment value is how important successfully carrying out, or taking part, in an activity is to an individual and how determined the individual is to succeed in doing so. Attainment value is also linked to engaging in an activity to confirm or disconfirm important sides of individual's self-image: attainment value of an activity will be higher for an individual if the activity helps to confirm an important side of their (ideal) self-image. (Eccles *et al.*, 1983) For example, if individual A considers themselves to be an early adopter, the attainment value of using a new piece of technology would be higher for individual A than for individual B, who does not consider being an early adopter important to his/her self-image.

Intrinsic value means either the gratification the individual gets from carrying out a task or the interest he or she has in the activity (Eccles *et al.*, 1983; Eccles and Wigfield, 2002). Utility value, the usefulness of the task, depends on the individual's short-term and long-term goals and how performing the task will help the individual reach their goals. The activity might not appear directly related to individual's goals but can still have high utility value. (Eccles *et al.*, 1983; Eccles and Harold, 1991; Eccles and Wigfield, 2002). Cost refers to the things the individual has to give up in order to perform the task

(Eccles and Harold, 1991). It also includes other negatives aspects related to performing the task, like performance anxiety and opportunities that are lost because of choosing to perform the task (Eccles *et al.*, 1983). Figure 2 depicts how expectancies, perceived subjective task value, and perceived costs affect an individual's intention to use digital credentials.
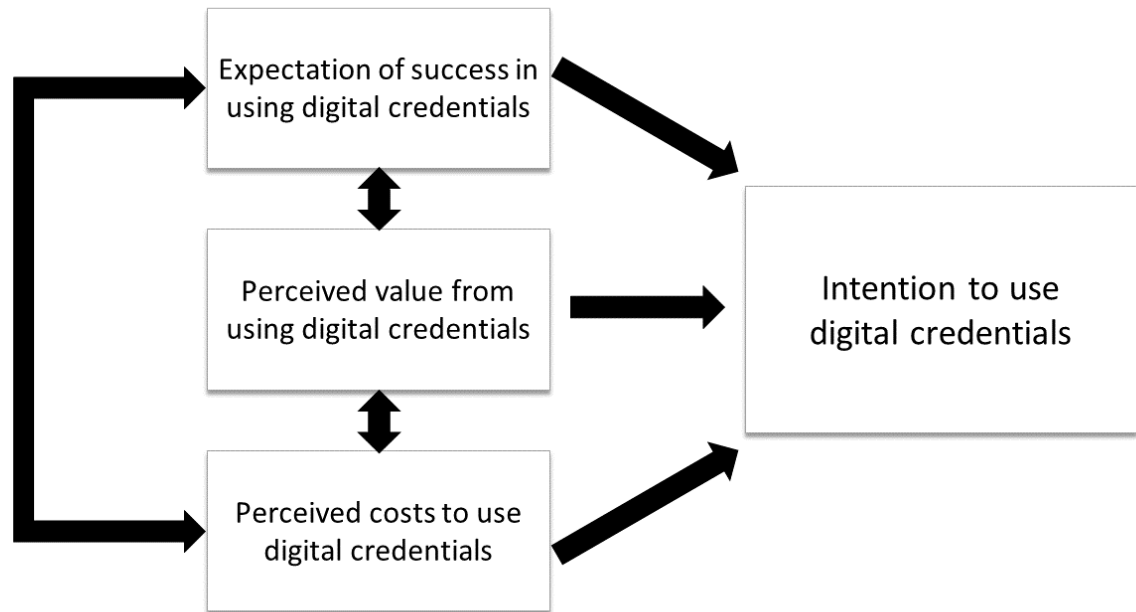

***Figure 2. Expectancy-value-cost model of micro-credentials* (modified from Hulleman *et al.*, 2016)**

The expectancy-value of digital credentials shown Figure 2 is modified from (Hulleman *et al.*, 2016) updated model of Eccles' et al. original model. The model of Hulleman et al. differs from the model of Eccles et al.. In the version of Hulleman et al. cost has been promoted to a separate construct, because theoretical and empirical work both suggest that cost could have as big of an influence on intention to take part in activity as expectancy and value (Hulleman *et al.*, 2016). The updated model was deemed a good starting point for model of micro-credentials, to ensure that cost is not dismissed or overlooked. An individual can choose not to take part in an activity even if they have high expectation of success and perceive that the activity offers them high value, if the individual perceives the cost of taking part in the activity as too high (Barron and Hulleman, 2015). Cost is also related to low levels of persistence, low levels of interest and lower general motivation (Flake *et al.*, 2015). This means that if an individual perceives costs of taking part in an activity not to be too much at first glance, and takes part in an activity, the cost can

become too much at some point and the individual may possibly quit without completing the activity.

4. RESEARCH METHODS

In this chapter the research methods that were used are described. This thesis was conducted as a qualitative case study using semi-structured interviews. This chapter includes descriptions of the case study organization, qualitative research, data collection methods and how data analysis was performed.

