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The Impact of Digital Literacy and Information Literacy on the Intention to use Digital Technologies for Learning

– A Quantitative Study Utilizing the Unified Theory of Acceptance and Use of Technology

Master's Thesis in Information Systems
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Faculty of Social Sciences, Business and Economics
Åbo Akademi University
Turku 2019

ABSTRACT

ÅBO AKADEMI UNIVERSITY
FACULTY OF SOCIAL SCIENCES AND ECONOMICS

Subject: Information Systems

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Language: English

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Abstract: Our society is undergoing a digital transformation extending to various areas in life. One of these areas is digital technologies in learning environments, such as those utilized in universities. As new technologies and tools are rapidly emerging, educational institutions are exposed to new digital applications and tools for teaching and learning. Simultaneously, new dimensions of literacy have surfaced, yet their relationship with the usage of digital technologies in an educational context has not seen much exploration. Thus, the aim of this thesis is to investigate the impact of digital literacy and information literacy on the intention to use digital technologies for learning. Built upon prior digital- and information literacy literature as well as the Unified Theory of Acceptance and Use of Technology 2 framework, a new conceptual model is presented and tested with the results of 249 participants. The model is analyzed through partial least square structural equation modeling.

The findings indicate that digital literacy has more of an impact on the intention to use digital technologies for learning than information literacy. A significant relationship was found between digital literacy and the intention to use digital technologies for learning. However, this was not the case with information literacy. A mediation analysis was also conducted, where the results show that the relationship between digital literacy and intention to use digital technologies for learning is partially mediated by habit and performance expectancy. Furthermore, a multi-group analysis was performed, where age, gender and levels of proficiency were used as mediators, and some group differences were identified. This study concludes that digital literacy has a positive impact on individuals' intention to use digital technologies for learning purposes, whereas the same could not be said for information literacy and the intention to use digital technologies for learning.

Keywords: digital immigrants, digital learning, digital literacy, digital natives, digital technology, information literacy, UTAUT, UTAUT2

Date: 16.11.2019 | **Number of pages:** VIII + 79 + 1 appendix

ACKNOWLEDGEMENT

This thesis is written as a part of the Impact of Information Literacy in the Digital Workplace (DiWIL) project at the faculty of Social Sciences and Economics at Åbo Akademi University. The project was funded by the Academy of Finland. I would like to thank my supervisor Dr. Shahrokh Nikou for giving me the chance to partake in this project and for providing invaluable support and insight during the process of writing this thesis. The motivation and inspiration I received led me to aspire a career in academia.

I would also like to thank my colleagues, Suellen Cavalheiro, Thao Orrensalo, Matin Mahboob and Sanaz Soltani, for their advice and the intriguing discussions we had during our time working on the DiWIL project. I am sincerely grateful for our time together and I would consider myself lucky to get the chance to work with them again in the future.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ALA	American Library Association
APA	American Psychological Association
BI	Behavioral Intention
CB-SEM	Covariance-Based Structural Equation Modeling
CI	Continuance Intention
CFA	Confirmatory Factor Analysis
DL	Digital Literacy
DLE	Digital Learning Environment
DOI	Diffusion of Innovation
EE	Effort Expectancy
FC	Facilitating Conditions
HM	Hedonic Motivation
HT	Habit
ICT	Information and Communications Technology
IDT	Innovation Diffusion Theory
IL	Information Literacy
MGA	Multi-Group Analysis
MM	Motivational Model
MPCU	Model of PC Utilization
PE	Performance Expectancy
IN	Intention
IS	Information Systems
ISI	Individual Social Influence
OS	Organization Support
PLS-SEM	Partial Least Squares Structural Equation Modeling
PV	Price Value
SCT	Social Cognitive Theory
SEM	Structural Equation Modeling
SI	Social Influence
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UB	User Behavior
UTAUT	Unified Theory of Acceptance and Use of Technology

1 INTRODUCTION

Our society is undergoing a digital transformation extending to various areas of life. One of these areas is digital technologies in learning environments, such as those utilized at universities. As new technologies and tools are rapidly emerging, educational institutions and in particular universities are exposed to new digital applications and tools for teaching and learning. Lecturers and students are experimenting with software, applications, cloud services and other online tools such as Moodle, Kahoot, various productivity suites and social media. The tasks executed through these digital applications and tools require a high level of literacy above the traditional sense of reading and writing.

As mentioned by Nikou, Brännback and Widén (2018), new dimensions of literacy have surfaced, which have, in turn, introduced a revolution in the use and effects of literacy. An example of this would be digital literacy, which encompasses the abilities related to technical, cognitive and socio-emotional literacy capabilities (Eshet-Alkalai, 2004). The importance of multi dimensions of the literacy is more prominent than ever before, considering the following statement by Warschauer (2007): "Though the need for information literacy pre-dates the digital era, its importance has now greatly expanded in a world where vast amounts of unfiltered data are available online" (p. 42).

In contrast to predigital environments, which have been limited by how resources were created and distributed (Hill & Hannafin, 2001), the current available digital tools and technologies are fostering a new way of utilizing resources. Due to this change, educational settings are developing and the educational resources have experienced a metamorphosis fueled by the exponential growth of information systems (Hill & Hannafin, 2001). Naturally, even informal learning is undergoing changes. The future of learning is digital, and the swift diffusion of the new technologies will have a wide impact on the nature of learning and literacy (Warschauer, 2007). The exponential growth of digital development is highlighted by the fact that "elementary school students with laptop computers and high-speed Internet connections have greater information and communication resources at their disposal then [sic] any scholar in the world of a half-century ago" (Warschauer, 2007, p. 45).

1.1 Background

Given that digitalization is impacting several aspects of daily life, education and educational institutions are facing ongoing challenges. As mentioned by Peters (2000), learning experts are not in consensus regarding the nature of learning and therefore the questions surrounding the necessary reforms in relation to teaching and learning. Digitalization of education and learning may be praised by some and questioned by others, but as mentioned by Cooper (2006), "educators have always searched for ways to make learning more efficient and more enjoyable. The marriage between the schools and the computer technology was a natural" (p. 322-323). This union of education and technology is backed up by Laakso, Kurvinen, Enges-Pyykönen and Kaila (2018) as they argue that the use of technology in teaching has shifted, as it is no longer "an additional game or entertainment" (p. 696), but rather possesses a meaningful role just as exercise books used in traditional teaching.

The benefits of digitalization are wide-ranging, enabling new ways to approach learning, teaching, collaboration and assessment. In order to harness these benefits, however, users of digital tools will face new challenges, requirements and even obstacles. Different types of literacy are an example of this, as current and emerging digital environments demand an array of skills in relation to cognitive, technical and sociological factors (Eshet-Alkalai, 2004). These skills are vital, considering that the mere availability of technology applications will not assure that users will learn from the interaction (Huang, Hood & Yoo, 2013), although there have been studies which indicate that the ownership of a computer has led to considerable advantages on academic test scores (for more, see Cooper, 2006).

Simply put, digital literacy can be characterized as a survival skill in our digital era (Eshet-Alkalai, 2004). The need for this survival skill is highlighted by the argument that information systems (IS) are becoming progressively user centered, and they are demanding more from the user in terms of context-driven and individualized learnings skills (Hill & Hannafin, 2001). These demands are not easily disregarded, considering that "few classrooms in western society would consider education complete if they did not teach at least some of their lessons through the medium of modern computer programmes" (Cooper, 2006, p. 320).

The increasing importance of literacy, however, is not the only issue in need of attention. As new technologies emerge, the adoption and usage of them is naturally a topic of interest. Since the development of consumer technologies began taking off, scholars have been researching consumer behavior and intentions, which has led to different frameworks and theories. These theories have traditionally incorporated constructs relating to attitudes, perceptions, expectations, external opinions, ease or difficulty. However, there remains room for the inclusion of different dimensions of literacy within the technology behavior theories.

1.2 Research gap

Although some research has been conducted on the connections between different types of literacy and usage of digital technology (Eshet-Alkalai, 2004; Glister, 1997, Nikou et al., 2018), there remains a need for a closer examination of the effects that digital literacy and information literacy can have on variables that have been empirically proven to influence individuals intentions regarding technology, and how this in turn can impact the intention to use digital tools for learning purposes. Learning purposes refers here not only to formal learning activities within educational settings, but also informal learning which individuals partake in. Therefore, this thesis intends to explore the relationships of digital literacy and information literacy in the context of digital learning, while incorporating empirically validated frameworks for technology behavior.

1.3 Objectives and purpose

The main objective of this thesis is to assess the impact of digital literacy and information literacy on the usage of digital technologies in the context of learning, e.g., in a university setting. This thesis explores both the literacies direct impacts on intention as well as their indirect impact through empirically validated constructs which have been shown to affect intention to use technologies. In order to foster lifelong learning and the utilization of digital technologies in sustainable ways, groups such as users, teachers and policymakers need to possess an understanding of the past and contemporary issues surrounding digital literacy.

This thesis also aims to obtain and provide insight for the relevant literature. The contribution of this thesis could also be of interest for organizations that work with the

design of digital tools meant to be used for educational purposes. In addition to this, the knowledge gained could also help bridge the digital divide between digital natives and digital immigrants, as those who were born into the digital world can have different ways of using technologies for learning compared to those who might have to learn the technologies themselves before being able to use them for learning other things.

1.4 Research questions

According to Bryman and Bell (2011), research questions should be clear, researchable, connected to established theory, as well as linked to each other. In addition, the questions should neither be too broad nor narrow, and they should have potential for contributing to prior knowledge (Bryman & Bell, 2011). In order to meet the objectives of this thesis, the following research questions have been devised:

- **RQ1:** Does digital literacy affect the intention to use digital technologies for learning purposes, and if so, through what mediators?
- **RQ2:** Does information literacy affect the intention to use digital technologies for learning purposes, and if so, through what mediators?

1.5 Methodological approach

In order to assess the objectives and research questions mentioned above, the research of this thesis is conducted through a quantitative research approach. With regard to previous research and relevant constructs, a conceptual model is developed to examine the impact of digital literacy and information on the intention to use digital technologies for learning. The conceptual model and the chosen constructs function as a foundation for the hypothesis development.

The empirical data used in this thesis is collected with an online survey questionnaire. The purpose of this study is briefly explained to the respondents, after which they are requested to participate by answering a set of questions developed with the conceptual model in mind. The survey is composed of questions regarding participant background information as well as questions derived from empirically tested theories of prior technology behavior research. The question items used to build the conceptual model are to be answered with a Likert-type scale. The distribution of the survey questionnaire is

conducted through several channels utilizing a combination of private links, a public link and flyers in order to target both university students and university employees.

The gathered data is then analyzed through a descriptive analysis as well as structural equation modeling in order to assess the hypothesized relationships of the suggested conceptual model. The methodological approach will be further discussed in Chapter 4.

1.6 Expected results and contribution

As the different aspects of digital literacy and information literacy have connections to individual's self-efficacy, it is to be expected that a higher perception of one's own literacy levels has a positive effect on the intention to use digital technologies for learning purposes. Regarding the chosen constructs that reflect an individual's expectations, it is to be expected that positive perceptions regarding performance, effort, hedonic motivation and habit can have positive effects on the individual's intentions to use digital technologies for learning purposes.

This study contributes to, and expands the existing literature of digital literacy. This thesis aims to develop a comprehensive conceptual model that encompasses the impact of both literacy and perceptions of performance, effort, hedonic motivation and habit to help gain insight in how digital technologies are being perceived in a learning context, and how they could therefore be further developed with current issues in mind. As mentioned earlier, the knowledge provided by this thesis could be of interest for groups such as users, teachers and policymakers, as well as those conducting further research on the topic.

1.7 Structure of the thesis

This thesis unfolds as follows. First, followed by this introduction, a literature review starts with an introduction of literacy as a concept (Section 2.1). This is further expanded upon through a dive into two specific dimensions of literacy: information literacy (Section 2.1.1) and digital literacy (Section 2.1.2). The literature review then goes on to discuss digital technologies (Section 2.2), touching on hardware and software (Section 2.2.1), the Internet and some usage statistics in Finland (Section 2.2.2). The chapter continues on to discuss digital learning and the possibilities enabled by modern technology (Section 2.3), while glancing at formal and informal learning, digital learning environments and differences between digital immigrants and digital natives.

Subsequently, an overview of the theoretical background is presented through an introduction of prior frameworks and models (Section 3.1) related to the topic of the thesis. The overview of past theories then leads to a closer examination of the unified theory of acceptance and use of technology (Section 3.1.1) and its successor (Section 3.1.2), finally followed by further implementations of the model in a variety of research topics, including a glance at a model where digital literacy has been incorporated in to some constructs of the framework (Section 3.1.3). The end of this chapter discusses the hypothesis development (Section 3.2) which is accompanied by the introduction of a conceptual model (Section 3.3).

Following the theoretical background, the methodology chapter describes the chosen method used for data collection and analysis. The quantitative and qualitative approaches are compared and contrasted (Section 4.1 and 4.2) as a means to motivate the decision to carry out a quantitative study (Section 4.3) in order to research the subject of this thesis. Alternative approaches are also touched on (Section 4.4), as well as ethical considerations (Section 4.5). The main focus of the methodology chapter, however, is to discuss the application of the chosen method (Section 4.6), including survey design, data collection (Section 4.7) and plans for data analysis (Section 4.8).

The data analysis is further discussed in the following results and analysis chapter. This chapter presents the results of the conducted research, as the gathered data are introduced through a descriptive analysis (Section 0), followed by measurement model results (Section 5.2) and structural model results (Section 5.3). A multi-group analysis (Section 5.4) and mediation analysis (Section 5.5) are also introduced in this chapter, as well as some qualitative insights (Section 5.6). Finally, a discussion is presented, including main findings (Section 6.1), conclusions (Section 6.2), theoretical contribution and practical implications (Section 6.3 and 6.4), limitations and future research suggestions (Section 6.5). A Swedish summary is also included in the end of the thesis.

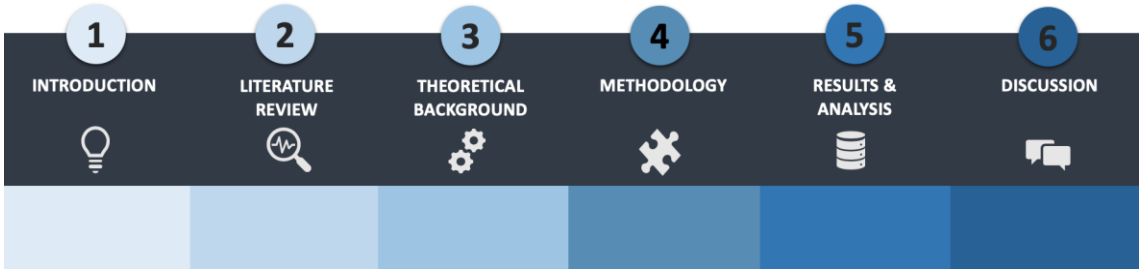


Figure 1. Structure of the thesis

2 LITERATURE REVIEW

This chapter presents an introduction of the existing literature and prior research regarding information literacy and digital literacy, followed by a dive into digital technologies and digital learning. Both formal and informal learning are addressed as the possibilities of digital learning are discussed.

2.1 Literacy as a concept

The concept of literacy has traditionally been used to refer to abilities in relation to reading and writing. These abilities are taught through the educational system; they are present in daily activities and used as a measurement for a population's level of education. The significance of literacy is meaningful, as it not only empowers people and enables them to take part in and contribute to society, but also decreases poverty and creates more life opportunities (UNESCO, 2019). Literacy is therefore a powerful concept, as it encompasses a variety of pivotal skills and abilities. A comprehensive definition of the term is presented by the American Library Association (ALA) which adopted the definition from the Organisation for Economic Co-operation and Development Programme for the International Assessment of Adult Competencies:

> *Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society (American Library Association, 2019).*

With time, the concept of literacy has, however, evolved, and thus, it no longer only refers to the conventional definition of reading and writing. In the present climate, literacy can be thought of as "a means of identification, understanding, interpretation, creation, and communication in an increasingly digital, text-mediated, information-rich and fast-changing world" (UNESCO, 2019). Given the technological developments of past decades, it is only natural that the concept of literacy is taking new forms. New terms and dimensions have surfaced, such as information literacy (e.g., Eisenberg, 2008; Lloyd,

2006), media literacy (e.g., Livingstone, 2004; Potter & Christ, 2007), ICT literacy (e.g., ICTL Panel, 2002; Katz & Macklin, 2007) and, of course, digital literacy (e.g., Eshet-Alkalai, 2004; Ng, 2012). This thesis will focus on two of these dimensions; information literacy and digital literacy.

2.1.1 Information literacy

Information evaluation related abilities have always been important in the context of learning, but in the modern times these abilities have reached a new level of essentiality as they have become a "survival skill" (Eshet-Alkalai, 2004). An underlying factor to this is the changes in exposure to information, and the easily manipulated nature of information (Eshet-Alkalai, 2004). The need for information literacy is also highlighted by the fast-phased technological changes as well as the manifold information resources (American Library Association, 2000). Considering these changes in access and nature, it is not difficult to grasp the concerns in relation to individuals' levels of information literacy. This dimension of literacy, as explained by the American Library Association (2000), entails that an information literate individual must have the ability to recognize when information is needed and also possess the abilities regarding locating, evaluating and using the information effectively. Or as defined by Eshet-Alkalai (2004), information literacy refers to "the cognitive skills that consumers use to evaluate information in an educated and effective manner" (p. 101).

Information literacy is especially important considering issues of credibility and originality. As an example of this, Eshet-Alkalai (2004) brings up decision making, which is dependent on user awareness. Awareness of information, what to believe and surpass, affects not only conclusions but also possible opinions and stances which have been formed based on the obtained information (Eshet-Alkalai, 2004). The choices regarding what information to accept and what to reject can be further complicated by the sheer plentitude of availability. Today, information is available through a magnitude of sources such as libraries, various community resources, different organizations and special interest groups, and of course media and the Internet (American Library Association, 2000). The essentiality of information literacy is highlighted in the context of societal challenges, as pointed out by the American Library Association:

> *The uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively (ALA, 2000, p. 2).*

The necessity of information literacy is extensive, considering that this dimension of literacy belongs to all disciplines, to all types of learning environments, as well as all levels of education (American Library Association, 2000). Education entails formal learning, which is characterized by formal curricula, teachers, lectures and devices (Candy, 2002). Information literacy has been a topic of interest at all levels of formal education, as research has been conducted all the way from early childhood education (e.g., Havigerová & Haviger, 2014, Heider, 2009; von Loh & Henkel, 2014) to tertiary education (e.g., Dunn, 2002; Gross & Latham, 2012; Maughan, 2001). Particularly high school students have been a subject of interest, as studies range from high-school students' evaluation of scientific information (Julien & Baker, 2009) to readiness for academic work (Smith, Given, Julien, Ouellette, & DeLong, 2013) and transition to college (Varlejs & Stec, 2014).

When discussing information literacy in the context of education it is important to note that the set of abilities extends beyond formal learning. As mentioned by the American Library Association (2000), information literacy competency can enable the practice of self-directed investigations for responsibilities in all domains of life. This is supported by Candy (2002), who states that "information literacy and lifelong learning are inextricably intertwined" (p. 6). In fact, as noted by Candy (2002), plenty of learning takes place incidentally and as an unplanned activity. Moreover, informal learning can also take place in a formal learning setting. This can occur during a variety of activities, such as students helping one and other, or even conversing about topics more or less related to the learning setting (Candy, 2002).