4.1 Case study organization

This study was conducted as a case study, which is the most common qualitative method used in information systems (Orlikowski and Baroudi, 1991). Yin (2003) defines case study as *"an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident"*. Case studies typically focus on one, or a small number of cases at most, like companies or organizations, where chosen research methods are used to extract information from. Generally the goal of a case study is to create a thorough and detailed description of the case. (Ylikoski and Zahle, 2019). Case studies are fitting when the researched phenomenon is contemporary, has not been studied widely, there is a real life context involved, and the purpose of the study is to explain and describe the studied phenomenon. (Yin, 2003). As micro-credentials are not widely adopted, they can be considered as a contemporary phenomenon, which validates the fittingness of case study for this thesis.

The case organization for this thesis is The European Consortium of Innovative Universities (ECIU). ECIU is an alliance of European 12 universities that was founded in 1997 (ECIU, 2021a). ECIU has launched an EU-funded initiative for a European university, ECIU University, which plans to create an innovative educational model by offering opportunities for students, staff members and researchers of universities and for business and society (ECIU, 2021b). ECIU University currently offers many challenge-based learning opportunities and is developing innovative learning solutions. ECIU University also aims to be a leading force in micro-credentials movement and it is actively piloting and testing new technologies (ECIU, 2021c). One of the cases where new technologies are piloted is a micro-credential platform pilot project. This pilot project enabled tapping straight into the student body and studying their views on micro-credentials, while the adoption of digital credentials is still in its infancy, which makes ECIU University a fitting context for gathering data.

4.2   Data collection

The aim of this thesis was to investigate the intentions of higher education students to use micro-credentials. This research was conducted as a qualitative study. Qualitative research methods were created for studying social and cultural phenomena, and the purpose of the research methods is to gain understanding about people and different contexts. Sources of obtaining qualitative data include observation, participant observation, questionnaires, documents and texts, researcher's impressions, and interviews. (Myers, 1997).

Data was collected using semi-structured interviews, which, according to Myers and Newman (2007), is the most common type of interview in qualitative research in information systems research. In semi-structured interviews the interviewer has a list of questions and themes they are going to cover, but during the interview some questions can either be excluded or added in order to gather information that enables the answering of the research question. The order of the questions may also vary from interview to interview. The audio of a semi-structured interviews is also typically recorded. (Saunders, Lewis and Thornhill, 2009).

Interviews in general are a suitable data collection method when the research area in question is unknown and it is difficult for the interviewer to anticipate the directions of the answers will take. Interviews can also provide descriptive examples, unlike other data gathering methods, like surveys, for example. (Hirsjärvi and Hurme, 2008) Semi-structured interviews were chosen as the data collection method as they enable the interviewer to uncover reasons behind interviewees' answers (Saunders, Lewis and Thornhill, 2009), as it is possible ask the respondents to clarify their answers or explain their views (Hirsjärvi and Hurme, 2008), which will enrich the collected data (Saunders, Lewis and Thornhill, 2009). Semi-structured interviews are also suitable when questions of the interview are open-ended or complex (Saunders, Lewis and Thornhill, 2009), which both are true for this research: the topic at of the interviews, micro-credentials, was quite unfamiliar to the respondents and the majority of the questions were open-ended.

Self-selection sampling was used in recruiting respondents for the interviews. In self-selection sampling the research publicizes their need for interview subjects via an appropriate media or by asking potential subjects to take part. Self-selection sampling is used when research is just exploratory, and the sample does not need to be representative. (Saunders, Lewis and Thornhill, 2009)

As students with experience in micro-credentials were preferred for the study, an invitation to take part in the interviews was sent via email to all the students who had completed a master's degree level course, where micro-credentials were awarded for course completion. Eleven (57,9 %) of the respondents were recruited this way. As the research project had time restrictions and not enough respondents signed up from the course, more respondents were recruited via messages on message boards within the student community. The remaining eight (42,1 %) respondents were recruited this way. These eight respondents had not completed the above-mentioned course and had not received any micro-credentials.

Of the 19 respondents, two were women (10,5 %) and seventeen were men (89,5 %). The over-representation of men can result from the fact that early technology adopters tend to be male (YouGov, 2020). Sixteen (84,2 %) had a bachelor's degree and three (15,8 %) had an upper secondary school certificate and were currently working towards their bachelor's degree. Nine (47,4 %) of the respondents were between the age of 20 and 24, and ten (52,6 %) were between the age of 25 and 29, while the average age of the respondents was 24,5 years. All the respondents were students at Tampere University at the time of the interviews.

The interviews were conducted during February 2021 and on lasted from 33 to 75 minutes, average length being 49 minutes. The interviews were conducted remotely using Microsoft Teams, as remote working was recommended in Tampere university's COVID-19 guidelines during the time the research was conducted. The interviews were recorded with the respondent's permission and transcribed.

The interview structure and interview questions were based on EVT-based surveys used in studies of (Wigfield and Eccles, 2000) and Kosovich *et al.*, (2015). The survey items in these studies were adapted to formulate questions that enable investigating how useful, interesting, and important students perceive digital credentials, how students perceive their competences to use them, and what costs do they associate in using them. The interview structure is attached as appendix A.

The questions that were used in the interviews are attached as appendix A. The questions were adapted from the studies of Wigfield and Eccles (2000) and Kosovich *et al.* (2015) to examine how students perceived the usefulness, interest and importance of micro-credentials and their abilities of using and utilizing them.

Majority of the questions were open ended, but towards the end of the interview the respondents were asked to give indicative answers to questions, e.g. "How important are

micro-credentials to you, on a scale of 1 to 7?". These answers were asked as respondents had limited experience with micro-credentials (even the most experienced respondents only owned a single micro-credential) and because of this most of their answers were estimates. The answers clarified and helped summarize the respondents' answers, for example, the perceived usefulness of micro-credentials, as most of the time respondents contemplated things from multiple different viewpoints, and their stance was not always clear.

4.3   Data analysis

A standardized procedure for analyzing qualitative data does not currently exist, but the analysis process generally involves summarizing and categorizing data and producing well-grounded conclusions (Saunders, Lewis and Thornhill, 2009). This research's data analysis started with transcribing the interviews using the interview recordings. Once transcribing was ready, the summarization phase started. In this phase the respondents' answers are trimmed into a more condensed form, while preserving the answer's essential message. During the data summarization, main themes will start to arise from data and obvious relationships between themes can start to be identified. (Saunders, Lewis and Thornhill, 2009) Each interview transcript was gone examined and the answers were condensed and collected into a single document, where the answers were placed under each respective question to summarize them.

The next phase, categorizing, has two activities: developing categories and connecting these categories to pieces of data. Through these activities the relationships between categories start to become more recognizable and the categories can be revised if needed. The categories can either originate from the data or from a theoretical framework. (Saunders, Lewis and Thornhill, 2009) In this research the categories were originated from EVT: ability beliefs, expectancy beliefs, utility value, attainment value, intrinsic value and cost. The respondents' answers were categorized under these categories. Operationalized versions of the EVT constructs were created to make it easier to connect respondent's answers to EVT. Operationalized definitions helped in categorizing, as respondent's answers could be easier categorized, as the operationalized definitions were more practical, but still constant with the literature definitions. The categories which data was categorized into, the literature definitions of the categories, operationalized definitions and example unit of data are shown in Table 1 below.

Category	Literature definition (Eccles *et al.*, 1983; Eccles, 2005)	Operationalized definition	Example
Ability beliefs	Individual's perceptions of their current competence to complete an activity	Student's perceptions of his/her current competences to use micro-credentials	I believe I am better than most of my peers at using micro-credentials
Expectancy beliefs	Individual's perceptions of their future competence to complete an activity	Student's perceptions of his/her future competences to use micro-credentials	I think I am able to find a way to use micro-credentials to benefit myself in the future
Utility value	How useful the individual perceives completing an activity	Perceived usefulness of micro-credentials	Micro-credentials can help me get a job
Attainment value	How important the individual perceives an activity to be	How important micro-credentials are to the student	Micro-credentials are important to me
Intrinsic value	The enjoyment that participating in an activity brings or the interest towards the activity	The enjoyment experienced when using micro-credentials and/or interest towards micro-credentials	I enjoy receiving micro-credentials
Cost	Things that the individual has to give up to participate in an activity	The things that the student has to give up to use micro-credential	I don't think I have to put in too much effort to use micro-credentials compared to the value they provide

Table 1. List of codes applied to interviews

For example, ability beliefs refer to the individual's current perceptions of their competences to complete an activity. In this thesis' operationalized definition, the *"completing an activity"* mentioned in ability beliefs becomes *"using micro-credentials".*

When units of data were categorized, similar answers were grouped together, and important patterns started to become clearer.

5. RESULTS

In this chapter the results of the data analysis are discussed. The chapter is divided into subchapters based on constructs of expectancy-value theory.

5.1 Ability beliefs

Most of the respondents were confident in their abilities to use micro-credentials, seven even saying that they were very confident in their abilities. Only three respondents thought that their skills were average and two of the respondents thought that they had less than average skills. Rest of the respondents perceived themselves to be technologically able to use micro-credentials, but four of them mentioned that while they were confident in their abilities, they were not sure where they would use micro-credentials right now. One of these four respondents had this to say:

"I feel that I can use these myself and I have some visions what I could do with [micro-credentials]. But nothing concrete comes to my mind where I could use micro-credentials right now. I feel I have the skills, or that I would learn them if I needed to." – Fourth year male student A

Students were generally confident in their technological abilities to adopt and use the information systems where they would store their digital credentials and would share them from. The area where students felt less confident in their current abilities was using digital credentials to benefit them. The reasons respondents mentioned for this included that they currently do not have any digital credentials and that they were not sure where they could use digital credentials, as they are not too familiar with them, and did not think companies would appreciate singular digital credentials either.

5.2 Utility value

The most often mentioned situation to utilize micro-credentials was searching for work, like in the next example:

"I could imagine this would be useful when searching for a job. Job-hunting is what first comes to my mind." - Sixth year female student B

The next most expressed form of utility is that micro-credentials enable proving skills and knowledge. These were often related to offering proof of skills to a potential employer. Couple of respondents also felt that it was a benefit that you do not have to rate your

skills yourself. Few respondents thought that micro-credentials are especially useful when used in searching for work internationally, like one respondent mentioned:

"… and if you are searching for work globally, or you are working in a company which has global competition, you can prove that you have a competent degree or that you possess qualified competence." - Fifth year male student C

Being able to provide proof of skills and knowledge was also related to other situations where micro-credentials were perceived useful. Applying for exchange studies, further education and another major or master's program were among these situations:

"Applying for student exchange - that was agonizing, I had to come up with all sorts of files for them and ask for signatures and stuff. But If all my courses would go straight to the "European Standard form", I feel the process to apply for an exchange would have been much easier. The exchange destination university could verify my information more easily … you could also use [micro-credentials] when searching for work, or if you want to apply to a different master's program in another university." - Fourth year male student D

Transparency and descriptiveness of micro-credentials resonated with the respondents. By offering information about the learning outcomes and especially skills, respondents felt that micro-credentials enable self-development. Respondents perceived that micro-credentials would help them be more aware of their skills, help in planning what to study next and keep track of their skills:

"I feel that if you pull a transcript of studies from [national information system] the course doesn't… well it's just the name of the course. Here [in Europass] you have clearly separated what did you learn on the course. So if you want to keep track of what you have already learned, and I have noticed this myself, that if you categorize the information like it's categorized here [in Europass], it does help you long-term in utilizing the information. So you won't just forget about what was done on a course when it's finished. I think that's a useful utilization of this system. Especially if you could plan out what you want to learn. So, in a sense, you could keep track of what you are and what you want to be." - Sixth year female student B

Respondents also felt that the presented micro-credential gave a sufficient overview of the course it was awarded from. Micro-credentials were thought to offer value compared to current ways learning is recognized, because information that is spread among multiple different systems in currently used systems is held in one place in micro-credentials:

"There's always the trouble when you want to go look at your grade from a course and what affects it and where, because some of the information is in [national information

system], some of it is in Moodle and some is in PDF documents in Moodle. So of course, when all of the information is in one place it speeds up and simplifies working." - Third year male student E

The extent of information in the exhibited micro-credentials was also perceived to offer value compared to transcript of studies. They felt that some courses have ambiguous names that do not provide information about the contents of the said course. Respondents felt that their transcript of studies does not provide adequate information, as the only information concerning an individual course are the name and grade of the course and the amount of ECTS:

"… you can't see what is included on a course from a transcript of studies, only thing visible is the name of the course and the grade. At least from this you can see that more clearly … an employer can't have a picture of the course based on the name, because they don't know what is included. For example, something like "Development 1": The name does not say what programming language was used. So, in those cases [micro-credentials] would be useful." – Fourth year male student F

Respondents also pointed out that employers rarely ask for transcript of studies, but one also noted that micro-credentials could be something that employers might be interested in:

"Nobody asks for your transcript of studies, but maybe [micro-credentials] would be more meaningful to look at, as there is information besides just the name of the course." – Sixth year female student G

Respondents also noted aspects that negatively affected the utility value of micro-credentials. They felt that micro-credentials need to be widely used in society and recognized and appreciated by employers for micro-credentials to be useful:

"On the other hand, they won't help in searching for work if companies and others don't know about them." – Fourth year male student A

"In job-hunting, [micro-credentials] would need to be generally used, but then I think they would be useful." - Sixth year female student G

Some of the respondents also pointed out they would like to receive micro-credentials of all of their courses to maximize the potential value of micro-credentials, so that they could use the micro-credentials to accurately showcase all of their competences:

"You would need to have them all in the same place. If there are only a few courses sharing, sharing them won't bring any benefits." – Third year male student H

5.3 Attainment value

Overall respondents did not feel micro-credentials were important to them. The reasons were varied. Some respondents said the micro-credentials were not important because they felt that nobody uses them, while some said the reason was that they currently did not have any. Two respondents felt that micro-credentials were not important for them because of their current situation: they were almost done with their studies and they were currently employed. Couple of respondents said that they felt somewhat neutral about micro-credentials. Two respondents said that micro-credentials were sort of important to them, as they see the potential of micro-credentials.

Some respondents did clarify that micro-credentials would be more important to them if they were more widely accepted and used or that if they had received micro-credentials from all the courses they had completed in university. Two respondents even mentioned that they would consider micro-credentials very important to them if they had a wide array of them.

Nine/almost half of the respondents also felt that finding out that a completing a course would award them a micro-credential would not affect their learning motivation: nine respondents said that if that if they were told that they would receive a micro-credential from a course, it would not affect their learning motivation at all.

Two respondents said it would increase their learning motivation and four respondents said that the effect on their learning motivation would also depend on the subject of the course.

5.4 Intrinsic value

There were only a few extreme cases of either very low or very high intrinsic value. Most of the respondents' answers were fairly neutral but tended to lean more towards interest than disinterest. There were only a few students who expressed high intrinsic value:

"It would be exciting to see that where I am currently with the skills I have and that I could be on a path where I would like to go, if I just obtained certain skills. It would make it easy to be aware of what skills I need." – Sixth year male student I

"Well, it's nice to see how [digital credentials] will develop. … New technologies are always welcome in these sorts of things. I'd almost call myself an early adopter, maybe a bit after them" – Fourth year male student F

Then again, there were four students who had a low intrinsic value. Only one of these respondents expressed a value of 1, other three respondents rated their intrinsic value

as a 3, so almost neutral. The one respondent who had very low intrinsic value had this to say:

"[Micro-credentials] don't bring me any enjoyment. They wouldn't excite me to jump to a computer with my fingers itching, and be like "yeah, micro-credentials! I'd rate my interest at one. If I have some micro-credentials, then that's nice, but that's it." - Third year male student J