Beyond the context of education, information literacy is naturally also a key resource in a workplace setting, as it contributes to learning about the work and practices of the workplace (Lloyd & Somerville, 2006). The information abundance of the contemporary society is reflected in the workplace setting, as more and more information is available to workers. Lloyd and Somerville (2006) have therefore called for the exploration of workplace information literacy, as it has a substantial influence on workplace learning

and the collective practice. In their research, Lloyd and Somerville (2006) set out to explore the meaning and role of information literacy in workplace learning by studying the information literacy practices of fire-fighters. The findings of their research highlight that information literacy does not simply refer to the development of skills associated with the access to information in text or digital formats, as it also demands the possibility to utilize social and physical information sources (Lloyd & Somerville, 2006).

In addition to the contexts of education and workplace settings, information literacy has also been examined in other domains such as social networking (Click & Petit, 2010), health in everyday life (Eriksson-Backa, Ek, Niemelä, & Huotari, 2012), as a predictor of internet risks (Leung & Lee, 2012), and as a sociotechnical practice (Tuominen, Savolainen, & Talja, 2005). As information literacy is a dimension of the concept of literacy, it has also been researched in contrast and connection to other dimensions of literacy (e.g., Bawden, 2001; Bushman, 2009; Koltay, 2011). However, according to some (e.g., Breivik, 2005), information literacy is best visualized as a broader concept which incorporates the other literacy dimensions.

2.1.2 Digital literacy

Digital literacy can be defined to as "the ability to use information and communication technologies to find, understand, evaluate, create, and communicate digital information, an ability that requires both cognitive and technical skills" (American Library Association, 2013, p. 2). Or as referred to by Ng (2012), digital literacy is "the multiplicity of literacies associated with the use of digital technologies" (p. 1066). The use of digital technologies can include the versatile usage of hardware and software for various purposes, e.g. activities related to entertainment or education. These digital technologies take shape in a variety of ways, including desktops, mobile devices, interactive whiteboards, datalogging equipment, digital recording devices, Web 2.0 technologies and other Internet based resources as well as software packages (Ng, 2012). Digital technologies are therefore widely present in the contemporary activities, and the need for digital literacy skills is prominent. Also, as mentioned by Huang et al. (2013), the demand for this type of literacy in the 21st century workforce cannot be dismissed. This is backed up by Cooper (2006) through the mention that "nowadays, citizens from university professors to kindergarten children, cashiers to nuclear scientists, must be at least somewhat conversant with computers" (p. 320).

On an individual level, a digitally literate person should know how to use and work with new technologies and the semiotic language they might entail (Ng, 2012). Individuals of today's society are surrounded by a new type of communications environment characterized by activities in relation to information collection and knowledge access (Verčič & Verčič, 2013), but the sheer quantity of accessible information and knowledge demands a broader set of literacy skills in comparison with the demands of traditional literacy abilities. This is not to say that traditional literacy skills should be downplayed, since, as mentioned by Warschauer (2007), "competence in traditional literacies is often a gateway to successfully enter into the world of new literacies" (p. 34).

As pointed out by Eshet-Alkalai (2004), the term "digital literacy" has been used in a wide variety of differing contexts, therefore causing ambiguity and misconception among scholars. Consequently, Eshet-Alkalai (2004) has proposed a conceptual framework in an effort to cover the skills referred to when using the term "digital literacy". The proposed conceptual framework encompasses five types of literacy: photo-visual literacy, reproduction literacy, information literacy, branching literacy and socio-emotional literacy. This framework is intended to combat the notion that digital literacy is sometimes reduced to its technical aspects, while at other times merely cognitive and socio-emotional aspects are discussed.

The consideration of dimensions has also been discussed by Ng (2012), who presents digital literacy at the intersection of three dimensions: the technical, the cognitive and the social-emotional. The presented framework draws from the work of Eshet-Alkalai (2004), while incorporating wide definitions of digital literacy and the multiliteracies concept presented by the New London Group (1996). The technical dimension of Ng's (2004) framework focuses on the technical and operational ICT-related abilities utilized in everyday activities, the cognitive dimension encompasses abilities in relation to critical thinking and evaluation while managing information, and the social-emotional dimension touches on the abilities in relation to responsible utilization of the Internet while performing tasks connected to communication, socialization and learning (Ng, 2004).

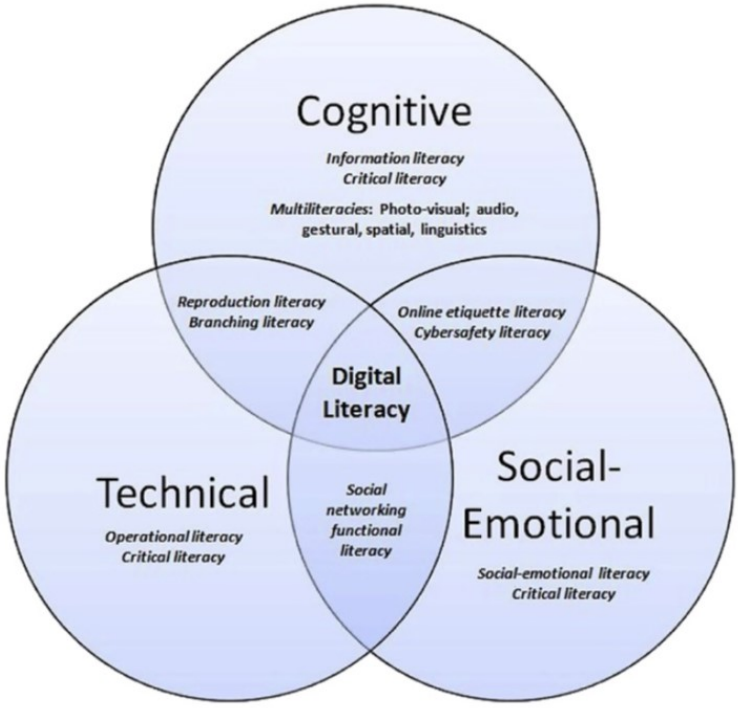


Figure 2. Digital literacy model (Ng, 2012)

The concept of digital literacy in the context of multidimensionality has also been discussed by Nikou et al. (2018), as they build upon the work of Ng (2004). Nikou et al. (2018, 2019) present a framework for assessing the impact of multidimensionality of literacy on the usage of digital technologies. In their model, Ng's (2004) three dimensions are accompanied by the dimension of information literacy, as the dimensions impact on attitude toward usage is assessed. In addition to the dimensions of literacy, the impacts of attitude towards use, social norms and self-efficacy are assessed in context of intention to use digital technologies. The impact of this multidimensionality is then examined in the context of digital natives and digital immigrants in order to explore potential variations.

The findings of Nikou et al. (2018, 2019) indicate that the intentions for using technology differs between digital immigrants and digital natives, as these groups operate differently due to differences in influencing factors. According to the findings, digital literacy and information literacy in addition to social norms and self-efficacy play an important role for digital immigrants. For digital natives, however, self-efficacy was not important. Considering the differences, a noteworthy finding is that the cognitive literacy dimension had no impact on the attitude to use digital technology for both digital natives and digital immigrants (Nikou et al., 2018).

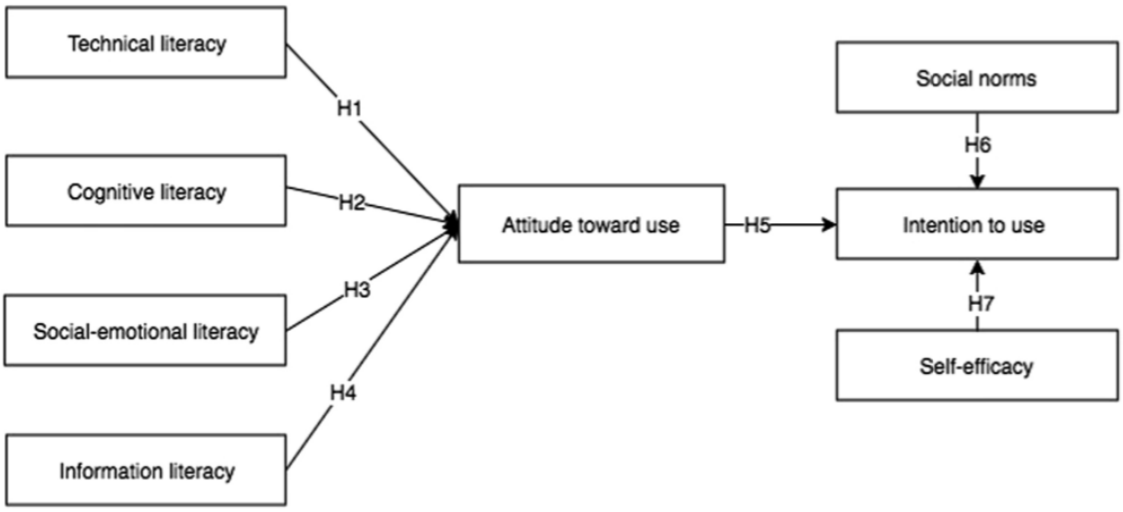


Figure 3. Conceptual model for multidimensionality of literacy (Nikou et al., 2018)

The concept of digital literacy has also been explored in the context of higher education. According to research by Lea and Jones (2011), there exists an intricate relationship between literacies and technology, as there is potential for disruption of traditional academic literacy practices. Lea and Jones (2011) mention that today's students are interacting with digital texts in a manner which can seem distant from the more traditional type of literacy associated with university studies. However, at the same time digital technologies are spreading within higher education through funding and institutional drivers (Lea & Jones, 2011). Therefore, their research offers a complementary perspective with a focus on digital literacy and the work of students in learning environments where digital technology is utilized.

As for their findings, Lea and Jones (2011) note that there exists "a significant shift from more conventional academic literacy practices to student engagement in a wide range of hybrid texts, requiring a sophisticated level of rhetorical complexity in bringing these different texts together, primarily in terms of assessment practices" (p. 385). In addition, students are said to be skilled at using various technologies while working with intricate textual genres, and that the texts produced by these students can offer new possibilities due to their hybrid and multimodal nature. It is however pointed out in the research that while students lean towards the Web as a key resource, the way they conduct searches is reliant on institutional authorities and assessment requirements. This indicates that although students may possess a high level of digital literacy, their literacy related actions are influenced by institutional guidance.

Digital literacy is naturally also a present component in informal learning. As noted by Meyers and Erickson (2013), "informal venues of learning and development are important spaces where digital literacy is both employed and cultivated" (p. 356). In fact, informal learning is engraved in the daily life of individuals who use digital technologies, as an array of the performed tasks encompass literacy activities (Meyers & Erikson, 2013). The attitude towards digital literacy skills is also shifting, which is highlighted in the following statement by Meyers and Erickson (2013):

> *[…] what was once perceived as 'the school's responsibility' to prepare students to be digitally literate citizens is now the acknowledged responsibility of all learning spaces, formal and informal (including the home and the workplace), to ensure both preparation and continuous updating of digital literacy skills, understandings and practices for everyone from toddlers to seniors (p. 356).*

2.2 Digital technologies

The information- and digital literacy skills of an individual are put to the test through interaction with digital tools and technologies. As mentioned earlier, these technologies can include things such as hardware and software, as well as other Web resources. The emergence of these technologies has changed the landscape of learning. In contrast to predigital educational resources, which "conveyed meaning consistent with and supportive of established goals and standards" (Hill & Hannafin, 2001, p. 38), new resources enable new diverse possibilities for learning, such as new means for informal learning, assessment and collaboration. This chapter will take a look at the digital technologies prominent in today's society, while reflecting on their impact on formal and informal learning.

2.2.1 Hardware and software

The technology users of the 21st century have an array of devices to choose from. Laptop computers, tablets and smartphones are widely used and often part of everyday life. Other emerging devices such as smart speakers, virtual reality headsets and augmented reality technology are catching attention and enabling new ways of interaction with devices. Naturally, the degree of usage of different devices can depend on location and

circumstances. According to the Official Statistics of Finland (2018a, 2018b, 2018c, 2018d), 87% of the households possess a computer of some sort, 71% have a laptop computer, 34% possess a desktop computer, and 53% reported to own a tablet of some sort. The access to these types of devices is, therefore, rather prominent among the population.

Hardware, such as the devices mentioned above, enable the use of software. Software in turn, whether it be system software or application software, enable versatile use of devices. A common example of software is office programs such as Microsoft Office and Apple's iWork, that provide a variety of productivity tools for word processing, spreadsheet calculations, presentations and more. Other common types of application software include web browsers, photo editing programs, media players, IT development tools, and games, to name a few. The wide usage of software is highlighted by Shaw (2000) through the mention that "software-intensive systems have become essential parts of everyday activity" (p. 371). In the context of digital literacy, however, the topic that can often be found at the forefront is neither hardware nor software, yet requires both; the World Wide Web.

2.2.2 The Internet and the Web

While sometimes used synonymously, the Internet and the World Wide Web are not the same. While the Internet functions as a network of networks in order to direct traffic (Gralla, 1998), the Web provides a more uniform and user-friendly interface for the individuals using the Internet (Pallen, 1995). Information can therefore be presented in a format that is appealing to users, and contributions to the web is not complicated due to possibilities for electronic publishing (Pallen, 1995). The function of the Web can therefore be said to serve as a way for individuals to utilize the Internet.

In our contemporary society, the Internet is being utilized on a large scale. According to the Official Statistics of Finland (2018e), 89% of the population between 16 and 89 years used the Internet in 2018. They also found that in this age range, 76% tended to use the Internet multiple times daily, 80% had a smartphone in their own use, and 61% followed social network services (Official Statistics of Finland, 2018e). Respectively, the proportions for the youngest age bracket, aged 16 to 24, the Internet usage was 100%, recurring daily usage 98%, smartphone usage 99%, and social network usage 93%

(Official Statistics of Finland, 2018e). These statistics highlight the degree of wide acceptance of Internet usage, not only among youth but among the population as a whole.

The wide usage of Internet services is also represented in the data by the Official Statistics of Finland (2018e). According to the findings, the population uses the Internet for everyday errands such as communicating, consuming media, searching data, online shopping and online banking—the latter one being the most prevalent of errands.

Table 1. Internet usage in 2018 (Official Statistics of Finland, 2018)

	Used the Internet [1)]	Usually uses the Internet several times a day	Used the Internet for calls or video calls [1)]	Smartphone in own use	Followed some social network service [1)]	Bought something on the web [1)]	Rented accommodation directly from a private person through an online marketplace specialised in accommodation (e.g. Airbnb)	Bought something on the web with a mobile phone [2)]
	Percentage share of population							
16-24	100	98	62	99	93	56	9	39
25-34	99	97	54	97	87	72	16	50
35-44	100	96	56	96	84	76	13	46
45-54	98	87	42	90	71	56	10	21
55-64	93	72	33	80	46	32	4	9
65-74	78	47	21	59	29	17	2	3
75-89	40	19	9	24	10	7	0	1
	..	..	..	..	..	..	..	..
Men	90	78	41	81	58	47	8	25
Women	88	74	40	79	64	46	8	25
All	89	76	40	80	61	47	8	25

The Web is however, as mentioned above, the user-friendly interface of the Internet. Since the Web has developed and changed, the new characteristics and innovations have given rise to the terms Web 1.0, Web 2.0, Web 3.0 and Web 4.0. According to Aghaei, Nematbakhsh and Farsani (2012), the distinctions can be briefly described as follows: "Web 1.0 as a web of cognition, web 2.0 as a web of communication, web 3.0 as a web of co-operation and web 4.0 as a web of integration are introduced such as four generation of the web since the advent of the web." (p. 1). Aghaei et al. (2012) highlight that the Web has undergone much progress since its beginnings, and that it is moving towards a future of highly intelligent interactions through the utilization of artificial intelligence.

For the moment being, in the context of learning, Web 2.0 is most widely discussed. In this context, Huang et al. (2013) discusses Web 2.0, the term coined by O'Reilly (2005), as "an active and open web architecture that enables users to participate in facilitating their active learning. […] [it] allows users the opportunity to participate in collective and collaborative learning activities through applications such as blogs, wikis, social networking sites, online games, online video sharing, and immersive virtual environments, to name a few" (p. 58). The Web provides access to a range of resources regarding a myriad of topics (Hill & Hannafin, 2001), which in turn gives individuals the possibility to use information without constraints of time or location (Hill, 1999). Considering these possibilities, it is not difficult to envision why the Web 2.0 has been of great interest in the context of learning.

According to Kelly (2008), the most popular Web 2.0 applications include blogs, wikis, syndicated content, podcasts and videocasts, mashups, social sharing services, communications tools, social sharing services, communications tools, social networks, folksonomies and tagging, and virtual worlds (see Table 2). The nature of these applications accentuate communication, the very core of Web 2.0, as they provide a multitude of ways for interaction and content creation.

Table 2. Web 2.0 applications as described by Kelly (2008)

Concept	**Description by Kelly (2008)**
Blogs	"Applications which are commonly used to provide diaries, with entries provided in chronological order. There are now many diverse ways in which blogs can be used" (p. 22).
Wikis	"Collaborative web-based authoring tools. The best-known example of a wiki is Wikipedia, a global encyclopedia which was developed through the collaborative effort of many volunteers around the world" (p. 22).
Syndicated content	"Technologies which allow content to be automatically embedded elsewhere" (p. 22).
Podcasts and videocasts	"Syndicated audio and video content, which is often transferred automatically to portable MP3 players such as iPods" (p. 22).
Mashups	"Services which contain data and services from multiple sources. A mashup often incorporated syndicated content, although there are other ways of creating mashups" (p. 22).
Social sharing services	"Applications which provide sharing of various types of resources such as bookmarks, photographs, etc" (p. 22).

Communications tools	"Various tools including chat applications (such as MSN Messenger and internet telephony tools (such as Skype) which can provide various forms of communication ranging from simple text messaging systems through audio and video communications" (p. 22).
Social networks	"Communal spaces which can be used for group discussions and sharing of resources" (p. 22).
Folksonomies	"A bottom-up approach to providing descriptive labels for resources, to allow them to be retrieved" (p. 22).
Virtual worlds	"3D simulations in which avatars (which represent the user) can interact with other users" (p. 22).

The variety of available Web 2.0 applications enable an array of possibilities for learning. This can be seen in the quantity of research that has been conducted on Web 2.0 in various learning and education related contexts, such as community learning (e.g., Goldie, 2016; Mason & Rennie, 2007), personalised learning (e.g., McLoughlin & Lee, 2010), learning management systems and environments (e.g., Craig, 2007; Sclater, 2008), as well as implications for learning and teaching (e.g., Alexander, 2006; Brown, 2010; Greenhow, Robelia, & Hughes, 2009).

2.3 Digital learning

Lodge, Kennedy and Lockyer (2019) mention that an evolution in digital technologies is taking place due to the increasing usage of data, sophisticated algorithms and adaptive learning environments. The possibilities enabled by data and analytics have enabled elaborate ways of monitoring students' progress and therefore also predictive ways of gaining information regarding students' learning trajectories (Lodge et al., 2019). Targeted and personalized methods for learning can now be taken to a different level, as the possibilities enabled by emerging technologies, data and algorithms make it possible to not simply teach out facts but also complex concepts (Lodge et al., 2019).

Digital technologies have therefore found their way both to formal and informal learning. Within the education systems, educational technologies are becoming increasingly common, and even expected to be a part of formal learning environments (Lodge et al., 2019). Naturally, transferring resources into electronic form simply for the sake of it should not be considered beneficial, as the aim should be to obtain benefits over the more traditional methods (Laakso et al., 2018). Considering the variety of devices and Web applications, the options and possibilities provided for students and teachers are very real:

mobile wireless computers provide ease of moment, relaxed fit, strategic deployment, low profile, flexibility, cleanliness, convenience, simplicity and speed (McKenzie, 2001, cited by Kim, Mims, & Holmes, 2006); personal digital assistants enable mobility, information management capacity and beaming capacity (Yuen & Yuen, 2003, cited by Kim et al, 2006); mobile wireless phones provide independence location- and timewise, faster teaching and learning, one-to-one learning and the upkeep of educational subjects (Oku, 2001, cited by Kim et al, 2006).

Another example of the presence of digital technologies in education is the utilization of digital learning environments (DLE). A DLE can provide new opportunities for learning as well as teaching while enabling novel ways of interaction (Pynoo, Devolder, Tondeur, van Braak, Duyck, & Duyck, 2011). One example of a DLE is ViLLE (https://ville.utu.fi), a tool developed for research and learning purposes by the University of Turku (Kuikka & Laakso, 2017). ViLLE can be used by teachers to create courses and exercises, as well as tutorials and exams (Kuikka & Laakso, 2017). The tool enables immediate feedback for the students, which in turn enables a revision of learning while studying. Other examples of DLEs include Udacity (https://www.udacity.com), Udemy (https://www.udemy.com) and Khan Academy (https://www.khanacademy.org).

In order for reaping the benefits of digital technologies in education, the tools and services must be accepted by teachers and students. Gu, Zhu and Guo (2013) conducted research on technology acceptance in classrooms in order to assess how students and teachers accept and utilize technology. The aim was to assess if the digital immigrant teachers could meet the expectations of their digital native students in regard to choosing technologies to be used during class. The findings of Gu et al. (2013) show that differences can be found between how teachers and students use technology and how they interpret the importance of it. These findings include students having more opportunities to use different information and communication technologies (ICT) outside of the school than compared with inside the classroom, students used more types of ICT than teachers, teachers usage of ICT exceeded students in regard to duration and frequency, teachers had a higher perception regarding the usefulness of ICT outside of school, teachers were affected more by social influence than students, and students had a higher level of confidence in using ICT when compared with their teachers (Gu et al., 2013).

Outside of formal education, digital technologies are however also changing the ways of informal learning. Thanks to the availability of mobile devices, individuals can access

information at any moment as long as there is access to a network connection (Lodge, 2019). According to Lodge et al. (2019), this level of access has changed the way individuals go about obtaining some types of knowledge. As an example of this, they mention the possibility of simply going online and looking up videos so that they can observe the desired process in action. A popular and widely used option is YouTube (https://www.youtube.com), a video-sharing website where users can watch and upload content free of charge. YouTube has wide reach considering that the website is available in over 91 countries and more than 1.9 billion users are logged on the website each month (YouTube, 2019).

Considering the possibilities within both formal and informal learning, digital learning is a matter of great magnitude. As pointed out by Lodge et al. (2019), the significant impact of educational technologies can already be seen within education, student-teacher dynamics are evolving, and the future of student learning will surely include elements of machine learning and AI systems.

3 THEORETICAL BACKGROUND

As technology has advanced during the past decades, an array of research has surfaced, and a wide range of studies have been conducted in order to gain insight of attitude, intentions, adoption, and actual usage. The following chapter will present some of the widely used theories, followed by the hypothesis development of this thesis as well as the proposed conceptual model.

3.1 Theoretical models

A conceptual framework can be described as a research tool that is supposed to aid researchers to develop insight in a particular situation, as the framework is intended to serve as a starting point for contemplation (Smyth, 2004). The framework itself can be seen as an abstract representation affiliated with the research purpose. A clearly articulated conceptual framework does not only serve as a useful tool in research, but can also aid researchers in handling the findings (Smyth, 2004). As noted previously, an array of theoretical frameworks has been developed and tested out in order to obtain knowledge of technology in various contexts. In addition, research from the field of psychology and frameworks for behavior have also been applied to the context of technology. Some of the most notable theories include the theory of reasoned action (TRA), the theory of planned behavior (TPD), the technology acceptance model (TAM), the innovation diffusion theory (IDT), and the unified theory of acceptance and use of technology (UTAUT).

The theory of reasoned action (TRA) is a model proposed by Fishbein and Ajzen (1975). The theory suggests that an individual's behavior is steered by behavioral intent regarding the performance of that behavior. The behavioral intention construct is affected by two other constructs, which are an individual's attitude regarding the behavior and the subjective norm (Fishbein & Ajzen, 1975). The first of these is, in turn, affected by behavioral beliefs and outcomes evaluation, while the latter is affected by normative beliefs and motivation to comply (Fishbein & Ajzen, 1975). The TRA model has been applied to a variety of different contexts, such as role identity (Charng, Piliavin, & Callero, 1988); renewable energy concerns (Bang, Ellinger, Hadjimarcou, & Traichal, 2000); fast food consumption (Bagozzi, Wong, Abe, & Bergami, 2000); and green information technology acceptance (Mishra, Akman, & Mishra, 2014).

A decade later, Ajzen (1985) went on to further develop the TRA model by including a new construct in order to assess problems regarding the possibility of situations where lack of volitional control is present. The new construct, perceived behavior control, was assigned to the model in order to address an individual's perception of the degree of ease or difficulty regarding the performance of the wanted behavior. The new construct was assigned to affect the intention construct and the behavior construct, while perceived behavior control itself was affected by control beliefs construct and a perceived power construct (Ajzen, 1985). This new extended version of TRA became known as the theory of planned behavior (TPB) (Ajzen, 1985). Since the proposition of TPB, an array of research has surfaced examining and contrasting the framework with its predecessor TRA (for more, see Madden, Ellen, & Ajzen 1992; Hankins, French, & Horne, 2000; Hansen, Jensen, & Solgaard, 2004; Cooke & French, 2008). And just as the TRA model, TPB has been used to research behavior and intention in a wide variety of different contexts, such as entrepreneurship (Krueger & Carsud, 1993); identity (Terry, Hogg, & White, 1999); health behavior (Conner & Sparks, 2005); and student teachers intention to use technology (Teo & Beng Lee, 2010).

Shortly after the establishment of TRA, Davis (1989) developed the technology acceptance model (TAM), which came to be one of the most widely used frameworks utilized for examining the adoption of technology. This framework examines the impact of perceived usefulness and perceived ease of use on behavioral intention and actual system use. Davis (1989) defines perceived usefulness as “the degree to which a person believes that using a particular system would enhance his or her job performance” (p. 320), and perceived ease of use as “the degree to which a person believes that using a particular system would be free of effort” (p. 320). The emphasis of both constructs is therefore on perception. Since its development, the TAM framework has served as a template for further extensions and modifications, leading to the development of e.g. TAM2 (Venkatesh & Davis, 2000) and TAM3 (Venkatesh & Bala, 2008). The different versions of TAM have been applied to research in several different topics such as online consumer behavior (Koufaris, 2002); online banking (Pikkarainen, Pikkarainen, Karjaluoto, & Pahnila, 2004); e-learning (Park, 2009), and social media usage (Rauniar, Rawski, Yang, & Johnson, 2014).

Following a couple of years later, the innovation diffusion theory (IDT) was developed by Moore and Benbasat (1991) for measuring individuals’ perceptions regarding the

initial adoption of information technology innovations. The constructs of interest in the IDT rely primarily on work of Rogers (1983) who developed the diffusion of innovation (DOI). The constructs from DOI are defined by Rogers (1983) as follows: relative advantage, "the degree to which an innovation is perceived as being better than its precursor"; compatibility, "the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters"; complexity, "the degree to which an innovation is perceived as being difficult to use"; observability, "the degree to which the results of an innovation are observable to others"; and trialability, "the degree to which an innovation may be experimented with before adoption" (cited in Moore and Benbasat, 1991, p. 195). The construct of observability was however divided into visibility and result demonstrability. In addition to these six constructs, Moore and Benbasat (1991) added two further constructs which they defined as follows: image, "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system" (p. 195); and voluntariness of use, "the degree to which use of the innovation is perceived as being voluntary, or of free will" (p. 195). The IDT has been utilized in different contexts, such as spreadsheet software adoption (Brancheau & Wetherbe, 1990); collaboration technology evaluation (Sonnenwald, Maglaughlin, & Whitton, 2001); and support of employees' intentions towards usage of e-learning systems (Le,e Hsieh, & Hsu, 2011), to name a few.

While the models discussed above – TRA, TDP, TAM, TAM2, TAM3 and IDT – have connection to the topic of this thesis, there remains a framework which encompasses and unifies the central aspects of the several technology usage and intention frameworks. With the above-mentioned theoretical models as a baseline, Venkatesh, Morris, Davis and Davis (2003) created the unified theory of acceptance and use of technology (UTAUT) framework. In addition to the already touched on theories, the UTAUT also draws from the motivational model (MM) by Davis, Bagozzi and Warshaw (1992), the model of PC utilization (MPCU) by Thompson, Higgins and Howell (1991), the combined TAM and TPB model (C-TAM-TPB) by Taylor and Todd (1995) and social cognitive theory (SCT) by Compeau and Higgins (1995). The UTAUT model was therefore born out of an effort to comprehensively assess the connections between different constructs in association with individual's acceptance of information technology (Huang et al., 2013).

3.1.1 The unified theory of acceptance and use of technology

The UTAUT framework is the product of information technology acceptance literature review, empirical comparison, integration of central elements and empirical validation of the proposed model (Venkatesh et al., 2003). Through the review and comparison of previous works, Venkatesh et al. (2003) identified seven constructs which were determined to serve as "significant direct determinants of intention or usage in one or more of the individual models" (p. 446). Originating from these seven constructs, four core constructs were identified which were suggested to be direct determinants regarding user acceptance as well as usage behavior. These constructs were performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). These constructs were moderated by gender, age, experience and voluntariness of use, as the constructs were theorized to affect behavioral intentions (BI), which in turn affects actual user behavior (UB). These constructs are discussed in more detail.

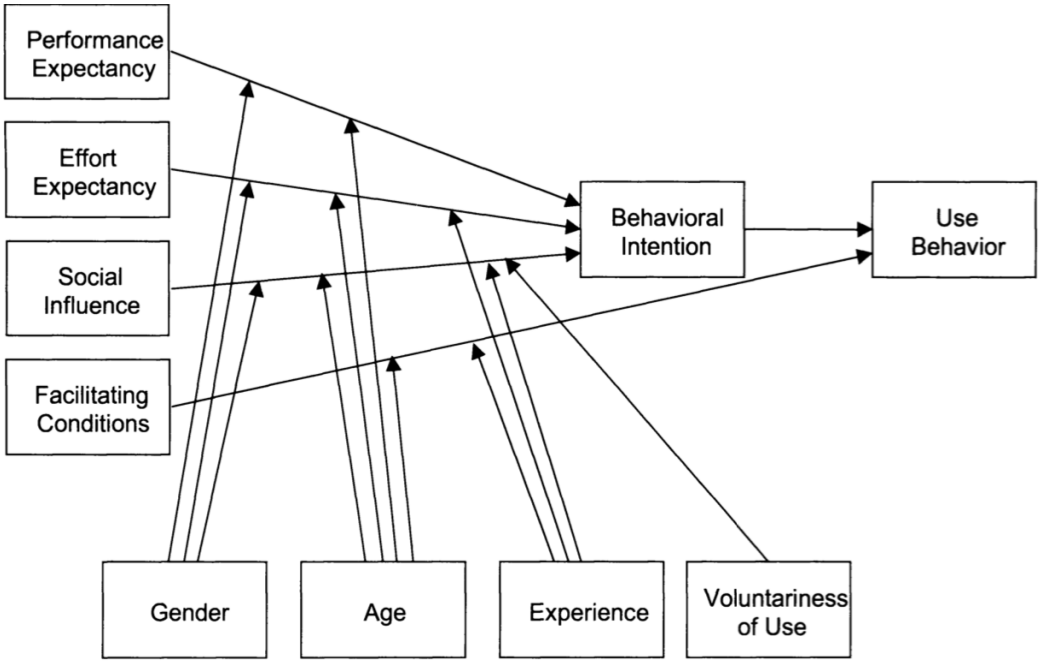


Figure 4. The UTAUT model (Venkatesh et al., 2003)

Performance expectancy (PE) is defined by Venkatesh et al. (2003) as "the degree to which an individual believes that using the system will help him or her attain gains in job performance" (p. 447). This construct therefore assesses an individual's expectations regarding the perceived benefits that can be attained by using a system. Out of the eight different models reviewed by Venkatesh et al. (2003), constructs that pertain to PE were

found in TAM/TAM2/C-TAM-TPB, MM, MPCU, IDT and SCT (Venkatesh et al., 2003). Through empirical comparisons, the PE construct was found to be the strongest predictor of intention (Venkatesh et al., 2003). The PE construct was hypothesized to be moderated by gender and age.

The following construct, effort expectancy (EE), is defined by Venkatesh et al. (2003) as "the degree of ease associated with the use of the system" (p. 450). The construct thus encompasses an individual's interpretation regarding the anticipation of how easy it is to operate a system. Out of the reviewed model, constructs that pertain to EE were found in TAM/TAM2, MPCU and IDT (Venkatesh et al., 2003). These found constructs which relate to effort expectancy are most noticeable in the early phase of using a system (Venkatesh et al., 2003). As for the influence of the EE construct on BI, the impact was hypothesized to be moderated by gender, age and experience.

Social influence (SI) is defined by Venkatesh et al. (2003) as "the degree to which an individual perceives that important others believe he or she should use the new system" (p. 451). Therefore, this construct focuses on the perception of external attitudes of close ones regarding the individual's choice to use a particular system. Out of the reviewed models, constructs that pertain to SI were found in TRA, TAM2, TPB/DTPB, C-TAM-TPB, MPCU and IDT (Venkatesh et al., 2003). It is noted that while the constructs found in these models possess different labels, each of them expresses either explicitly or implicitly that individuals' beliefs of how other people perceive them due to use of a certain technology affect the individual's behavior (Venkatesh et al., 2003). The influence of the SI construct was hypothesized to be moderated by gender, age, voluntariness and experience (Venkatesh et al., 2003).

The fourth of the core constructs is facilitating conditions (FC), which is defined by Venkatesh et al. as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (p. 453). The construct thus encompasses an individual's interpretations of how the surrounding organizational environment and its technological features work to remove barriers which might affect the usage of a system. Out of the reviewed model, constructs that pertain to FC were found in TPB/DTPB, C-TAM-TPB, MPCU and IDT (Venkatesh et al., 2003). The influence of the FC construct was hypothesized to be moderated by age and experience (Venkatesh et al., 2003). However, unlike the other constructs, which are suggested to

influence UB through BI, the FC construct is suggested to have a direct impact on usage (Venkatesh et al., 2003).

Table 3. The four core constructs of UTAUT (Venkatesh et al., 2003)

Abbreviation	Construct	Definition by Venkatesh et al. (2003)
PE	Performance expectancy	"The degree to which an individual believes that using the system will help him or her attain gains in job performance" (p. 447)
EE	Effort expectancy	"The degree of ease associated with the use of the system" (p. 450)
SI	Social influence	"The degree to which an individual perceives that important others believe he or she should use the new system" (p. 451)
FC	Facilitating conditions	"The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (p. 453)

Out of the four core constructs discussed above, three (PE, EE, SI) were hypothesized to influence the behavioral intention construct (BI), which in turn accompanied by FC was suggested to impact actual use behavior (UB) (Venkatesh et al., 2003). After empirical testing of the UTAUT framework, strong empirical support was found for the model and the moderating influences were validated as integral attributes of UTAUT (Venkatesh et al., 2003). It was therefore concluded by Venkatesh et al. (2003) that the UTAUT model manages to integrate key elements of previous models successfully while harnessing "the combined explanatory power of the individual models and key moderating influences" (p. 467).

The UTAUT model has been used in a wide variety of contexts, including adoption of mobile banking (Zhou, Lu, & Wand, 2010), student perception on course management software (Marchewka & Kostiwa, 2007), acceptance of electronic medical records (Wills, El-Gayer, & Bennett, 2008), and adoption of virtual learning environments (Šumak, Polancic, & Hericko, 2010), to name a few. In addition to diverse application of UTAUT, the model itself has been discussed and examined widely (for more, see e.g. Dwivedi, Rana, Chen, & Williams, 2011; Oye, Iahad, & Rahim, 2014; Williams, Rana, Dwivedi, & Lal, 2011). A noteworthy observation from one of these meta-analyses is that although the UTAUT model has received many citations, it appears that the majority of them, however, do not actually utilize the theory in empirical research while studying

information systems or information technology related issues (or more, see Williams, Rana, Dwivedi, & Lal, 2011)

3.1.2 The unified theory of acceptance and use of technology 2

The UTAUT model was originally introduced by Venkatesh et al. (2003) for the prediction of intent and usage of technology in organizational settings. Since its development, the model has however come to been used in organizational as well as non-organizational contexts (Venkatesh, Thong, & Xu, 2012). Due to this discovery, Venkatesh et al. (2012) set out to research how the UTAUT framework could be altered to better suit a consumer technology use context. This resulted in the development of UTAUT2, an extended version of the original UTAUT framework (Venkatesh et al., 2012). The aim of the extended version was to build upon the framework of its predecessor while accommodating the model for consumer use context (Venkatesh et al., 2012).

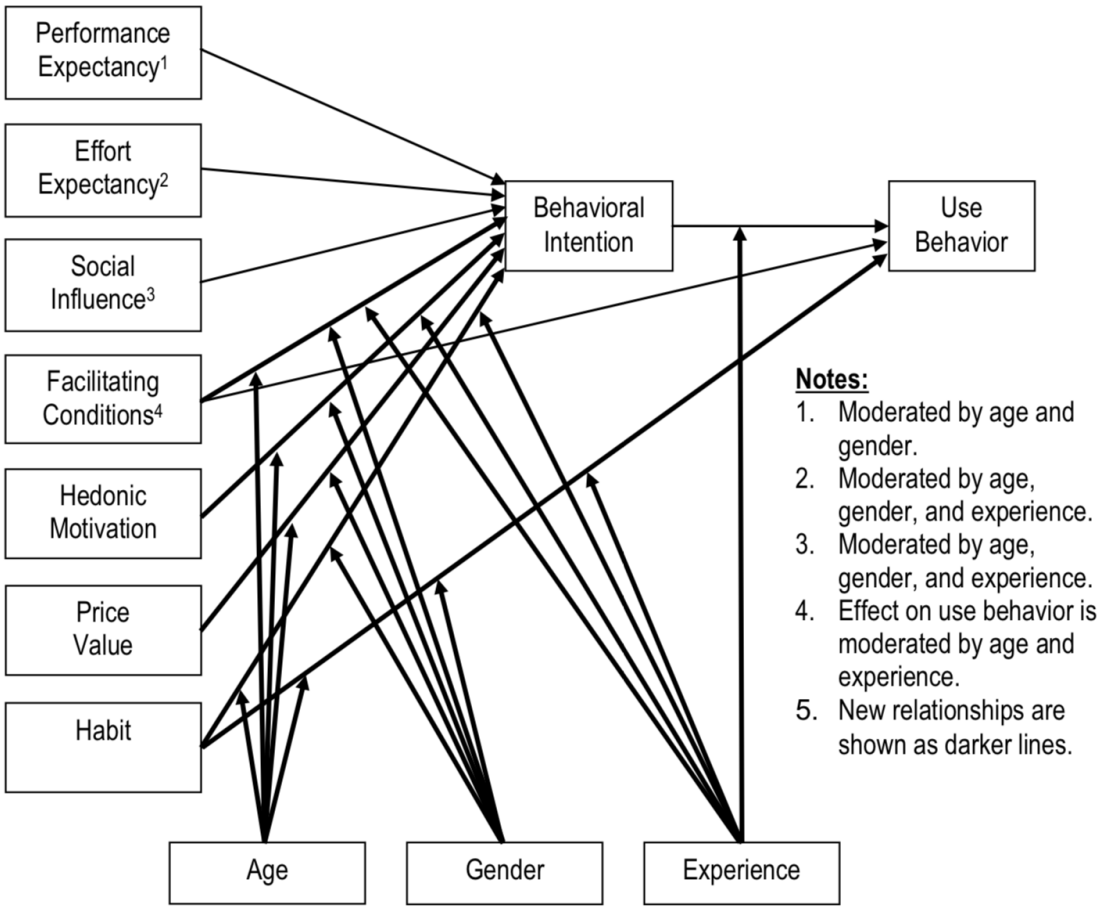


Figure 5. Extended version of UTAUT; the UTAUT2 (Venkatesh et al., 2012)

The UTAUT2 framework is the product of previous research on technology adoption and usage, modification of existing relationships present in the original UTAUT model, and the introduction of new relationships (Venkatesh et al., 2012). The new extended version identifies three additional key constructs, referred to as hedonic motivation (HM), price value (PV) and habit (HT) (Venkatesh et al., 2012). The three new constructs, accompanied by the four core constructs already present in the original UTAUT model, are moderated by age, gender and experience (Venkatesh et al., 2012).