5.5 Expectancy beliefs

Overall, the respondents were confident or very confident in their future abilities. None of the respondents rated their future capabilities as low, and only four respondents gave themselves a rating of four. The rest of the respondents all gave themselves ratings that can be considered as high. Most of these respondents were confident that when micro-credentials have gained popularity the systems will be so well designed that they are very easy to use:

"In the long run I think using the system would be made so easy that it wouldn't differ from using the systems we have today. So, I would say it would not be limited by technological capabilities, at least not in Finland, or anywhere in Europe either." – Fourth year male student D

Some respondents talked about other aspects than technological abilities that might affect how well they will use micro-credentials in the future:

"I'd say a six. The reason why it's not a seven is my own general motivation … maybe my personal motivation is not the best." – Sixth year female student B

"There's everything else than just technological know-how … Let's take making a CV for example: I have all the tools in the world available to me, but my CV still isn't the world's best. Maybe I'm sort of a lazy person, so I wouldn't be a world champion in using micro-credentials either." – Fourth year male student K

"This isn't hard. Only thing that would cause difficulties would be finding places, where micro-credentials could be utilized. I think that'd be hard." – Sixth year male student M

5.6 Cost beliefs

All but two respondents felt that the cost of using micro-credentials was small compared to the value micro-credentials can bring. One of these respondents explained how they perceive the process of starting to use micro-credentials:

"Right now, it feels like a burden, because information is spread to so many places and you would have to amass it from so many places." – Sixth year male student M

This respondent also said that because micro-credential is not self-explanatory as term, getting to know what they are and how to use them will take some time. The other respondent who had reservations about the costs of micro-credentials had had some bad experiences with online certifications and explained his view:

"… it depends how well the system is built. I have completed two certifications, and obtaining the other badge was very painful, the whole process of creating an account and logging in was difficult somehow. Then these two certifications are in different services and I don't even remember what they are… there should be just one provider of micro-credentials, so that the [micro-credentials] would not be divided, because they lose value if they are exclusive [to a certain service]. I am maybe a little skeptical…" - Sixth year male student N

The most usual resource that respondents felt using micro-credentials required was time. All respondents, except the two are quoted above, estimated that using micro-credentials would not take too much time as long as the system is developed properly, though.

The bother of having to start using another system was mentioned by two different respondents, who felt that they already have to use too many different platforms.

One of the platforms that respondents could try out before the interview did require them to install a plugin to their browser, which did irritate the respondents. This platforms implementation process was also perceived as painstaking by the respondents who had completed the process.

Two respondents emphasized the ease of use. They said that they would be likely to abandon the system if it is not simple to use, or if they face any problems when using it.

5.7 Summary

All respondents perceived their current and future abilities to be either high or moderate, so the competences of using micro-credentials are not likely to impede the adoption of micro-credentials. Majority of respondents felt that they would not have to use too much of their time and effort to use micro-credentials. Respondents were trustful that when micro-credential systems are developed and available for use, they will be easy to use. This suggests that the cost of using micro-credentials will not impede micro-credential adoption either. User-friendliness of the future system should still not be overlooked, as people will value activities, like using micro-credentials, with positive memories if they

think they can succeed in using with appropriate levels of effort and vice versa(Eccles and Harold, 1991).

Of all the constructs of EVT, utility values varied most among respondents. Short-term utility value was generally perceived as lower than long-term utility value. Respondents did perceive the potential value that micro-credentials can offer but felt that the value of micro-credentials will be higher in the future. There were only two respondents who perceived micro-credentials long-term utility value as low. Both of them stated that the reason for this was that they were almost done with their studies and were currently employed full-time.

18 of the 19 respondents had low or medium attainment values. This means that the respondents did not feel that micro-credentials were especially important to them. This is an interesting finding, since utility value of micro-credentials did not mirror the levels of attainment value. Most often stated reason for unimportance of micro-credentials were that companies and thus potential employers are not aware or appreciative of micro-credentials, or that the respondents cannot portray their whole portfolio of competence and knowledge with micro-credentials. On the bright side, this means that attainment values of the students should improve once they start receiving more micro-credentials and companies start to become more aware of micro-credentials.

Intrinsic values were mostly moderate, apart from five cases of high intrinsic value and one low. Micro-credentials were generally deemed as interesting, which bodes well for micro-credentials. Promising levels of intrinsic value suggest that future marketing of micro-credentials does not have to focus on getting higher education students interested in micro-credentials as an idea but can instead focus on ensuring the students of the value they provide.

6. DISCUSSION

This thesis proposed to answer the main research question: *do higher education students perceive micro-credentials offer value to them*? To answer this question, data was gathered through interviewing higher education students and examining the results by using the EVT framework. Based on gathered data, the next section describes how competency beliefs and value beliefs affect higher education students' intentions to use micro-credentials.

6.1 Value of digital credentials

The results of the interviews are summarized in Table 2. Numerical values that the respondents provided were categorized to low, moderate, and high, to allow for easier pattern recognition. Several important patterns found in the data are highlighted in the figure. As shown in ability belief and expectancy belief columns of Table 2, students feel that they possess the necessary skills to start using micro-credentials now and in the future.