Hedonic motivation (HM) is defined by Venkatesh et al. (2012) as "the fun or pleasure derived from using a technology" (p. 8). Venkatesh at al. (2012) argue that the inclusion of HM will complement the frameworks strongest predictor that stresses utility, as they mention that prior research has indicated that the aspect of enjoyment is important not only for technology acceptance and usage, but also in the usage of consumer products. It is however pointed out that as individuals gains more experience with using a technology, the sense of novelty gained from said technology will decrease with time since the usage will shift towards more pragmatic purposes (Venkatesh et al., 2012). The influence of the HM construct is moderated by age, gender and experience (Venkatesh et al., 2012).

For the second added construct, price value (PV), Venkatesh et al. (2012) use the definition by Dodds, Monroe and Grewal (1991), who refer to PV as "consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them" (p. 9). The incorporation of this construct is motivated with the statement that the individuals using technology in a consumer construct are responsible for costs, which in turn can steer the decisions related to the adoption of technologies (Venkatesh et al., 2012). The PV construct is therefore said to complement the frameworks existing resource considerations, which previously simply focused on time and effort (Venkatesh et al., 2012). The influence of the PV construct is moderated by age and gender (Venkatesh et al., 2012).

For the final new construct, habit (HT), Venkatesh et al. (2012) differentiate the concept in two ways. One definition is by Limayem, Hirt and Cheung (2007), who define habit as "the extent to which people tend to perform behaviors automatically because of learning" (cited by Venkatesh et al., 2012, p. 9). The other definition is by Kim and Malhotra (2005), who refer to habit as "prior behavior" (cited by Venkatesh et al., 2012, p. 9). The inclusion of the HT construct is motivated by Venkatesh et al. (2012) through mentioning that research into the role of habit in technology has "challenged the role of behavioral

intention as the key predictor of technology use" (p. 4) while introducing habit as construct to describe some underlying processes in regard to technology use. The influence of the HT construct is moderated by age, gender and experience (Venkatesh et al., 2012).

Table 4. The three new constructs of UTAUT2 (Venkatesh et al., 2012)

Abbreviation	Construct	Definition by Venkatesh et al. (2012)
HM	Hedonic motivation	"The fun or pleasure derived from using a technology" (p. 8)
PV	Price Value	"Consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them" (p. 9)
HT	Habit	"The extent to which people tend to perform behaviors automatically because of learning" (p. 9)

The three new constructs (HM, PV, HT) were suggested to influence the behavioral intention construct (BI), which in turn is suggested to impact UB (Venkatesh et al., 2003). In addition, the HT construct is hypothesized to also have a direct relationship with UB, just as the FC construct in the original UTAUT model. A differing aspect of the UTAUT2, however, is that Venkatesh et al. (2012) also suggest a relationship from FC to BI. This is due to the reason that in an organizational setting, FC can function as the proxy for UB since training and support is usually available in organizational settings, while in consumer context FC can variate greatly (Venkatesh et al., 2012). Thus, Venkatesh et al. (2012) point out that "a consumer who has access to a favorable set of facilitating conditions is more likely to have a higher intention to use a technology" (p. 12).

After empirical testing of the UTAUT2 framework, the findings indicated support for the applicability and validity of the model as a base for prediction of individuals intention and usage of technology in a consumer context (Venkatesh et al., 2012). Venkatesh et al. (2012) point out that a noteworthy difference between the UTAUT and UTAUT2 models is the influence of BI on UB, as a positive direct effect was present in UTAUT but in UTAUT2 the effect was moderated by experience. The proposition of UTAUT2 concludes that the influence of HM, PV and HT are complex and important in the consumer context (Venkatesh et al., 2012).

Since its development, the UTAUT2 model has also been applied to a range of different contexts, such as teacher perception on learning management software (Raman & Don,

2013); adoption of mobile banking (Alalwan, Dwivedi, & Rana, 2017); intention to use NFC mobile payments (Morosan & DeFranco, 2016), perception of health and fitness apps (Yuan, Ma, Kanthawala, & Peng, 2015), and adoption of social networks sites for sharing user-generated content (Herrero & San Martín, 2017), to name a few.

3.1.3 Digital literacy and technology acceptance

To date, the UTAUT (Venkatesh et al., 2003) and UTAUT2 (Venkatesh et al., 2012) models have not had much exposure to the context of digital literacy. However, Mohammadyari and Singh (2015) have explored the subject by proposing a modified version of the UTAUT framework for investigating the role of digital literacy in understanding the impact of e-learning on individual performance. Mohammadyari and Singh (2015) propose that an individual's level of literacy influences performance through performance expectancy and effort expectancy.

The modified version of UTAUT incorporates digital literacy (DL) as a construct, which is hypothesized to influence PE and EE. The SI construct is modified by separation into two sub-constructs: individual social influence (ISI) defined as "the perceived influence of key individuals" (p. 15) and organization support (OS) defined as "the perceived influence of the organization that individuals work for" (p. 15). The separation is motivated by stating that in UTAUT, the SI construct is used as a predictor for behavioral intention, but in the context of digital literacy it can be argued that ISI can affect PE and EE due to IT being a social activity. (Mohammadyari & Singh, 2015). The OS construct is hypothesized to affect the intention to continue (CI) using an e-learning technology, while ISI is hypothesized to affect PE and EE. The PE and EE constructs retain their definitions but are modified for the context of continued use. These constructs are hypothesized to affect CI, which is defined as "a belief that extended use of it [an e-learning technology] will lead to valued outcomes" (p. 16). The CI construct is hypothesized to affect performance.

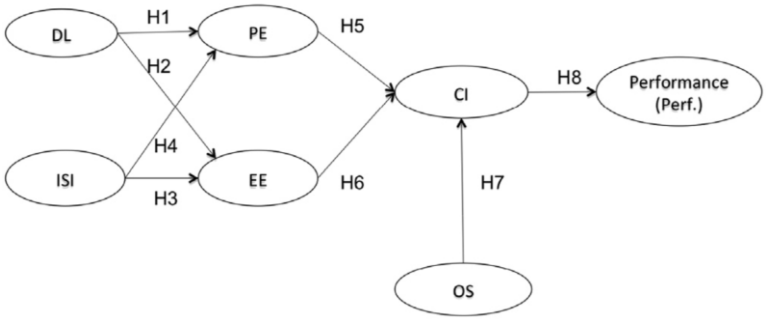


Figure 6. Modified version of UTAUT model (Mohammadyari & Singh, 2015)

After empirical testing of the modified UTAUT framework, the findings of Mohammadyari and Singh (2015) indicate that the proposed relationships are significant, as it is found that DL affects PE and EE, PE affects the intention to continue using Web 2.0 tools, and CI affects performance. Therefore, it is concluded that individual digital literacy assists usage of e-learning, which in turn means that it should be regarded when researching how e-learning influences performance (Mohammadyari & Singh, 2015). It is also pointed out that "digital literacy as a construct deserves more attention in e-learning and other settings, because it incorporated the idea of IT use as a skill that evolves" (Mohammadyari & Singh, 2015, p. 22).

3.2 Hypothesis development

This subchapter will present the constructs of the conceptual model of this thesis, which intends to connect the domains of digital literacy and information literacy with constructs of the robust and empirically widely used UTAUT framework. Constructs from the UTAUT framework are not only chosen due to the expected suitability of a technology acceptance model in the context of literacies, but as Miles and Huberman (1994) put it, previous theory and research are important since they can help with the mapping of variables and relationships. The formulated hypotheses of this study will also be presented incorporated with the constructs. The constructs of the proposed framework are as follows: digital literacy, information literacy, performance expectancy, effort expectancy, hedonic motivation, and habit.

Digital literacy (DL) is defined here as referred to by the American Library Association (2013): "the ability to use information and communication technologies to find, understand, evaluate, create, and communicate digital information" (p. 2). In prior

research by Nikou et al. (2018), digital literacy has been examined as a product of technical literacy, cognitive literacy and social-emotional literacy. The findings report that two of these dimensions, the technical dimension and social-emotional dimension, have significant relations to the attitude toward using digital technologies. Attitude was, in turn, found to have a significant relationship to the intention to use digital technologies, therefore supporting the relationship between digital literacy and intention. Previous research (Mohammadyari & Singh, 2015) has also reported that digital literacy has a positive impact on performance expectancy and effort expectancy. Hedonic motivation and habit have, however, not thus far been studied in a similar context. Therefore, based on the prior findings, as well as the aim to gain insight on the yet unexplored relationships, the following relationships are hypothesized:

- **H1:** Digital literacy is positively related to the intention to use digital technologies for learning purposes.
- **H2a:** Digital literacy is positively related to performance expectancy.
- **H2b:** Digital literacy is positively related to effort expectancy.
- **H2c:** Digital literacy is positively related to hedonic motivation.
- **H2d:** Digital literacy is positively related to habit.

Information literacy (IL) is defined here based on the American Library Associations (2000) description of a set of abilities which entail that an individual is able to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (p. 2). Prior research conducted by Nikou et al. (2018, 2019) has indicated that information literacy has a significant relationship to attitude toward using digital technologies, and as mentioned above, attitude was found to have a significant relation to the intention to use digital technologies, therefore supporting the relationship between information literacy and intention. Performance expectancy, effort expectancy, hedonic motivation and habit have, however, not thus far been studied in a similar context. Hence, based on the prior findings, as well as the aim to gain insight on the yet unexplored relationships, the following relationships are hypothesized:

- **H3:** Information literacy is positively related to the intention to use digital technologies for learning purposes.
- **H4a:** Information literacy is positively related to performance expectancy.
- **H4b:** Information literacy is positively related to effort expectancy.
- **H4c:** Information literacy is positively related to hedonic motivation.

- **H4d:** Information literacy is positively related to habit.

Performance expectancy (PE) is here defined as the degree to which using a digital technology will provide benefits to individuals in performing certain activities. This definition is an adaption from the PE construct used in UTAUT (Venkatesh et al., 2003) and UTAUT2 (Venkatesh et al., 2012). As mentioned before, the UTAUT model was used in an organizational setting and the UTAUT2 in a consumer context, and so the PE construct is therefore altered to suit the context of this thesis. Prior research reports that PE is a significant predictor of behavioral intention (Ghalandari, 2012; Goncalves, Oliveira, & Cruz-Jesus, 2018; Kang, Liew, Lim, Jang, & Lee, 2015; Venkatesh et al., 2003). Thus, the following relationship is hypothesized:

- **H5:** Performance expectancy is positively related to the intention to use digital technologies for learning.

Effort expectancy (EE) is here characterized as the degree of ease associated with individuals' use of digital technology. This definition is also a modification of the EE construct used in UTAUT (Venkatesh et al., 2003) and UTAUT2 (Venkatesh et al., 2012), and the definition has been modified. According to previous research (Boontarig, Chutimaskul, Chongsuphajaisiddhi. & Papasratorn, 2012); Ghalandari, 2012; Lowenthal, 2010; Sung, Jeong, Jeong, & Shin, 2015; Venkatesh et al., 2003), EE is a significant predictor of behavioral intention. Therefore, the following relationship is hypothesized:

- **H6:** Effort expectancy is positively related to the intention to use digital technologies for learning.

Hedonic motivation (HM) is here defined as the fun or pleasure derived from using a technology for learning purposes. This definition is a modification of the HM construct used in UTAUT2 (Venkatesh et al., 2012). In prior research, HM has been found to be a critical determinant of behavioral intention (Alalwan, Dwivedi, Rana, Lal, & Williams, 2015; Kang et al., 2015; Morosan & DeFranco, 2016; Rahi, Ghani, & Ngah, 2018; Sharif & Raza, 2017; Son, Lee, & Cho, 2014; Venkatesh et al., 2012). Hence, the following relationship is hypothesized:

- **H7:** Hedonic motivation is positively related to the intention to use digital technologies for learning.

Habit (HT) is here defined as the extent to which individuals tend to perform behaviors automatically because of learning. This definition is also a modification of the HT

construct used in UTAUT2 (Limayem et al., 2007, cited by Venkatesh et al., 2012). In prior research, HT has been found to be a critical determinant of behavioral intention (Alalwan et al., 2015; Escobar-Rodríguez & Carvajal-Trujillo, 2013; Goncalves et al., 2018; Kang et al., 2015; Morosan & DeFranco, 2016; Sharif & Raza, 2017, Venkatesh et al., 2012). Thus, the following relationship is hypothesized:

- **H8:** Habit is positively related to the intention to use digital technologies for learning.

Intention (IN) refers here to an individual's intention to use digital technologies for learning. The IN construct was chosen to be the observed outcome variable of this study, as the aim of this thesis is to explore how intention to use digital technologies for learning can be affected by the DL, IL, PE, EE, HM and HT constructs. Intention as a construct has been widely applied for the prediction of future technology use (e.g., Ajzen, 1985; Davis, 1989; Fishbein & Ajzen, 1975; Moore and Benbasat, 1991; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh et al., 2012).

Table 5. An overview of the constructs utilized in this thesis

Abbreviation	Construct	Definition
DL	Digital literacy	The ability to use information and communication technologies to find, understand, evaluate, create, and communicate digital information.
IL	Information literacy	The ability to recognize when information is needed and having the ability to locate, evaluate, and use effectively the needed information.
PE	Performance expectancy	The degree to which using a digital technology will provide benefits to individuals in performing certain activities.
EE	Effort expectancy	The degree of ease associated with individuals' use of digital technology.
HM	Hedonic motivation	The fun or pleasure derived from using a digital technology.
HT	Habit	The extent to which an individual performs behaviors automatically because of learning.
IN	Intention	The intention to use digital technologies for learning purposes.

While some of the UTAUT2 constructs are utilized in this thesis, others are excluded from the study. Social influence, facilitating conditions, price value and use behavior have not been included within the proposed framework. To start off, use behavior has not been included as the aim of this thesis is to assess intention, not actual usage. As for the social influence and facilitating conditions constructs, they were not included as this thesis

intends to research the impact that literacies can have on internal variables that affect intention. As social influence and facilitating conditions are external factors, they were not considered to be under the influence of the chosen literacies. And finally, the price value construct has been left out due to the fact that this study is being conducted at universities in Finland, where the students and employees have free access to technologies, e.g. on campus or public libraries, and the access does therefore not require payment.

3.3 Conceptual model

As mentioned by Miles and Huberman (1994), conceptual frameworks should rather be done graphically than textually, as the creation of a framework demands specification, mapping of relationships, division of variables, and working with all information simultaneously. A visual representation of the conceptual model of this thesis is therefore presented in Figure 7. The framework hypothesizes the relationships between digital literacy, information literacy, performance expectancy, effort expectancy, hedonic motivation, habit, and intention.

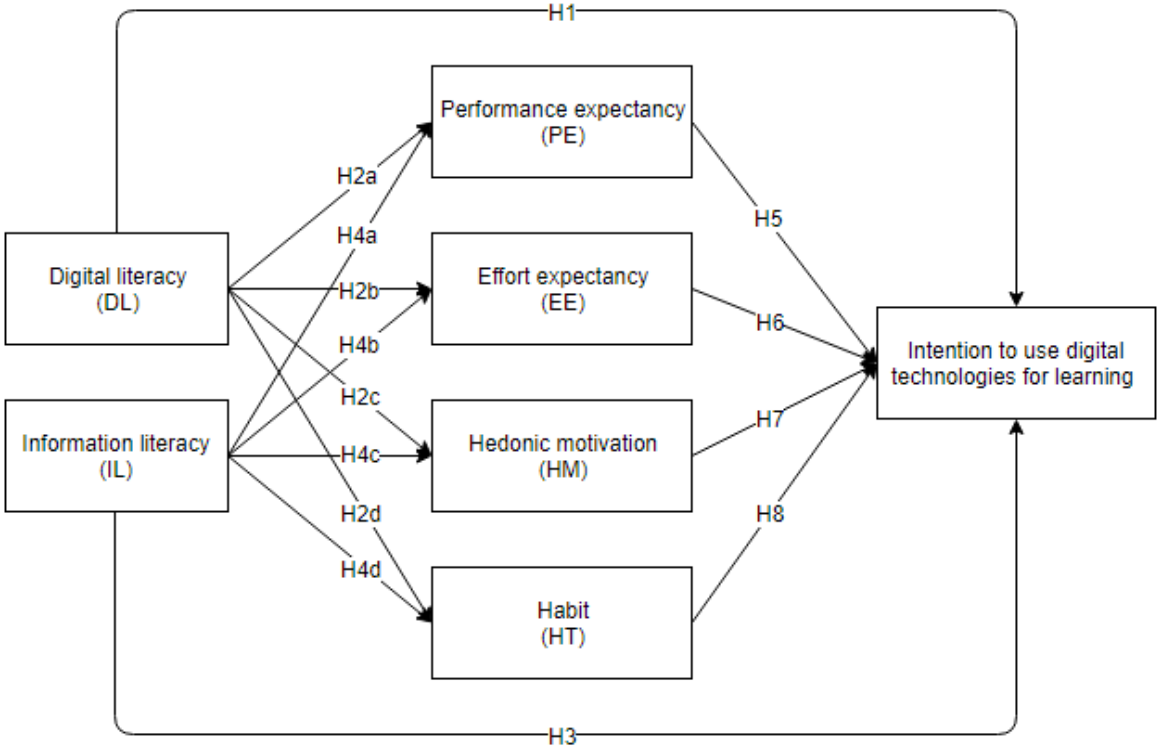


Figure 7. The conceptual model of this thesis

4 METHODOLOGY

According to Mahoney and Goertz (2006), the quantitative and qualitative approaches can be thought of as two cultures with different values, both of which make good sense depending on the goals of the research. The following chapter presents these two methodological approaches, followed by a motivation for the approach chosen in order to assess the proposed research questions.

4.1 Quantitative methods

The quantitative research approach is described by Bryman and Bell (2011) as "a research strategy that emphasizes quantification in the collection and analysis of data" (p. 26). This research approach is characterized by the testing of theories and an objective view of reality (Bryman & Bell, 2011). Quantitative approaches can be utilized when the aim of the research is to assess questions regarding quantity, frequency, connections or relationships, and the answers can be provided with measuring instruments which can be calculated or processed with statistical methods (Nyberg & Tidström, 2012). Quantitative analysis can therefore be thought of as the creative and curious usage of method for the sake of researching the relationship between theoretical ideas and empirical facts (Edling & Hedström, 2003).

Quantitative methods can often be used for testing hypotheses which have been formed based on prior literature (Nyberg & Tidström, 2012). The analysis of quantitative data helps determine if and how well the hypotheses are supported by the gathered data, while probabilities and relationships between different variables can also be examined (Nyberg & Tidström, 2012). Quantitative approaches have naturally also been subjected to criticism. The criticizing remarks tend to stem from a perspective where the social world is deemed unfit to be studied through a natural science model (Bryman & Bell, 2011).

4.2 Qualitative methods

Within the field of social- and behavioral sciences, quantitative approaches were most prominently used up until the 1980s, after which qualitative methods started to become more commonly used during the 1990s (Nyberg & Tidström, 2012). The qualitative research approach is described by Bryman and Bell (2011) as "a research strategy that

usually emphasizes words rather than quantification in the collection and analysis" (p. 27). This research approach is also characterized by the emphasis on the generation of theories and a continuously shifting view of reality that emerges from the individual (Bryman & Bell, 2011). In fact, it is pointed out by Bryman and Bell (2011) that "most qualitative researchers reveal a preference for seeing through the eyes of research participants" (p. 421).

Although some disagreement can be found over what exactly qualitative research entails (Bryman & Bell, 2011), distinctions can still be made in contrast to the quantitative approaches. As pointed out by Lowhorn (2007), qualitative methods attempt to interpret a given situation for a specific group instead of looking into phenomenon that are then generalized to a population. Furthermore, the overall nature of qualitative research tends to be more open-ended, as a presence of clear linear steps is lacking (Bryman & Bell, 2011). This can be seen in the view on theory, as theories and concepts often tend to be seen as outcomes of research and a way to explain the observed phenomenon (Lowhorn, 2007; Bryman & Bell, 2011). However, in spite of this generalization, qualitative research can be employed both for the generation as well as the testing of theories (Bryman & Bell, 2011). Nevertheless, just as the quantitative approaches, qualitative methods have also received their share of criticisms. A common subject of remarks is the unease regarding reliability and validity criteria, as the application is deemed simpler in association with quantitative methods (Bryman & Bell, 2011).

As pointed out by Nyberg and Tidström (2012), it can occasionally be beneficial to combine qualitative and quantitative methods in the same research, as the results of these two approaches can support each other. An example of a situation where the combination could be beneficial is case studies (Nyberg & Tidström, 2012). Furthermore, as mentioned by Mahoney and Goertz (2006), "Quantitative analysis inherently involves the use of numbers, but all statistical analyses also rely heavily on words for interpretation. Qualitative studies quite frequently employ numerical data; many qualitative techniques in fact require quantitative information" (p. 245). The merging of the two approaches can therefore occasionally be considered quite natural, as the methods themselves can already employ parts from one another.

4.3 Chosen method

This thesis aims to obtain knowledge regarding the impact of information- and digital literacy on the intention to use digital technologies for learning. In order to propose and test out a conceptual model for the subject, a quantitative research approach has been chosen to utilize and build upon prior research in literacy and technology acceptance. The decision to use a quantitative research approach is motivated with the intention to assess relationships between variables which are based on prior research in the subject area. Since prior research is used as a basis for the proposed conceptual model, the model must be empirically tested and quantitative data analysis is suitable to assess the functionality of the model. Furthermore, as the population of interest is university students in Finland, a quantitative analysis of sample data will enable the generalization of the results for the phenomenon of interest.

4.4 Alternative approaches

As qualitative and quantitative approaches aim to explain phenomenon from different angles, both research approaches are valid choices depending on the context of the research (Lowhorn, 2007). Therefore, in addition to the chosen method, the impact of information- and digital literacy on the intention to use digital technologies for learning could naturally also be assessed through qualitative research approaches. Qualitative methods, such as interviews or observations, could allow exploration of underlying experiences as well as more abstract information that might be unattainable through numerical measurements. This could be of interest for further research after the validation of the presented framework.

If the aim of the study was not to create generalized hypotheses about the population, and the context of the study was a smaller segment, qualitative approaches could be utilized to gain more anthropological and ethnographic insights of the subject matter. Group discussions could be used for deeper investigation of underlying beliefs, interviews could be utilized in order to obtain knowledge of underlying conditions and experiences, and document analysis could be employed for deeper exploration of prior literature and other media materials (Hammarberg, Kirkman, & Lacey, 2016). While these approaches could indeed enable a different depth in the subject matter, it is precisely this case specificity that would interfere with the generalization of findings (Bryman & Bell, 2011). Yet, as

mentioned by Bryman and Bell (2011), "the findings of qualitative research are to generalize to theory rather than to populations" (p. 408-409). The methods mentioned could therefore be suitable in a slightly altered context or perspective.

4.5 Ethical considerations

Every student and researcher possesses an ethical and juridical responsibility for the conducted research with regard to high quality and good scientific practice (Nyberg & Tidström, 2012). This entails that researchers must strive to provide a truthful image of the subject of research, and this discussion regarding the ethical considerations of research has led to the development of ethical standards in publishing. According to the American Psychological Association (2009, p. 11), the principles of ethics stand in place in order to guarantee accuracy, to safeguard the rights of participants and to protect rights when it comes to intellectual property.

As with any questionnaire-based research, the collection and usage of the collected data demands consideration with regard to the welfare of the research participants. Therefore, participants were notified of the intention of the study before participation. The results were declared to be presented in generalized manners, and personal information would not be connected to the answers although participants could give out their email whether they chose to do so. Participants were also notified of who would have access to the data, and by proceeding to participate in the study, participants gave their consent to store and analyze the data for the intended purpose of the thesis.

4.6 Application of method

The quantitative research approach was carried out with survey research, which is defined by Bryman and Bell (2011) as "a cross-sectional design in relation to which data are collected predominately by questionnaire or by structured interview on more than one case […] and at a single point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables […] which are then examined to detect patterns of association" (p. 54). For this thesis, a questionnaire was chosen due to the quantitative nature of the research. The data of this thesis were collected with a self-completion questionnaire which was developed with the Webropol online survey tool (https://webropol.com). A self-completion questionnaire is completed by the participants

themselves as they answer the presented questions (Bryman & Bell, 2011). As concerns data gathering through a social survey design, self-completion questionnaires are one of the primary tools (Bryman & Bell, 2011).

The aim of this research was to explore how information- and digital literacy can affect the intention to use digital technologies for learning in the context of a university environment in Finland. The selected sample was therefore university students and university employees. Both domestic and international students were welcome to participate.

4.7 Data collection

The questionnaire for this study was designed to obtain the thoughts and opinions of the participants, with regard to their intention to use digital technologies for learning purposes. In order to do this, the questionnaire was made to consist of 16 questions. Questions 1-7 assess the background information of the participants, including questions regarding gender, age, educational background, current occupation, access to digital technologies, frequency of software use and self-reported proficiency of software use. Following the background information, questions 8-14 were designed to measure the participants' perception of their information- and digital literacy, as well as to identify how the chosen UTAUT2 constructs affect their intention to use technology for learning purposes. Questions 8-14 were designed utilizing a seven-point Likert scale, ranging from 1 - strongly disagree to 7 - strongly agree (see Table 6). Finally, questions 15-16 were optional fields where the participant could enter their email or leave feedback regarding the questionnaire.

Table 6. Seven-point Likert scale

Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

All items in the questionnaire were in English, and the items in questions 8-14 were adapted from published sources in order to increase the reliability of the study. The information literacy items were modified from Kurbanoglu et al. (2006), the digital literacy items from Ng (2012) and the chosen UTAUT2 items from Venkatesh et al.

(2012). In total, questions 8-14 consisted of 41 measurement items that describe the 7 chosen constructs (see Appendix 1).

Before the distribution of the questionnaire, a small group of participants were asked to participate in respondent debriefing in order to test the questionnaire and provide feedback from their experience. As mentioned by Hess and Singer (1995), respondent debriefing is useful for assessing reliability as well as comprehension. The gathered feedback was then utilized to make small modifications such as rewording questions, providing explanations and examples, rearranging questionnaire items, and altering the layout of the questionnaire structure.

As the target audience of this study was university students and employees and the study was conducted during the summer months, the questionnaire was distributed through several channels. The questionnaire was published on the 1st of August 2019 and the URL for the questionnaire was distributed through a combination of private links, a public link and flyers. First, the private links were emailed to some university students and employees. Then, a public link was distributed publicly via two social media sites: Facebook and LinkedIn. In addition to this, flyers were printed out containing the URL and a Quick Response (QR) code which participants could scan to access the questionnaire. These flyers were distributed at the campuses of Åbo Akademi University, University of Turku, University of Vaasa, University of Helsinki, and also at some student residential areas. In order to motivate potential participants, an incentive was offered through the possibility to participate in a raffle for movie tickets. Participation in the raffle was optional, as participants could choose whether or not they wished to provide their email at the end of the questionnaire. The participants were notified that the questionnaire would still be completely anonymous as the email addresses would not be connected with the answers in any way. The questionnaire was open until the 25th of August 2019.

4.8 Quantitative data analysis

Statistical analysis has functioned as a valuable tool for over a century, and the possibilities for applications have evolved over time due to development of hardware, software, user-friendly interfaces and new ways of delivering knowledge with technology (Hair, Hult, Ringle, & Sarstedt, 2017). One of these methods is structural equation modeling (SEM), which makes it possible to study unobservable variables through indirect measures via indicator variables (Hair et al., 2017). The SEM methods can be

divided into covariance-based SEM (CB-SEM) which is mainly utilized for confirmation or rejection of theories, and partial least squares SEM (PLS-SEM) which can be implemented in exploratory research in order to develop theories (Hair et al., 2017). As this thesis aims to propose a framework, PLS-SEM will be utilized as the chosen statistical method.

PLS-SEM, also known as PLS path modeling, utilizes diagrams in order to visually present hypotheses and relationships between variables while applying SEM (Hair et al., 2017). A PLS path model consists of a structural model, where relationships between constructs are illustrated with single-headed arrows (Hair et al., 2017). These arrows are considered to represent predictive relationships, and given a supporting theoretical background, they can be construed as causal relationships (Hair et al., 2017). In order to assess these relationships, the constructs are measured through indicator variables, also known as items, which comprise of all the gathered raw data (Hair et al., 2017). The PLS-SEM method enables therefore the possibility to "estimate complex models with many constructs, indicator variables and structural paths without imposing distributional assumptions on the data" (Hair, Risher, Sarstedt, & Ringle, 2019, p. 2).

According to Hair et al. (2019), PLS-SEM should be used when a researcher is testing a theoretical framework in a predictive context. This is the case with this thesis, as the proposed conceptual model aims to predict the intention to use digital technologies for learning purposes. PLS-SEM is also recommended for cases where a complex structural model is present and several constructs are included (Hair et al., 2019). The conceptual model of this thesis consists of seven constructs and 14 hypothesized relationships, making PLS-SEM a suitable tool for assessment. Furthermore, Hair et al. (2019) recommend PLS-SEM for theoretical extensions of previously presented theories, which is the case with this thesis as it utilizes and builds upon the prior work of Kurbanoglu (2006), Ng (2012) and Venkatesh et al. (2012). Due to the concluded suitability of the method for the thesis at hand, PLS-SEM was applied using the SmartPLS software (https://www.smartpls.com) in order to analyze the data gathered via the questionnaire.

5 RESULTS AND ANALYSIS

Following the methodological approach presented in the previous chapter, this chapter exhibits the results of the conducted research. The gathered data are introduced through a descriptive analysis, followed by measurement model results and conceptual model results. A multi-group analysis and mediation analysis are also presented. Before conducting any of the data analysis, 8 out of the 257 participants had to be removed due to unengaged or incomplete responses. The analysis was then conducted on the obtained data of 249 respondents.

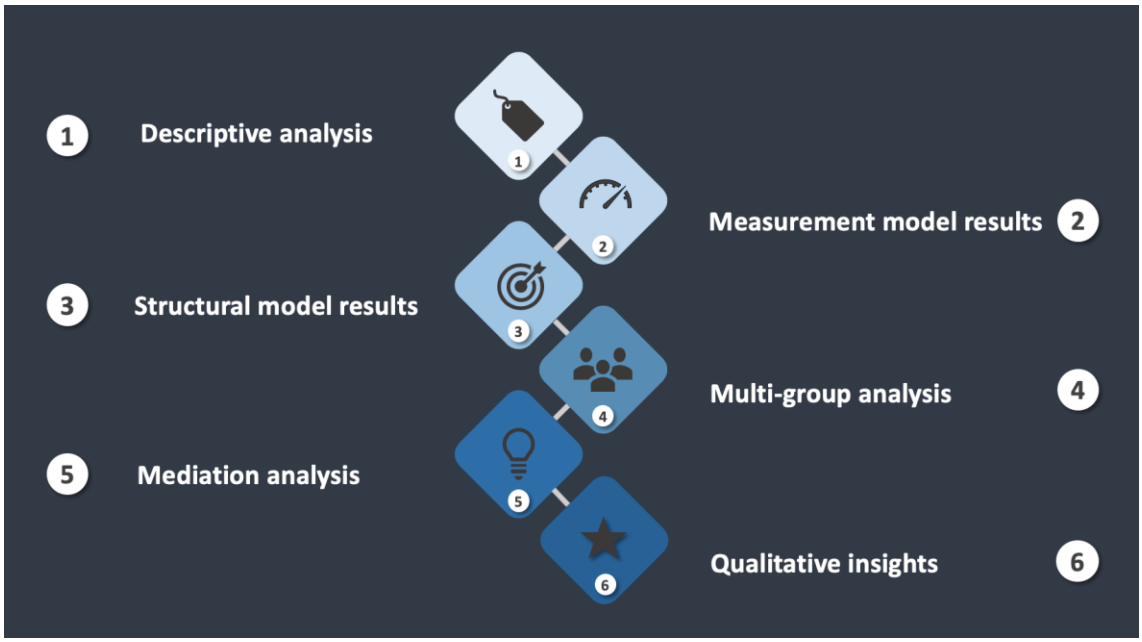


Figure 8. The structure of results analysis

5.1 Descriptive analysis

The first seven questions of the survey were designed to gather background and demographic information of the sample. The information obtained was then processed and analyzed with Microsoft Excel and IMB SPSS v.24. The first background information question assessed gender. Out of the sample of 249 respondents, 147 (59.0%) were females and 99 (39.8%) were males. The remaining 3 (1.2%) identified as other. The gender division is illustrated in Table 7. The age of the sample respondents ranged from 18 to 66 years old. Most of the participants were within the age bracket 20-29 (58.6%) and the second largest group was 30-39 (17.3%), followed by the third largest bracket 40-

49 (13.7%). The smallest age brackets were 50-60 (5.2%), over 60 (4.0%) and under 20 (1.2%). The age distribution is illustrated in Table 7.

Table 7. Distribution of gender and age

	Frequency	Percentage
Gender		
Female	147	59.0
Male	99	39.8
Other	3	1.2
Age		
<20	3	1.2
20-29	146	58.6
30-39	43	17.3
40-49	34	13.7
50-60	13	5.2
>60	10	4.0

When asked about the respondents' highest level of education, the majority 87 (34.9%) reported to have a bachelor's degree, 57 (22.9%) reported a Ph.D. degree, 53 (21.3%) reported a master's degree, 49 (19.7%) reported a high school diploma, and 3 (1.2%) answered other. Moreover, when asked about their current occupation in the university, 153 (61.4%) were university students, 90 (36.1%) were teaching and research employees, 8 (3.2%) were administration employees, and 29 (11.6%) reported to have other duties at the university. The question regarding occupation was a multiple-choice matrix, thus, participants who both studied and worked at the university would not have to choose between these roles. The educational and occupational data are illustrated in Table 8.

Table 8. Participant education and occupation

	Frequency	Percentage
Education		
High school diploma	49	19.7
Bachelor's degree	87	34.9
Master's degree	53	21.3
Ph.D.	57	22.9
Other	3	1.2
Occupation		
Student	153	61.4

Teaching and research	90	36.1
University administration	8	3.2
Other	29	11.6

Respondents were also asked to provide background information regarding their access to digital technologies, their frequency of software application use, as well as a self-report rating of proficiency. Regarding access, respondents were asked to answer on a 5-point Likert scale (1 = do not use, 2 = a few times a month or less, 3 = a few times a week, 4 = about once a day, 5 = several times each day). From the sample, the usage of a mobile smartphone scored M = 4.95, laptop computer usage scored M = 4.31, and desktop computer usage scored M = 2.92. The usage of these devices, as well as tablets, game consoles and wearable devices, is illustrated in Figure 9.

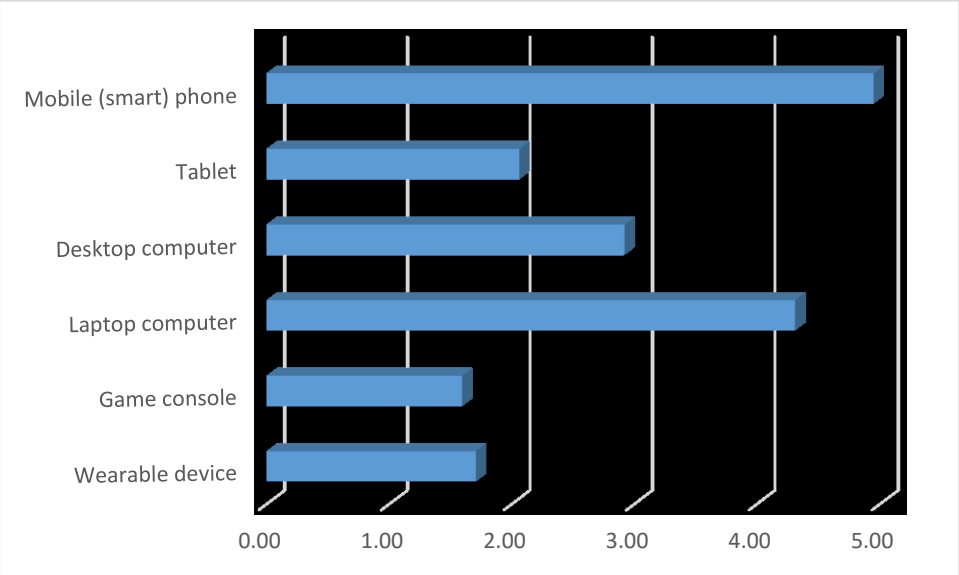


Figure 9. The usage of digital technologies

Regarding the frequency of software application use, respondents were asked to answer on a 5-point Likert scale (1 = do not use, 2 = a few times a month or less, 3 = a few times a week, 4 = about once a day, 5 = several times each day). Email services were the most prominently utilized with a score of M = 4.77, followed by social media at M = 4.58 and word processors at M = 3.84. The frequency of usage is shown in Figure 10.