Respondent	Ability belief		Utility value		Attainment value		Intrinsic value	Expectancy belief	Cost
	Self	Compared to peers	Short-term	Long-term	Self	Compared to other activities			
A	MOD	MOD	MOD	MOD	LOW	LOW	MOD	MOD	MOD
B	MOD	MOD	HIGH	HIGH	MOD	MOD	MOD	HIGH	HIGH
C	MOD	MOD	MOD	HIGH	MOD	MOD	MOD	MOD	MOD
D	HIGH	HIGH	LOW	HIGH	MOD	LOW	HIGH	HIGH	HIGH
E	HIGH	MOD	MOD	HIGH	LOW	LOW	MOD	MOD	HIGH
F	HIGH	MOD	MOD	MOD	HIGH	LOW	HIGH	MOD	HIGH
G	HIGH	MOD	MOD	MOD	MOD	LOW	MOD	MOD	MOD
H	MOD	MOD	MOD	HIGH	LOW	LOW	MOD	MOD	HIGH
I	HIGH	HIGH	HIGH	HIGH	MOD	MOD	HIGH	HIGH	HIGH
J	MOD	MOD	MOD	MOD	LOW	MOD	LOW	MOD	HIGH
K	HIGH	HIGH	MOD	MOD	MOD	LOW	MOD	MOD	HIGH
L	HIGH	MOD	LOW	LOW	LOW	LOW	MOD	MOD	HIGH
M	HIGH	HIGH	MOD	MOD	MOD	LOW	MOD	MOD	MOD
N	HIGH	HIGH	MOD	LOW	LOW	LOW	MOD	MOD	MOD
O	MOD	MOD	LOW	MOD	LOW	LOW	MOD	MOD	HIGH
P	MOD	MOD	LOW	MOD	LOW	LOW	MOD	MOD	HIGH
Q	HIGH	HIGH	MOD	HIGH	MOD	MOD	HIGH	HIGH	HIGH
R	HIGH	MOD	MOD	HIGH	MOD	LOW	MOD	HIGH	HIGH
S	MOD	MOD	HIGH	HIGH	MOD	MOD	HIGH	HIGH	HIGH

Table 2. Respondent's perceived competence and value beliefs

It can also be seen that the costs of using micro-credentials are not perceived to be too high compared to the value that micro-credentials offer.

Intrinsic values show that students generally had at least moderate levels of enjoyment or interest towards micro-credentials. The low and moderate attainment values mean that students did not currently feel that micro-credentials were important to them. The reason was that even though the students recognized different ways micro-credentials can benefit them, they felt that the benefits are not going to be realized anytime soon, as micro-credentials are not generally well-known or valued by industries and companies. This is can also be seen in the utility value columns, where long-term utility values are the same or higher than short-term value for all except one respondent, as the awareness is expected to rise in the future.

Figure 3 presents the findings of this thesis. To summarize, based on the gathered data higher education students felt confident in their abilities to use micro-credentials now and in the future, found short-term and long-term ways that micro-credentials can benefit them, found micro-credentials at least moderately interesting, and did not think the cost of using micro-credentials was too high. Some factors were perceived as limiting the value of digital credentials though.
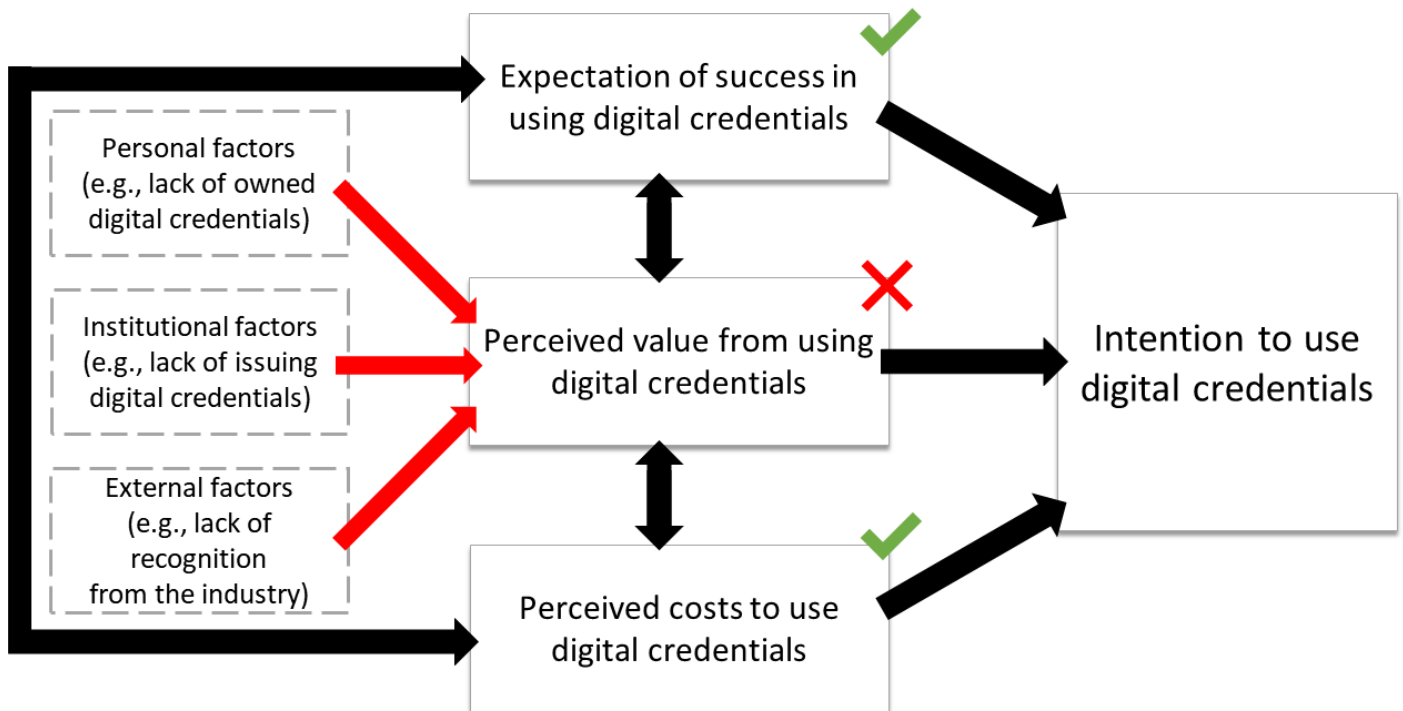

Figure 3. EVT constructs and their effect on higher education students' intentions to use digital credentials.

The positive findings about expectations of success and perceived costs are also important. Expectations of success are assumed to directly influence choices to take part in activities (Eccles and Wigfield, 2002), which means that the students' expectancies are likely not going to be a obstructive factor of digital credential adoption. Same can be said about the perceived costs, as high perceived costs can discourage individuals from taking part in an activity (Barron and Hulleman, 2015), while low perceived costs can therefore encourage taking part in an activity.

The findings about utility value concur with literature. According to Kato, Galán-Muros and Weko (2020) the most important motivating factors about digital credentials for students are acquiring and verifying competences and students value digital credentials because of their work-related benefits. This was reflected in the findings about utility value, as the most often mentioned use case for digital credentials was searching for work and using digital credentials to prove skills and knowledge was the second most mentioned use case. These findings are supported also by Oliver (2019), who posits that digital credentials that lead to work opportunities will offer the most value. Therefore, the following is proposed:

Proposition 1: Higher education students perceive digital credentials create value in work-related situations and as a way of verifying their skills and competences.

Low attainment value levels were said to be caused by general unfamiliarity with digital credentials, as students felt that potential employers would not trust digital credentials, as they are not as established as transcripts of studies, for example. This finding is supported by Kato, Galán-Muros and Weko (2020) who also note that the before-mentioned reason restricts the impact of digital credentials.

Higher education students' current intentions to start using micro-credentials could be characterized as uncertain, like shown in Figure 3. This is believed to be the cause of current perceived value of digital credentials, which is weakened by different factors. The findings suggest that three different factors currently diminish the value of digital credentials: personal, institutional, and external. Personal factors consist of students lack of owned digital credentials. Students said that the digital credentials' value is reduced because they cannot present their whole array of competences with digital credentials due to lack of them. Lack of institutions awarding digital credentials to students, i.e., Institutional factors, also diminishes the value of digital credentials. Lastly and most importantly, external factors also decrease the value of digital credentials. Students perceived that if industry is not aware of digital credentials and does not appreciate them, that greatly diminishes the value of digital credentials, as the most useful application of

digital credentials was in searching for work. When industry's recognition and appreciation of digital credentials improves, students are likely to start perceiving the value offered by digital credentials as higher, and the adoption rate will increase. Hence, the following is proposed:

Proposition 2: Higher education students' perceived value of digital credentials depends on the industry's level of recognition and appreciation of digital credentials.

6.2   Theoretical contributions

First, this thesis provided the expectancy-value-cost model of digital credentials. The model clarifies how the perceived competence to use digital credentials, the perceived value of using digital credentials and the cost of using digital credentials relate to each other and the intention to use digital credentials. The value of digital credentials for higher education students seems to depend on level which industry recognizes and appreciates digital credentials.

This is the also first study to examine in detail how students view micro-credentials, and more specifically digital credentials. There have been studies which have been more pragmatic, e.g. the study of Hollands and Kazi (2019), and studies where students have been interviewed about micro-credentials, e.g. the study of Ghasia et al.(2019) but no studies where students' perceptions and competences were the main target of investigation could be located. This thesis provides in-depth information about how higher education students perceive their competences to use digital credentials, how they perceive the value digital credentials can offer and what they must give up in order to use digital credentials. This thesis also uncovered that industry's unfamiliarity with digital credentials can slow down the adoption of digital credentials among higher education students, as the value of digital credentials is tied to the level which industry recognizes and appreciates digital credentials.

Second, this thesis specified which factors create value for higher education students and enable adoption, while at the same time empirically confirming value creating factors from literature. Students are not yet adopting micro-credentials in masses, and this could be result of the uncertainty of the benefits of digital credentials (Oliver, 2019), which makes students' perceptions of digital credentials an important area of research, as they must be desirable to students in order for them to scale. Applications that are perceived by users to offer high value from the beginning are adopted more rapidly than applications which are perceived to offer low value. In addition, the latter are not likely to gain

widespread adoption, even during a long period of time. (Jurison, 2000) Students perceived that digital credentials can create value for them in multiple different ways, from searching for work, proving skills and knowledge, applying for further education or exchange studies, to planning studies, tracking skills and self-development. The very essence of micro-credentials, transparency plays a major role in all of these use cases, as most of the time the transparency of the information is the factor that enables these benefits. Knowing what kind of value micro-credentials can bring students and what they find most important is necessary to efficiently communicate the benefits to the students and motivate them to adopt micro-credentials.