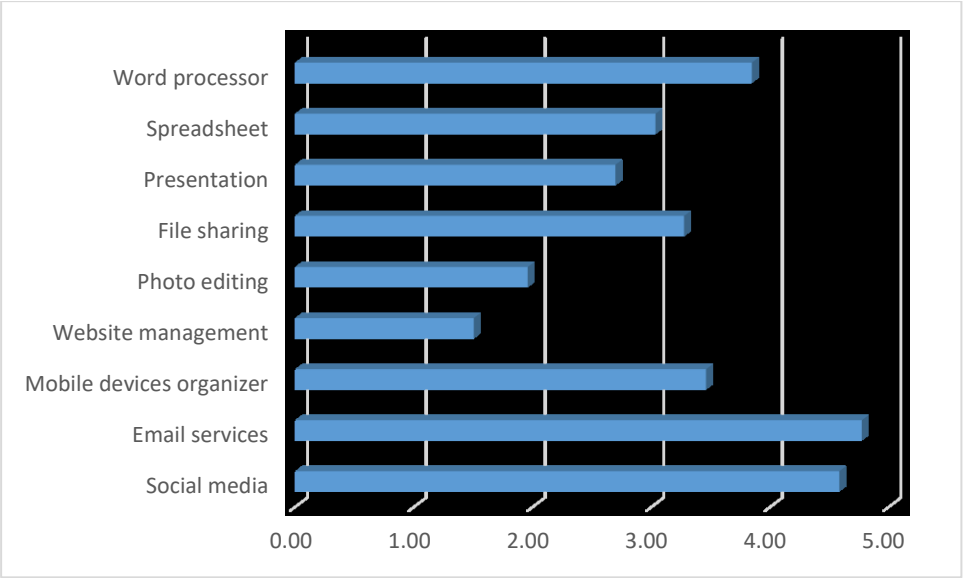


Figure 10. Frequency of usage

Regarding self-reported proficiency, respondents were asked to answer on a 7-point Likert scale (1 = not proficient at all, 7 = very proficient). The respondents reported to be most proficient in using email services with an average score of M = 6.11, word processors M = 5.91 and social media M = 5.53. With regard to the lowest levels of proficiency, however, the respondents reported to be least proficient in using website management tools with an average score of M = 2.54, photo editing M = 3.22 and spreadsheets M = 4.45. The self-reported proficiency is illustrated in Figure 11.

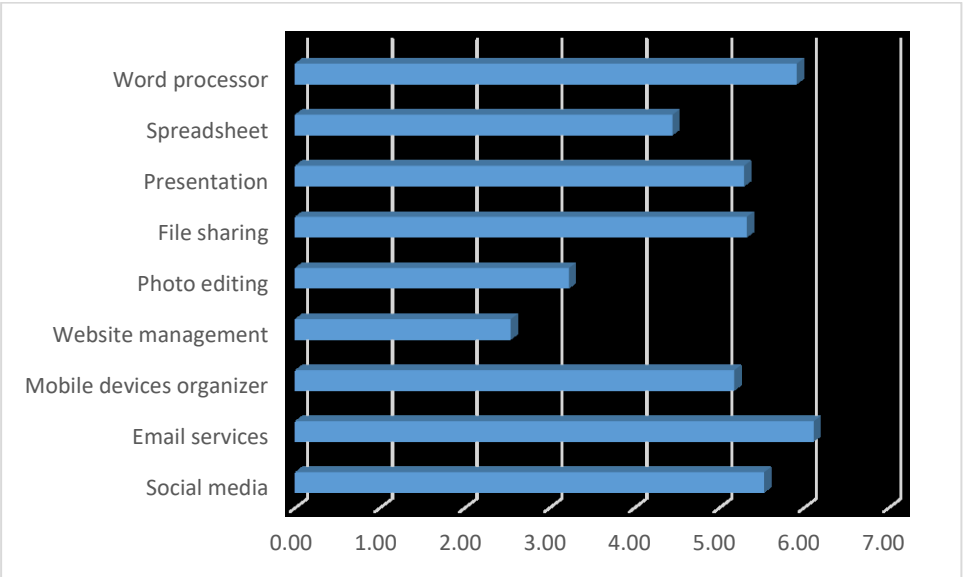


Figure 11. Self-reported proficiency of software application usage

5.2 Measurement model results

The measurement model was assessed with a confirmatory factor analysis (CFA), where the analysis plan is steered by the relationships that occur among the variables (Schreiber, Nora, Stage, Barlow & King, 2006). In CFA, a hypothesized model is utilized in order to make an estimation of a population covariance matrix which is then compared with the observed covariance matrix, as the aim is to minimize the differences between the two (Schreiber, 2006). In order to test the validity, both convergent- and discriminant validity were measured.

The convergent validity was tested with composite reliability (CR) and the average variance extracted (AVE). The composite reliability results can be seen in Table 9, where the values range from 0.856 to 0.962. All the values are higher than 0.70, which is the recommended value (Hair et al., 2011). The AVE scores can also be seen in Table 9, where they range from 0.600 to 0.863. These scores are also above the recommended score of 0.5 (Hair et al., 2011). Furthermore, also the Cronbach's alphas values were higher than the recommended value of 0.70 (Cortina, 1993). The item loadings were all above the value of 0.70 except for DL_6 and HT_2 which had the values of 0.681 and 0.684. These values are however acceptable (Hair, Black, Babin & Anderson, 2010). In order to obtain acceptable values and improve the model, a total of eight items were removed from the constructs due to low loadings values.

Table 9. Reliability and validity

Construct	Item	Loadings	Cronbach's α	CR	AVE
Digital literacy	DL_1	0.864	0.913	0.934	0.703
	DL_2	0.912			
	DL_3	0.883			
	DL_4	0.896			
	DL_5	0.772			
	DL_6	0.681			
Effort expectancy	EE_1	0.941	0.947	0.962	0.863
	EE_2	0.906			
	EE_3	0.922			
	EE_4	0.946			
Habit	HT_1	0.877	0.762	0.856	0.667
	HT_2	0.684			
	HT_4	0.875			
Hedonic motivation	HM_1	0.940	0.921	0.950	0.863

	HM_2	0.952			
	HM_4	0.894			
Information literacy	IL_1	0.753	0.918	0.931	0.600
	IL_2	0.799			
	IL_4	0.769			
	IL_5	0.731			
	IL_6	0.810			
	IL_7	0.750			
	IL_8	0.767			
	IL_9	0.812			
	IL_10	0.778			
Intention to use	IN_1	0.833	0.869	0.910	0.718
	IN_2	0.906			
	IN_4	0.815			
	IN_5	0.831			
Performance expectancy	PE_1	0.863	0.851	0.900	0.693
	PE_2	0.877			
	PE_3	0.858			
	PE_4	0.723			

The discriminant validity was measured through the square root of the AVE according to the Fornell and Larcker criterion, according to which the square root of all the AVE values should be above the value of the correlations which can be seen among them (Fornell & Larcker, 1981). The results for all constructs can be seen in

Table ***10***. The discriminant validity is therefore confirmed, as the gathered values are above the correlations.

Table 10. Discriminant validity with the Fornell-Larcker criterion

	DL	EE	HB	HM	IL	INT	PE
DL	**0.839**						
EE	0.822	**0.929**					
HT	0.394	0.505	**0.817**				
HM	0.515	0.608	0.525	**0.929**			
IL	0.517	0.468	0.184	0.176	**0.775**		
INT	0.341	0.403	0.538	0.326	0.403	**0.847**	
PE	0.459	0.516	0.519	0.493	0.366	0.551	**0.832**

Note: DL= Digital literacy; EE = Effort expectancy; HT = Habit; HM = Hedonic motivation; IL = Information literacy; INT = Intention to use technology; PE = Performance expectancy

In addition to the Fornell-Larcker criterion, the discriminant validity was also assessed with the Heterotrait-Monotrait Ratio (HTMT). HTMT can be used as a criterion through comparing it to threshold levels established in advance, such as 0.85 (Kline, 2011) or 0.90 (Teo, Srivastava & Jiang, 2008). The results for all constructs can be seen in Table 11. All but one value, EE - DL 0.875, are below the threshold level of 0.85, and even the one exception is below the threshold level of 0.90. The discriminant validity is therefore confirmed.

Table 11. Discriminant validity with the Heterotrait-Monotrait Ratio

	DL	EE	HB	HM	IL	INT	PE
DL							
EE	0.875						
HT	0.448	0.568					
HM	0.554	0.649	0.625				
IL	0.544	0.477	0.198	0.177			
INT	0.386	0.439	0.595	0.354	0.434		
PE	0.521	0.575	0.574	0.555	0.398	0.621	

Note: DL= Digital literacy; EE = Effort expectancy; HT = Habit; HM = Hedonic motivation; IL = Information literacy; INT = Intention to use technology; PE = Performance expectancy

5.3 Structural model results

The conceptual model introduced in Section 3.3 is examined through structural equation modelling (SEM) using SmartPLS version 3.2.8, where bootstrapping is applied in order to obtain significant level values and coefficient values. The path coefficients are tested in order to examine the hypotheses. The intention to use digital technologies for learning was explained by a variance of 40%. Performance expectancy was explained by a variance of 23%, effort expectancy by 68%, hedonic motivation by 28% and habit by 16%, respectively. These R Square values and the path relationships are illustrated in Figure 12.

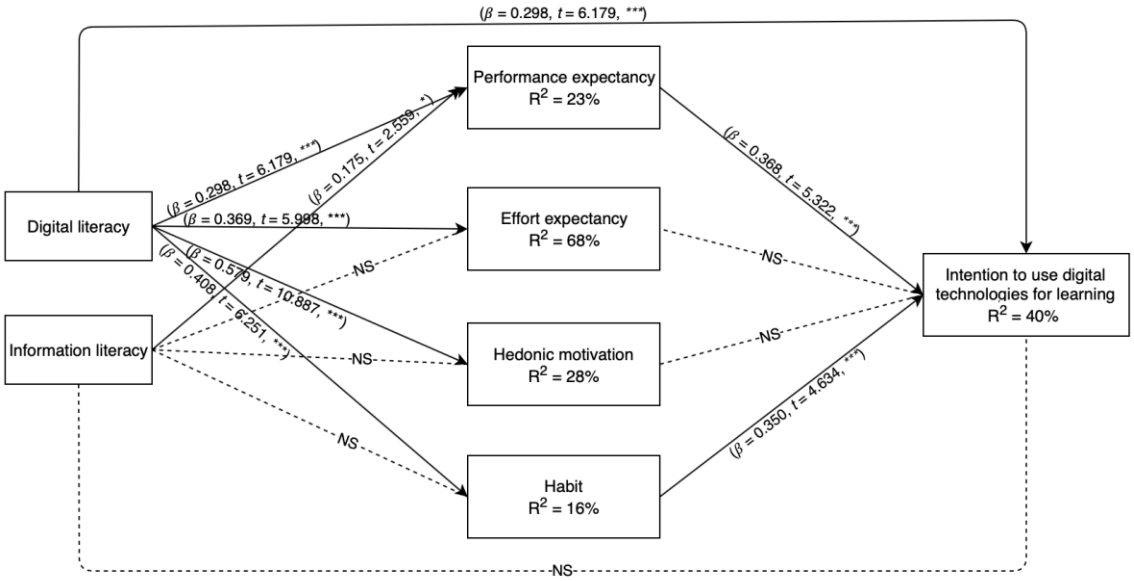


Figure 12. Structural model results

Notes: *** p-value < 0.001; ** p-value < 0.005; * p-value < 0.01

According to the results of the SEM analysis, the relationship between digital literacy and the intention to use digital technologies for learning is significant ($\beta = 0.298$, $t = 6.179$, $p < 0.001$), thus the H1 is supported by the model. The SEM analysis also shows significant paths from digital literacy to performance expectancy ($\beta = 0.369$, $t = 5.998$, $p < 0.001$), effort expectancy ($\beta = 0.792$, $t = 22.021$, $p < 0.001$), hedonic motivation ($\beta = 0.579$, $t = 10.887$, $p < 0.001$) as well as habit ($\beta = 0.408$, $t = 6.251$, $p < 0.001$). This entails that H2a, H2b, H2c and H2d are supported by the model.

As for the information literacy construct, the SEM analysis revealed no direct effect on the intention to use digital technologies for learning, and thus, H3 is not supported by the model. However, information literacy was found to have a significant path to performance expectancy ($\beta = 0.175$, $t = 2.559$, $p < 0.01$), and thus, the model supports H4a. The relationships between information literacy and effort expectancy, hedonic motivation and habit did, however, not show a significant path. This entails that H4b, H4c and H4d are not supported by the model.

The results of the SEM analysis also showed that the relationship between performance expectancy and the intention to use digital technologies for learning is significant ($\beta = 0.368$, $t = 5.322$, $p < 0.001$), thus H5 is supported by the model. According to the results of the SEM analysis, effort expectancy and hedonic motivation do, however, not have

significant paths to intention to use digital technologies for learning. H6 and H7 are therefore not supported by the model. Finally, the relationship between habit and intention to use was, however, found significant (β = 0.350, t = 4.634, $p < 0.001$), which entails that the model supports H8.

5.4 Multi-Group Analysis

As done by Venkatesh et al. (2012), age and gender were also used as mediators in this study in order to explore whether path relationships differ within groups. In addition, proficiency was also chosen as an additional control variable, based on the survey answers to self-report ratings of proficiency. These groups were then analyzed with Multi-Group Analysis (MGA).

For gender, the group was divided in to two subgroups: female and male. While the questionnaire survey enabled participants to choose "other" as their gender, only three respondents chose this option, and due to the limited number of participants in this group, it was not regarded as a subgroup in the MGA. The results of the MGA indicate that some differences can be found between females and males. The path relationship between effort expectancy and intention to use digital technologies for learning was found significant for females (β = 0.247, t = 2.813, $p < 0.005$), but not for males. In addition, hedonic motivation was found to have a significant relationship to intention to use digital technologies for learning for females (β = -0.270, t = 3.800, $p < 0.001$), but not for males. However, information literacy was found to have a significant path to intention to use digital technologies for learning for males (β = 0.318, t = 4.149, $p < 0.001$), but not for females. The final difference between the two groups was that the relationship between performance expectancy and intention was found significant for females (β = 0.334, t = 4.538, $p < 0.001$), but not for males.

Regarding age, the respondents were divided into two subgroups: digital natives and digital immigrants. The point of division was drawn at 1980, as suggested by Prensky (2001a; 2001b). Those born during and after 1980 are considered digital natives, while those born before 1980 are considered digital immigrants. The results of the MGA indicate that some differences can also be found between these groups. The path relationship between habit and intention to use digital technologies for learning was found significant for digital immigrants (β = 0.349, t = 3.520, $p < 0.001$), but not for digital

natives. In addition, information literacy was found to have a significant relationship to performance expectancy for digital immigrants ($\beta = 0.271$, $t = 2.744$, $p < 0.01$), but not for digital natives. Finally, the relationship between performance expectancy and intention to use digital technologies for learning was found significant for digital immigrants ($\beta = 0.446$, $t = 4.850$, $p < 0.01$), but not for digital natives.

For the MGA regarding proficiency, the respondents were divided into two subgroups: high proficiency and low proficiency. Based on the survey answers to self-report ratings of proficiency, where the questions were to be answered on a 7-point Likert-Scale, an average was drawn from the respondent's answers. The respondents were then divided into the two groups as the point of division was drawn at 4,5. The line was chosen to be drawn at this point in order to make the groups more similar in size. The results of the then conducted MGA indicate that some differences can also be found between these groups. The path relationship between information literacy and performance expectancy was found significant for the low proficiency group ($\beta = 0.317$, $t = 3.686$, $p < 0.001$), but not for the high proficiency group. In addition, through a more liberal perception of the p-value, effort expectancy was found to have a significant path to intention to use digital technologies for learning for the high proficiency group ($\beta = 0.197$, $t = 2.227$, $p < 0.026$), but not for the low proficiency group.

5.5 Mediation analysis

A mediation analysis was also conducted in order to see whether the four constructs in the model, i.e., performance expectancy, effort expectancy, hedonic motivation and habit mediate the relationship between information literacy and digital literacy to intention to use digital technologies for learning. The results of total indirect effects show that the path between digital literacy and intention to use digital technologies for learning is significant ($\beta = 0.370$, t = 7.230, $p < 0.001$) and the results of the specific indirect effects show that the relationship between digital literacy and intention is mediated by habit ($\beta = 0.143$, t = 4.064, $p < 0.001$). This means that the path between digital literacy and intention to use digital technologies for learning is partially mediated by habit. The results of the specific indirect effects also show that the relationship between digital literacy and intention to use digital technologies for learning is mediated by performance expectancy ($\beta = 0.136$, t = 3.880, p < 0.001). This means that the relationship is partially mediated by performance expectancy.

5.6 Qualitative insights

Although this thesis aims to explore the topic of literacy through a quantitative approach, the participants of the study also had an opportunity to provide additional comments in an optional text field at the end of the questionnaire survey. Out of the 249 participants, 36 chose to write something in the optional comment section. A central theme derived from the comments is that the participants seemed to become more reflecting about their relationship with digital technologies during their participation in the study. This theme is highlighted in the following comment:

> *I'm a librarian, and I think these questions were interesting. They made me think about my relationship with technology, which has become a huge part of my daily life. I currently study computer science, so digital technologies are very familiar to me, and I imagine that's not going to change anytime soon. The experience I've gained during my studies and work has made me pretty proficient with technology, and I feel like I usually have at least an idea of where to go, when I need to find information (Google, usually). Nevertheless, I do prefer reading a non-fiction book for getting more information on a specific subject - but even finding the book usually requires making a search on the library's website.*
>
> - *Participant #41*

Moreover, *Participant #224* noted that "The survey was good and opened for a better understanding of my own use of digital tools". A similar theme is present in the comments by participants #192 and #74 who commented "Interesting survey, made me think about my bad habits like using digital technologies too often" and "Very interesting questions that provoke me to think how I actually use digital materials for learning".

Other comments highlighted some negative associations with the use of digital technologies. As mentioned by Participant #152, "I tended to find digital technology useful in the past, but I have lately felt that it can also be a very ugly weapon. Therefore, I rather try to meet people face-2-face and live instead as opposed to digital communication". Furthermore, a comment by Participant #162 states that "Digital technologies are useful as well as addictive as well as time consuming in my case". Also,

whether interpreted negatively or positively, Participant #100 noted that “There are no alternatives to digital technologies anymore”.

6 DISCUSSION

By applying performance expectancy, effort expectancy, hedonic motivation and habit from the previously established UTAUT2 framework, in addition to information literacy and digital literacy, this thesis builds upon prior research through the contribution of a conceptual model for investigating intention to use digital technologies for learning purposes. This discussion chapter focuses on the main findings of the conducted research, their contribution and the implications of the results.

6.1 Main findings

The aim of this thesis is to research the impact of digital literacy and information literacy on the intention to use digital technologies for learning. In order to carry out the research, a conceptual model was developed based on prior literature on digital literacy, information literacy and some of the important determinants from technology acceptance models (UTAUT2: Venkatesh et al., 2012) in relation to individual's intention to use technology. Performance expectancy, effort expectancy, hedonic motivation and habit were chosen from the UTAUT2 model (Venkatesh et al., 2012) and incorporated in a new conceptual model also encompassing digital literacy and information literacy. The new model was then examined through structural equation modelling and the results of the hypothesis testing are presented in Table 12.