This thesis also points out the importance of other actors than higher education institutions and students. The current lack of awareness of digital credentials within industries and companies is decelerating the adoption of micro-credentials, as students, the main user group, do not perceive digital credentials as useful or worthwhile as they are not recognized by the industry. This finding complies with the study of Davis and Singh (2015), who studied high school students attitudes towards digital badges. They also came to the conclusion that in order for students to be able to prove their competences to audiences outside the school, like employers, employers need to be aware and recognize the validity of the badges.

Fourth contribution of this thesis are the propositions. As digital credential adoption is still in its early stages, these propositions support the further research and help guide the following research to focus on critical areas.

6.3 Practical contribution

This thesis provides practical contributions for higher education institutions, the digital credentials movement and digital credential platform providers. The results of this research highlight the challenge which has already been recognized by the European Commission (ECIU, 2021c): awareness of micro-credentials needs to be improved, as the lack of awareness decreases the value of digital credentials in the eyes of higher education students. The low value of digital credential in turn slows down the adoption rate and may even decrease the total width of adoption.

To improve the attainment value of digital credentials, higher education institutions should aim to increase awareness of digital credentials within industry. This could be done by awarding more digital credentials to higher education students (for example for all the courses they complete) and officially verifying them as being awarded by the in-

stitution. Verifying the credential by the institution would undoubtedly increase their trustworthiness in the eyes of companies, which in turn would increase the digital credentials' importance in the eyes of the students. Higher education institutions could also include companies in creation or revision of courses that are going to reward digital credentials and that are related to the companies' field. This could be a way to jumpstart companies' involvement in digital credentials, as they would be more invested in them. They could find a way to recruit people who have the skills relevant for them, as they could have a say in what the curriculum contains and could help in designing the assessment methods which ensures that the digital credential receivers possess the competences the credential states.

Digital credential movement should focus on spreading awareness about digital credentials in industry. Another step to take would be to work towards developing a standard system that would make digital credentials easier to trust, and thus easier to start appreciating, in the eyes of companies.

Based on the findings digital credential platform providers should focus on making sure digital credentials will look attractive to companies and higher education students. This could be done by focusing on ensuring that the credentials can be verified emphasizing the earned skills and what was done to assess them to ensure value to both companies and students.

6.4   Research limitations and future research topics

As with all research, this thesis also had its limitations. The number of interviewed students can be considered relatively small, which limits the generalizability of the results. This limitation was however not too serious, as the purpose of the study was exploratory, and the research was qualitative in nature. Future research could use larger sample sizes to validate the findings of this research to see if they can be generalized.

Respondents' levels of familiarity with digital credentials varied, but all the respondents were briefed at the start of every interview to make sure they had sufficient knowledge regarding micro-credentials.

As digital credentials are still not widely adopted and self-selection sampling was used in this thesis, it is possible that the respondents who signed up to be interviewed only represent the early adopters and their views on digital credentials. This could be dismissed in future research if a similar study is repeated and different kind of sampling is used, or when digital credentials have gained more maturity and are more widely

adopted. This limitation was not deemed too severe for at this time, as width of adoption is still low and not many students signed up to be interviewed.

This thesis provides multiple topics of future research. Future research could examine employers' levels of recognition and appreciation of digital credentials, as it seems to slow down the adoption of digital credentials. Research could also focus on what kind of digital credentials bring the most value to employers and finding out do employers value digital credentials that verify hard skills higher than digital credentials that verify soft skills. Overall digital credential research is still in its infancy and could benefit a lot from more research as a field. Empirically confirming things propositions of literature on digital credentials could be beneficial.

This thesis provides insights on what kind of value do higher education students perceive digital credential offer them, and what kind of factors affect this value. Micro-credentials have the potential to challenge or complement traditional ways of how learning is recognized, and hopefully this thesis helps advance the micro-credential movement.

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APPENDIX A: INTERVIEW STRUCTURE

Interview questions:

- Who would you consider sharing your credentials with?

- Does such a system add value to you in comparison to current way how learning is recognized?

- Would receiving a digital credential from a course affect your learning motivation?

- How good would you say you are implementing and utilizing micro-credentials?

- If you were to list, for example, all the students in your study program from the worst to the best in utilizing micro-credentials, where would you position yourself?

- In general, how useful are micro-credentials for you? What kind of short or long-term goals could micro-credentials help you fulfill? How do you they do that?

- How can micro-credentials benefit you?

- How important are micro-credentials to you? How important is it to you to utilize micro-credentials?

- Compared to your other activities, how important are micro-credentials and their utilization to you?

- Do you enjoy obtaining, implementing, and using micro-credentials or do you find it interesting?

- How well do you expect to do in using and utilizing micro-credentials in the future?

- Can you think of any barriers that block or disturb implementing or using micro-credentials?

- How much time do you think it requires for you to start using micro-credentials?

- Does implementing and/or using micro-credentials require something else from you besides time?