Table 12. An overview of the supported and rejected hypotheses

Hx	Hypotheses	Supported?
H1	Digital literacy is positively related to the intention to use digital technologies for learning	Y
H2a	Digital literacy is positively related to performance expectancy	Y
H2b	Digital literacy is positively related to effort expectancy	Y
H2c	Digital literacy is positively related to hedonic motivation	Y
H2d	Digital literacy is positively related to habit	Y
H3	Information literacy is positively related to the intention to use digital technologies for learning	N
H4a	Information literacy is positively related to performance expectancy	Y
H4b	Information literacy is positively related to effort expectancy	N
H4c	Information literacy is positively related to hedonic motivation	N

H4d	Information literacy is positively related to habit	N
H5	Performance expectancy is positively related to the intention to use digital technologies for learning	Y
H6	Effort expectancy is positively related to the intention to use digital technologies for learning	N
H7	Hedonic motivation is positively related to the intention to use digital technologies for learning	N
H8	Habit is positively related to intention to use digital technologies for learning	Y

As stated in Section 1.6, it was expected that higher perception of one's own literacy levels has a positive effect on the intention to use digital technologies for learning purposes. Regarding the chosen constructs that reflect an individual's expectations, it was also expected that positive perceptions regarding performance, effort, hedonic motivation and habit could have positive effects on the individual's intentions to use digital technologies for learning. The findings presented in Section 5.3 suggest that digital literacy, indeed, has a significant indirect relationship to the intention to use digital technologies for learning. Moreover, the results also indicate that digital literacy has a positive impact on performance expectancy, effort expectancy, hedonic motivation and habit. This aligns with the prior research by Mohammadyari and Singh (2015), who also found that digital literacy has a significant relationship to performance expectancy and effort expectancy. Furthermore, a positive relationship between digital literacy and the attitude to use digital technologies was also confirmed by Nikou et al. (2018). The results of this thesis therefore also comply with the findings of Nikou et al. (2018).

Diverging from the expected results, the findings of this thesis indicate that a significant relationship cannot be found between information literacy and the intention to use digital technologies for learning. These results are not consistent with the prior research by Nikou et al. (2018) who found that information literacy has a significant relationship to attitude toward using digital technologies, which in turn has a significant relation to the intention to use digital technologies. The relationships between information literacy and effort expectancy, hedonic motivation and habit also diverged from the expected results since no significant relationships could be found. However, information literacy was found to have a positive impact on performance expectancy, which aligns with the expected results.

According to prior research by Venkatesh (2003, 2012), performance expectancy, effort expectancy, hedonic motivation and habit were found to be significant predictors of behavioral intention. Therefore, these constructs were expected to have similar relationships in the proposed model of this thesis. However, this was the case only for performance expectancy and habit, as no significant relationships could be confirmed between effort expectancy and intention to use or hedonic motivation and intention to use. The results are therefore somewhat contradictory with the prior literature. However, it is noteworthy to mention that the context of the research differs from the prior research as the intention construct was altered to encompass learning. This could explain some of the inconsistencies in results.

Additionally, differences in results could be found when taking age, gender and levels of proficiency into consideration. According to the findings, females' expectations of effort, expectations of performance and their hedonic motivation have an impact on their intention to use technologies for learning. Whereas, for males, it was found that information literacy has an effect on the intention to use digital technologies for learning purposes. Moreover, regarding age and the division of the participants into digital natives and digital immigrants based on their age character, the results showed that the digital immigrants' intention to use digital technologies for learning is affected by their information literacy, expectations for performance and habit. Finally, regarding proficiency and the division of the participants into a high proficiency and low proficiency group, the findings indicated that for individuals with low proficiency in digital technologies, information literacy affects their expectations of performance. Whereas, for individuals with high proficiency, expectations of effort impact their intention to use digital technologies for learning. Gender, age and proficiency differences are therefore a present aspect when looking into the relationships between digital literacy, information literacy and the intention to use digital technologies for learning.

6.2 Conclusion

The aim of this thesis was to assess the impact that digital literacy and information literacy can have on the intention to use of digital technologies for learning. The results of the thesis confirmed 8 out of 14 hypotheses. The research questions aimed to assess were the following:

- **RQ1:** Does digital literacy affect the intention to use digital technologies for learning purposes, and if so, through what mediators?
- **RQ2:** Does information literacy affect the intention to use digital technologies for learning purposes, and if so, through what mediators?

Assessing the first research question regarding the relationship between digital literacy and the intention to use digital technologies for learning, the results support a relationship between the two. To begin with, the SEM analysis showed that digital literacy, indeed, has a positive impact on the intention to use digital technologies for learning. In addition, the results indicate that this relationship is partially mediated by performance expectancy and habit.

Concerning the second research question, the connection between information literacy and the intention to use digital technologies for learning, the findings are inconclusive as a significant direct relationship cannot be found between the two constructs. However, information literacy was found to have an impact on performance expectancy, which in turn was found to have an indirect effect to the intention to use. Differences in gender, age and proficiency with digital technologies as moderators were also found to play a part in the relationship between information literacy and the intention to use digital technologies for learning.

6.3 Theoretical contribution

The findings of this thesis have implications with regard to research contribution, societal consequences, as well as practical implications for policy makers. With regard to the academic contribution, this work builds upon previously established and validated literature while simultaneously providing a new conceptual model for investigating the impact of digital- and information literacy in the context of using digital technologies for learning purposes. The proposed conceptual model (see Figure 7) could be used to obtain additional insights from other settings and other geographical locations, in order to further explore the relationships between digital- and information literacy and the usage of digital technologies for learning.

6.4 Practical implications

Regarding societal consequences, the findings of this thesis can be of interest for universities and other learning environments utilizing digital technologies. Decision makers at the universities, professors, teachers, academic advisors, librarians and other university employees could benefit from the understanding of how digital- and information literacy can impact the learning of university students, and how these dimensions of literacy should therefore be considered and acknowledged in teaching and education as a whole. As pointed out by Laakso et al. (2018), "using educational technology instead of (or to complement) textbooks requires different approach in pedagogy, proper infrastructure for network and of course proper amount of devices" (p. 696). Considering this, efforts need to be taken in order to support the right type of pedagogical approaches and supporting infrastructures.

As for the practical implications, policy makers and academic developers can benefit from the obtained insights regarding university students and employee's intention to use digital technologies for learning, and how this can be affected by information literacy and digital literacy. As mentioned by Hill and Hannafin (2001), "technology capabilities hold considerable promise for teaching and learning, but current practices may prove insufficient in optimizing available resources and preparing individuals to learn in resource-rich environments" (p. 37). In addition, as pointed out by Warschauer (2007), "Unfortunately, many reform advocates have a romantic notion of the empowering potential of learning with new media, without taking into account the crucial role of more foundational forms of literacy and learning for personal and social advancement" (p. 44). A firmer consideration of digital literacy and information literacy within policy making might be able to support the preparation of coping with the resource richness.

As the research of this thesis was not only focused on university students, but also on university employees, the results also provide insight into the importance of digital literacy and information literacy in a workplace setting. As mentioned by Lloyd and Somerville (2006), information literacy is a key resource in a workplace setting, as it contributes to learning about the work and practices of the workplace. Decision makers at the universities and human resource management could therefore also benefit from the understanding of how digital- and information literacy can impact the learning of university employees, and how these dimensions of literacy should therefore be considered and acknowledged in the university as a workplace setting.

6.5 Limitations and future research directions

This thesis naturally also has some limitations. First, the data for the research was gathered from university students and employees from a couple of universities in Finland. The results are therefore not generalizable nationwide nor internationally. Future studies could therefore focus on other regions. Moreover, the research of this thesis had a quantitative focus, as the aim was to develop and examine a new conceptual model. As a new conceptual model has been presented, it would benefit from further testing and possible modifications. Future studies could, however, also implement qualitative approaches in order to explore underlying experiences and more abstract information which might impact individuals' intention to use digital technologies for learning. A combination of qualitative and quantitative methods could also be utilized in order to gain more depth and perspective in the research.

Furthermore, considering that the results of this thesis gave more insight into the impact of digital literacy than information literacy, the model could also be modified on this account. An alternative model could solely focus on digital literacy and its impact on the intention to use digital technologies for learning. In addition, other constructs and mediators could be incorporated within the model. An example of an alternative model is presented in Figure 13.

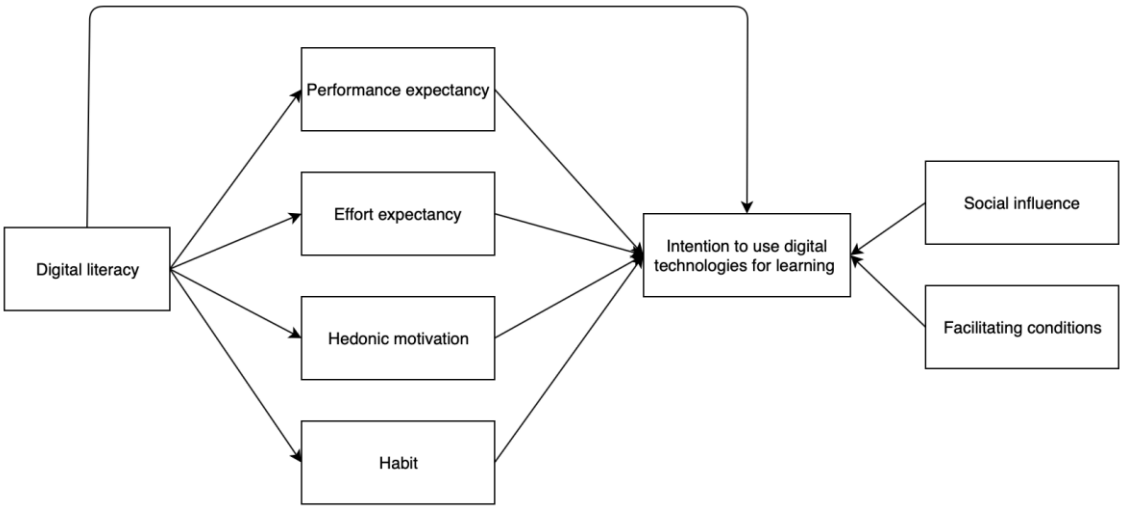


Figure 13. A modified alternative conceptual model

7 SUMMARY IN SWEDISH - SVENSK SAMMANFATTNING

Detta kapitel kommer att presentera en svensk sammanfattning av denna avhandling som undersöker hur digital kompetens och informationskompetens kan påverka avsikten att använda digitala teknologier för inlärningsändamål.

7.1 Inledning

Dagens samhälle kännetecknas av en genomgående digital transformation som sträcker sig till diverse delar av samhället. Ett av de berörda områdena är användningen av digitala verktyg i inlärningsmiljöer, som exempelvis universitet. Eftersom de digitala verktygen och nya teknologierna växer fram i snabb takt, ställs utbildningsinstitutioner inför nya möjligheter för undervisning och lärande. Vid universitet tar detta sig uttryck i att föreläsare och studeranden experimenterar med programvara, applikationer, molntjänster och andra onlineverktyg som Moodle, Kahoot, produktivitetssviter och sociala medier. De aktiviteter som man utför med dessa digitala verktyg kräver en uppsättning av kompetenser som sträcker sig utöver traditionell litteracitet (eng. *literacy*).

Enligt Nikou, Brännback och Widén (2018) har nya dimensioner av litteracitet dykt upp, vilket i sin tur har infört en revolution i användandet av litteracitet och dess effekter. Ett exempel på dessa dimensioner är digital kompetens, som omfattar förmågor som relaterar till tekniska, kognitiva och socioemotionella kunskaper (Eshet-Alkalai, 2004). Betydelsen av de nya dimensionerna av litteracitet är mer framträdande än någonsin tidigare. Behovet för informationskompetens har synnerligen existerat innan det digitala samhället, men dess betydelse har ökat avsevärt i dagens värld där enorma mängder ofiltrerat data finns tillgängliga online (Warschauer, 2007).

I motsats till förflutna icke-digitala miljöer, som har begränsat hur resurser skapats och distribuerats (Hill & Hannafin, 2001), främjar de tillgängliga digitala teknologierna ett nytt sätt att utnyttja resurser. Denna förändring har lett till utveckling av pedagogiska miljöer och utbildningsresurser har genomgått en metamorfos som drivs av den exponentiella tillväxten av informationssystem (Hill & Hannafin, 2001). Lärandets framtid är digital, och den snabba spridningen av de nya teknologierna kommer att ha en stor inverkan på lärande och litteracitet (Warschauer, 2007). Den exponentiella utvecklingen framhävs av det faktum att grundskoleelever med bärbara datorer och

höghastighetsinternet har mer informations- och kommunikationsresurser till sitt förfogande än alla forskare i världen för ett halvt sekel sedan (Warschauer, 2007).

7.2 Syfte och forskningsfrågor

Även om en del forskning har genomförts om kopplingarna mellan olika typer av litteracitet och användning av digitala teknologier (Eshet-Alkalai, 2004; Glister, 1997, Nikou m.fl., 2018), återstår det ett behov för en närmare undersökning av effekterna som digital kompetens och informationskompetens kan ha på empiriskt undersökta variabler som har bevisats påverka individers avsikter gällande teknologi, och hur detta i sin tur kan påverka avsikten att använda digitala teknologier för inlärning. Inlärning hänvisar här inte endast till formella inlärningsaktiviteter inom utbildningsmiljöer, utan även till informellt lärande som individer är med om dagligen. Syftet med denna avhandling är därmed att undersöka förhållandena mellan digital kompetens och informationskompetens i samband med digitalt lärande med hjälp av empiriskt validerade ramverk för teknologibeteende (eng. *technology behavior*).

Det huvudsakliga syftet med denna avhandling är att undersöka hur digital kompetens och informationskompetens kan påverka avsikten att använda digitala teknologier för inlärningsändamål. Denna avhandling undersöker både direkta effekter på avsikt samt indirekt påverkan genom empiriskt validerade konstruktioner som har bevisats påverka avsikten att använda teknologier. För att främja livslångt lärande och utnyttjande av digital teknologi på hållbara sätt, måste grupper som användare, lärare och beslutsfattare ha en förståelse av såväl förflutna som samtida problem kring digital kompetens.

Avhandlingen siktar även på att bidra med insikter för den relevanta litteraturen. Undersökningen kan vara av intresse för organisationer som arbetar med design av digitala verktyg som är avsedda att användas i lärandemiljöer. Utöver detta kan den kunskap som erhållits även hjälpa till att minska den digitala klyftan mellan digitalt infödda (eng. *digital natives*) och digitala invandrare (eng. *digital immigrants*), eftersom de som fötts in i den digitala världen kan ha olika sätt att använda teknologi för lärande än de som eventuellt behöver lära sig att använda själva teknologierna innan de kan utnyttja dem för inlärningsändamål.

För att uppfylla målen för denna avhandling har följande forskningsfrågor formulerats:

- **FF1:** Har informationskompetens en påverkan för avsikten att använda digitala teknologier för inlärningsändamål?
- **FF2:** Har digital kompetens en påverka, avsikten att använda digitala teknologier för inlärningsändamål?

7.3 Teori och litteraturöversikt

Litteracitet (eng. *literacy*) har traditionellt använts för att hänvisa till förmågor som relaterar till läs- och skrivkunnighet. Dessa förmågor lärs ut genom utbildningssystemet, de finns inbakade i dagliga aktiviteter och används som ett mått för befolkningens utbildningsnivå. Litteracitet är meningsfullt, eftersom det inte enbart stärker människor och möjliggör en chans att delta och bidra till samhället, utan det minskar även på fattigdom och skapar nya livsmöjligheter (UNESCO, 2019). Litteracitet är därmed ett kraftfullt begrepp, eftersom det omfattar en mängd viktiga färdigheter och förmågor. En omfattande definition av termen presenteras av American Library Association (ALA):

> *Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society (American Library Association, 2019).*

Med tiden har begreppet dock utvecklats, och därmed hänvisar det inte längre endast till konventionell läs- och skrivkunnighet. I det nuvarande klimatet kan litteracitet betraktas som ett medel för identifiering, förståelse, tolkning, skapande och kommunikation i en alltmer digital, textmedierad, informationsrik och snabbt föränderlig värld (UNESCO, 2019). Med tanke på den tekniska utvecklingen under de senaste decennierna är det bara naturligt att begreppet tar nya former. Nya termer och dimensioner har dykt upp, till exempel informationskompetens (t.ex. Eisenberg, 2008; Lloyd, 2006), medielitteracitet (t.ex. Livingstone, 2004; Potter & Christ, 2007), IKT-kompetens (t.ex. ICTL Panel, 2002; Katz & Macklon, 2007) och naturligtvis digital kompetens (t.ex. Eshet-Alkalai, 2004; Ng, 2012).

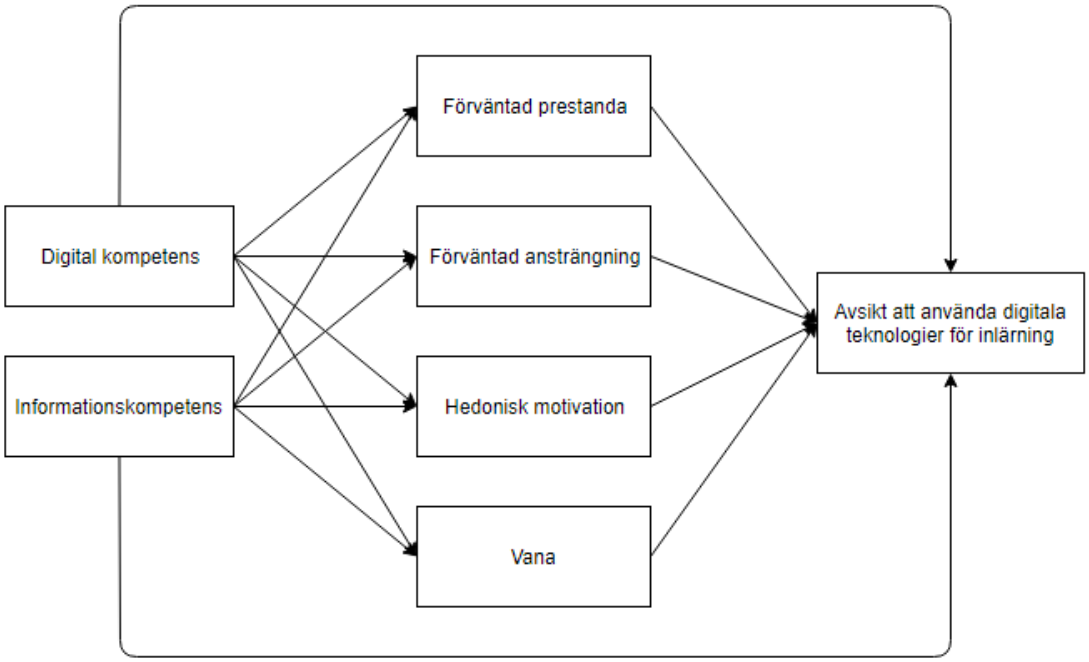
Denna avhandling fokuserar dock på två av dessa dimensioner, digital kompetens och informationskompetens. Förmågan att utvärdera information har alltid varit viktig i samband med inlärning, men i det moderna samhället har denna förmåga nått en ny nivå av väsentlighet eftersom den har blivit en "överlevnadsförmåga" (Eshet-Alkalai, 2004). En underliggande faktor till detta är förändringarna i exponering för information och dess enkelt manipulerbara karaktär (Eshet-Alkalai, 2004). Behovet av informationskompetens framhävs även av de hastiga teknologiska förändringarna samt de otaliga informationsresurserna som finns tillgängliga (American Library Association, 2000). Med tanke på dessa förändringar i tillgång och karaktär är det inte svårt att förstå den rådande oron gällande individers nivå av informationskompetens. Denna dimension av litteracitet, såsom förklarats av American Library Association (2000), innebär att en individ bör ha förmågan att känna igen när information behövs och även ha färdigheten att lokalisera, utvärdera och använda informationen effektivt.

Digital kompetens, i sin tur, syftar på förmågan att använda informations- och kommunikationsteknologi för att hitta, förstå, utvärdera, skapa och kommunicera digital information (American Library Association, 2013). Denna förmåga kräver således både kognitiva och tekniska färdigheter. Användningen av digitala teknologier kan inkludera mångsidig användning av hårdvara och mjukvara för olika ändamål, exempelvis aktiviteter relaterade till underhållning eller utbildning. Dessa digitala teknologier tar sig uttryck på olika sätt, inklusive stationära datorer, mobila enheter, digitala inspelningsenheter och andra internetbaserade resurser (Ng, 2012). Digital teknologi är således i hög grad inbakat i dagliga aktiviteter och behovet av digital kompetens är markant. Detta förekommer i Coopers (2006) påpekande om att dagens medborgare från universitetsprofessorer till dagisbarn, kassörer till kärnforskare, bör vara åtminstone någorlunda bekanta med datorer.

Såväl informationskompetens som digital kompetens har tydliga kopplingar till inlärning, men med tanke på användning av digitala teknologier för inlärning finns det utrymme för forskning som kombinerar dessa aspekter. I kontext av beteende har teknologi utforskats en hel del, och diverse modeller och ramverk har skapats för att belysa faktorer som påverkar individers sätt att agera med teknologi. Exempel på dessa är bland annat theory of reasoned action (TRA), theory of planned behavior (TPD), technology acceptance model (TAM), innovation diffusion theory (IDT), och unified theory of acceptance and use of technology (UTAUT). Den sistnämnda teorin, UTAUT, utvecklades på basis av

dess företrädare (Venkatesh m.fl., 2003). Modellen omfattar och förenar de centrala aspekterna av de tidigare modellerna, och ramverket har även uppdaterats några år senare för att vara bättre tillämpad till icke-organisatoriska kontext (Venkatesh m.fl., 2012). Det centrala för både UTAUT och UTAUT2 är att modellerna undersöker hur användningsbeteendet (eng. *use behavior*) påverkas av beteendemässig avsikt (eng. *behavioral intention*), och hur detta i sin tur påverkas av olika faktorer som relaterar till förväntningar, omständigheter, motivation, vanor med mera.

På basis av teorin om informationskompetens, digital kompetens och UTAUT2-ramverket föreslår denna avhandling en ny modell för undersökning av samband mellan litteracitet och avsikt att använda digitala teknologier för inlärning. Modellen använder följande fyra variabler från UTAUT2: förväntad prestanda (eng. *performance expectancy*), förväntad ansträngning (eng. *effort expectancy*), hedonisk motivation (eng. *hedonic motivation*) och vana (eng. *habit*). Modellen presenteras i Figur 14 och pilarna illustrerar de hypotiserade förhållandena mellan variablerna.



Figur 14. Det konceptuella ramverket för denna avhandling

7.4 Metodik

För att besvara forskningsfrågorna och undersöka de formulerade hypoteserna bedrevs undersökningen i denna avhandling genom en kvantitativ forskningsstrategi. Tidigare

forskning och relevanta konstruktioner användes som bas för utveckling av en konceptuell modell för att undersöka inverkan av digital kompetens och informationskompetens på avsikten att använda digitala teknologier för inlärning. Data för denna avhandling samlades in med en enkätundersökning där deltagarna fick svara på en uppsättning frågor utvecklade utgående från den konceptuella modellen. Enkäten distribuerades på tre olika sätt: privata länkar skickades ut med e-post till studerande och anställda vid Åbo Akademi, en allmän länk delades på sociala medier, och affischer med QR kod spreds runt på campusområden i Åbo, Vasa och Helsingfors.

Den insamlade datan av 249 deltagare behandlades sedan med Microsoft Excel, SPSS och SmartPLS. Excel och SPSS användes för deskriptiv analys och SmartPLS användes för att testa den konceptuella modellen. SmartPLS användes för att utföra strukturell ekvationsmodellering (SEM), vilket gör det möjligt att studera icke observerbara variabler genom indirekta mätningar via indikatorvariabler (Hair m.fl., 2017). Enligt Hair m.fl. (2017) är metoden lämplig i utforskande studier och teoriutveckling.

7.5 Resultat och diskussion

Denna studie hade som mål att undersöka inverkan av digital kompetens och informationskompetens på avsikten att använda digitala teknologier för inlärning. Resultaten från den insamlade datan analyserades genom en deskriptiv analys, följt av mätningsmodellresultat och konceptuella modellresultat.

Mätningsmodellen utvärderades med en bekräftande faktoranalys, där analysplanen styrs av förhållandena som förekommer bland variablerna (Schreiber m.fl., 2006). Utvärdering av modellens giltighet mättes både genom konvergen och diskriminant validitet. Resultaten för den konceptuella modellen indikerade att digital kompetens har en påverkan på avsikten att använda digitala teknologier för inlärningsändamål. Därutöver förekom det även samband mellan digital kompetens och förväntad prestanda, förväntad ansträngning, hedonisk motivation och vana.

Resultaten för informationskompetens avvek dock från förväntningarna. Resultaten för den konceptuella modellen tyder på att det inte förekommer ett signifikant förhållande mellan informationskompetens och avsikten att använda digitala teknologier för inlärning. Förhållandena mellan informationskunskap och förväntad ansträngning, hedonisk motivation och vana skiljde sig också från förväntningarna, eftersom inga

signifikanta samband kunde hittas. Resultaten indikerade dock att informationskompetens har en inverkan på förväntad prestanda, vilket är i linje med de förväntade resultaten.

Resultaten för förhållanden mellan förväntad prestanda, förväntad ansträngning, hedonisk motivation, vana och avsikten att använda digitala teknologier för inlärning avvek även en del från förväntningarna. Enligt resultaten förekom det inga signifikanta förhållanden mellan förväntad ansträngning och avsikt eller hedonisk motivation och avsikt. Däremot kunde signifikanta förhållanden hittas mellan förväntad prestanda och avsikt samt vana och avsikt. Dessa resultat avviker någorlunda från tidigare studier.

Syftet med denna avhandling var att undersöka om och hur digital kompetens och informationskompetens kan påverka avsikten att använda digitala teknologier för inlärningsändamål. Undersökningens resultat bekräftade 8 av 14 hypoteser och forskningsfrågorna 1) ” Har informationskompetens en påverkan för avsikten att använda digitala teknologier för inlärningsändamål?” och 2) ” Har digital kompetens en påverka, avsikten att använda digitala teknologier för inlärningsändamål?” besvarades utgående från de bekräftade hypoteserna. Avhandlingens resultat om digitala kunskaper överensstämmer med tidigare forskning gällande dess samband till avsikt, eftersom resultaten tyder på att digitala kunskaper har en inverkan på individens avsikt att använda digitala teknologier för inlärning. Däremot avviker resultaten om informationskunskaper från tidigare forskning i och med att avhandlingens resultat tyder på att det inte förekommer något signifikant förhållande mellan informationskunskaper och avsikten att använda digitala teknologier för inlärning.

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APPENDIX 1: CONSTRUCTS AND ITEMS USED IN THE RESEARCH

Construct	Code	Item	Source
Information literacy	IL1	I know how to define the information I need.	Kurbanoglu et al. (2006)
	IL2	I feel confident to select information most suitable to my information needs.	
	IL3	I am confident with my ability to interpret visual information (e.g., graphs, tables).	
	IL4	I feel competent to learn from my experiences and improve my information literacy skill.	
	IL5	I know how to use different kinds of print sources (e.g., books, encyclopedias).	
	IL6	I know how to use digital information sources (e.g., search engines, websites, digital databases).	
	IL7	I know how to locate information sources in the library.	
	IL8	I can create bibliographic records for different kinds of materials (e.g., books, websites).	
	IL9	I feel competent to combine newly gathered information with previous information.	
	IL10	I am able to critically evaluate the quality of my information seeking process.	
Digital literacy	DL1	I know how to solve my own technical (ICT related) problems.	Ng (2012)
	DL2	I can learn new digital technologies easily.	
	DL3	I keep up with new important digital technologies.	
	DL4	I know about a lot of different digital technologies.	
	DL5	I have the technical skills I need to use digital technologies for working/learning and to create artefacts (e.g. presentations, wikis, blogs) that demonstrate my understanding of what I have learnt.	
	DL6	I do not have good digital technology skills.	
	DL7	I am confident with my search and evaluate skills in regards to obtaining information from the Web.	
	DL8	I am familiar with issues related to web-based activities (e.g. cyber safety, search issues, plagiarism).	
	DL9	Digital technology enables me to collaborate better with my peers on project work and other learning activities.	
	DL10	I frequently obtain help with tasks from my friends over the Internet (e.g. through Facebook, Skype, Blogs).	
	PE1	I find digital technologies useful in my daily life.	

Performance expectancy	PE2	Using digital technologies increases my chances of achieving things that are important to me.	Venkatesh et al. (2012)
	PE3	Using digital technologies helps me accomplish things more quickly.	
	PE4	Using digital technologies increases my productivity.	
Effort expectancy	EE1	Learning how to use digital technologies is easy for me.	Venkatesh et al. (2012)
	EE2	My interaction with digital technologies is clear and understandable.	
	EE3	I find digital technologies easy to use.	
	EE4	It is easy for me to become skillful at using digital technologies.	
Hedonic motivation	HM1	Using digital technologies is fun.	Venkatesh et al. (2012)
	HM2	Using digital technologies is enjoyable.	
	HM3	Using digital technologies is very entertaining.	
Habit	HT1	The use of digital technologies has become a habit for me.	Venkatesh et al. (2012)
	HT2	I am addicted to using digital technologies.	
	HT3	I must use digital technologies.	
	HT4	Using digital technologies has become natural to me.	
Intention to use digital technologies for learning	IN1	I will not hesitate to use digital technologies to access information when I want/need to learn something.	Venkatesh et al. (2012)
	IN2	I plan to use digital technologies to seek information when I want/need to learn something.	
	IN3	I do not intend to use digital technologies to obtain information when I want/need to learn something.	
	IN4	I am very likely to use digital technologies to gain information when I want/need to learn something.	
	IN5	I will continue using digital technologies for learning purposes in the future.	
	IN6	I will recommend my friends to use digital technologies for learning purposes.	

APPENDIX 2: SURVEY QUESTIONNAIRE

Information and Digital Literacy

Dear Participant,

This questionnaire serves as a basis for a master's degree thesis in Information Systems with the focus on Information Literacy and Digital Literacy. Information Literacy is the ability to recognize when information is needed and then being able to find, evaluate, use and communicate the needed information. Digital Literacy refers to a similar set of abilities but in the context of digital information and using the information and communication technologies.

The aim of this study is to gain knowledge of how different dimensions of literacies affect an individual's intention to use digital technologies for learning purposes. Learning refers here to all kinds of learning, ranging from academic education and/to personal everyday experiences. In order to gain accurate insights, we are hoping for your help. This research is aimed at university students and employees. The questionnaire is completely anonymous and the results will be presented in generalized manners. Your honest opinion is very important in order to gain meaningful insights. We know that your time is precious, and we have therefore kept the questionnaire as simple and short as possible. It should not take more than 10 minutes. The questionnaire will be open until 20.08.2019.

Should you wish to participate in a lottery for movie tickets, please leave your email at the end of the survey. We are giving out five sets of movie tickets (2 tickets in each).

Yours sincerely,

Milla Aavakare (milla.aavakare@abo.fi)
Shahrokh Nikou (shahrokh.nikou@abo.fi)

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1. What is your gender?

- ◯ Female
- ◯ Male
- ◯ Other

2. What is your highest education?

- ◯ High school diploma
- ◯ Bachelor degree (e.g., university or polytechnic)
- ◯ Master degree
- ◯ Ph.D.
- ◯ Other

3. What is your current occupation?

Please select all that apply.

- ☐ Student
- ☐ Teaching and research
- ☐ University administration
- ☐ Other

4. What year were you born?

Select

5. Access to digital technologies

Please indicate how often do you use the following digital technologies (devices) in your daily life.

	I do not use	A few times a month or less	A few times a week	About once a day	Several times each day
Mobile (smart) phone	◯	◯	◯	◯	◯
Tablet	◯	◯	◯	◯	◯
Desktop computer	◯	◯	◯	◯	◯
Laptop computer	◯	◯	◯	◯	◯
Game console	◯	◯	◯	◯	◯
Wearable device (e.g., smartwatch, fitbit)	◯	◯	◯	◯	◯

6. Frequency of software (application) use

Please indicate how frequently do you use the following digital technologies in your daily life.

	I do not use	A few times a month or less	A few times a week	About once a day	Several times each day
Word processor (e.g., Word, Pages)	◯	◯	◯	◯	◯
Spreadsheet (e.g., Excel, Numbers)	◯	◯	◯	◯	◯
Presentation (e.g., PowerPoint, Keynote)	◯	◯	◯	◯	◯
File sharing (e.g., Google Drive, Dropbox)	◯	◯	◯	◯	◯
Photo/image editing (e.g., Photoshop, PhotoScape)	◯	◯	◯	◯	◯
Website management (e.g., WordPress, Squarespace)	◯	◯	◯	◯	◯
Mobile devices organiser (e.g., address book, calendar)	◯	◯	◯	◯	◯
Email services (e.g., Outlook, Gmail)	◯	◯	◯	◯	◯
Social media (e.g., Facebook, Instagram)	◯	◯	◯	◯	◯

7. Self-report rating of proficiency

Peace indicate how proficient you are at using the following digital technologies or applications.

	1 (Not proficient at all)	2	3	4	5	6	7 (Very proficient)
Word processor (e.g., Word, Pages)	◯	◯	◯	◯	◯	◯	◯
Spreadsheet (e.g., Excel, Numbers)	◯	◯	◯	◯	◯	◯	◯
Presentation (e.g., PowerPoint, Keynote)	◯	◯	◯	◯	◯	◯	◯
File sharing (e.g., Google Drive, Dropbox)	◯	◯	◯	◯	◯	◯	◯
Photo/image editing (e.g., Photoshop, PhotoScape)	◯	◯	◯	◯	◯	◯	◯
Website management (e.g., WordPress, Squarespace)	◯	◯	◯	◯	◯	◯	◯
Mobile devices organiser (e.g., address book, calendar)	◯	◯	◯	◯	◯	◯	◯
Email services (e.g., Outlook, Gmail)	◯	◯	◯	◯	◯	◯	◯
Social media (e.g., Facebook, Instagram)	◯	◯	◯	◯	◯	◯	◯

For questions 8-14, please rate the degree to which you agree or disagree (1 represents "Strongly disagree" and 7 represents "Strongly agree").

8. Information literacy

	1 (Strongly disagree)	2	3	4	5	6	7 (Strongly agree)
I know how to define the information I need.	○	○	○	○	○	○	○
I feel confident to select information most suitable to my information needs.	○	○	○	○	○	○	○
I am confident with my ability to interpret visual information (e.g., graphs, tables).	○	○	○	○	○	○	○
I feel competent to learn from my experiences and improve my information literacy skill.	○	○	○	○	○	○	○
I know how to use different kinds of print sources (e.g., books, encyclopedias).	○	○	○	○	○	○	○
I know how to use digital information sources (e.g., search engines, websites, digital databases).	○	○	○	○	○	○	○
I know how to locate information sources in the library.	○	○	○	○	○	○	○
I can create bibliographic records for different kinds of materials (e.g., books, websites).	○	○	○	○	○	○	○
I feel competent to combine newly gathered information with previous information.	○	○	○	○	○	○	○
I am able to critically evaluate the quality of my information seeking process.	○	○	○	○	○	○	○

9. Digital literacy

	1 (Strongly disagree)	2	3	4	5	6	7 (Strongly agree)
I know how to solve my own technical (ICT related) problems.	○	○	○	○	○	○	○
I can learn new digital technologies easily.	○	○	○	○	○	○	○
I keep up with new important digital technologies.	○	○	○	○	○	○	○
I know about a lot of different digital technologies.	○	○	○	○	○	○	○
I have the technical skills I need to use digital technologies for working/learning and to create artefacts (e.g. presentations, wikis, blogs) that demonstrate my understanding of what I have learnt.	○	○	○	○	○	○	○
I do not have good digital technology skills.	○	○	○	○	○	○	○
I am confident with my search and evaluate skills in regards to obtaining information from the Web.	○	○	○	○	○	○	○
I am familiar with issues related to web-based activities (e.g. cyber safety, search issues, plagiarism).	○	○	○	○	○	○	○
Digital technology enables me to collaborate better with my peers on project work and other learning activities.	○	○	○	○	○	○	○
I frequently obtain help with tasks from my friends over the Internet (e.g. through Facebook, Skype, Blogs).	○	○	○	○	○	○	○

10. Performance expectancy

	1 (Strongly disagree)	2	3	4	5	6	7 (Strongly agree)
I find digital technologies useful in my daily life.	○	○	○	○	○	○	○
Using digital technologies increases my chances of achieving things that are important to me.	○	○	○	○	○	○	○
Using digital technologies helps me accomplish things more quickly.	○	○	○	○	○	○	○
Using digital technologies increases my productivity.	○	○	○	○	○	○	○

11. Effort expectancy

	1 (Strongly disagree)	2	3	4	5	6	7 (Strongly agree)
Learning how to use digital technologies is easy for me.	○	○	○	○	○	○	○
My interaction with digital technologies is clear and understandable.	○	○	○	○	○	○	○
I find digital technologies easy to use.	○	○	○	○	○	○	○
It is easy for me to become skillfull at using digital technologies.	○	○	○	○	○	○	○

12. Hedonic motivation

	1 (Strongly disagree)	2	3	4	5	6	7 (Strongly agree)
Using digital technologies is fun.	○	○	○	○	○	○	○
Using digital technologies is enjoyable.	○	○	○	○	○	○	○
Please choose two (2) if you are reading this text.	○	○	○	○	○	○	○
Using digital technologies is very entertaining.	○	○	○	○	○	○	○

13. Habitual behaviour

	1 (Strongly disagree)	2	3	4	5	6	7 (Strongly agree)
The use of digital technologies has become a habit for me.	○	○	○	○	○	○	○
I am addicted to using digital technologies.	○	○	○	○	○	○	○
I must use digital technologies.	○	○	○	○	○	○	○
Using digital technologies has become natural to me.	○	○	○	○	○	○	○

14. Intention to use digital technologies

	1 (Strongly disagree)	2	3	4	5	6	7 (Strongly agree)
I will not hesitate to use digital technologies to access information when I want/need to learn something.	○	○	○	○	○	○	○
I plan to use digital technologies to seek information when I want/need to learn something.	○	○	○	○	○	○	○
I do not intend to use digital technologies to obtain information when I want/need to learn something.	○	○	○	○	○	○	○
I am very likely to use digital technologies to gain information when I want/need to learn something.	○	○	○	○	○	○	○
I will continue using digital technologies for learning purposes in the future.	○	○	○	○	○	○	○
I will recommend my friends to use digital technologies for learning purposes.	○	○	○	○	○	○	○

15. Thank you for participating in this research project!

Leave your email below if you wish to participate in a lottery for movie tickets. We are giving out five sets of tickets (2 movie tickets in each). Your email will not be connected to the answers.

Email

16. If you would like to comment or provide your feedback on this survey, please use the space below.

10000 characters left

Submit