Matin Mahboob Kanafi

# THE IMPACT OF DIGITAL LITERACY ON DIGITAL TRANSFORMATION AT THE WORKPLACE —DIGITAL IMMIGRANTS AND DIGITAL NATIVES

Master's Thesis in Governance of Digitalization
Supervisor: Dr.Shahrokh Nikou
Co-supervisor: Professor Gunilla Widén
Faculty of Social Sciences, Business and Economics
Åbo Akademi University
Åbo 2019

**Table of contents**

**List of Tables**

**List of figures**

| | |
|---|---|
| **Subject: Governance of digitalization** | |
| **Writer:** Matin Mahboob Kanafi | |
| **Title:** The impact of digital literacy on the digital transformation at the workplace: digital natives and digital immigrants | |
| **Supervisor:** Dr. Shahrokh Nikou | **Supervisor:** Professor. Gunilla Widén |

**Abstract:**

Over the last decades, rapid diffusion of digitalization has influenced almost all industries, in which many of them have been struggling with digital transformation. The growing importance of digital transformation has resulted in a shift to focus on how employees in the workplace can interact with and use the information that technology has generated. Consequently, digital workplaces are becoming increasingly complex in ways that are exerting enormous pressure on the staff. Therefore, the necessity and the importance of different dimensions of literacy have been considerably highlighted in the workplace. The main purpose of this study is to investigate the antecedent factors that might influence the intention to use digital technology at the workplace; particularly among digital natives and digital immigrants. We proposed a model consisting of seven independent constructs: self-efficacy, social norms, perceived ease of use, perceived usefulness, attitude, digital literacy, information literacy, and intention to use as the dependent variable. Data were collected through a survey questionnaire, which was published through many social media platforms among employees in Finland. Results show that there is a significant gap between digital natives and digital immigrants' intention to use digital technology at the workplace. We employed multi-group analysis to investigate whether or not the chasm between these two group ages can be decreased. Results showed that increasing the frequency of digital technology usage and improving the level of employees' proficiency might bridge the gap between digital natives and digital immigrants.

**Keywords:** Information literacy, digital literacy, digital transformation, digitalization

| | |
|---|---|
| **Date: 16.11.2019** | **Number of pages: 75** |

# Acknowledgement

First of all, I would like to profoundly thank my supervisor **Dr. Shahrokh Nikou** for his guidance, advice, patience, and great support throughout the processes of writing this thesis and my education at Åbo Akademi University. It was a great opportunity and honor for me to apply his knowledge and experience in my master's thesis.

I also would like to thank Professor **Gunilla Widén** for providing me with the support to accomplish my master's degree and throughout the process of writing thesis.

I would also like to acknowledge DiWIL project members for sharing their valuable knowledge and experience with me, I am gratefully indebted to them for their thoughtful and useful comments on this thesis.

Special thanks to teachers of Governance of Digitalization, they taught me a lot. I also would like to thank all my classmates in the governance of digitalization program.

To my sister "Mona" and brother-in-law "Armin" for all their support during my education and also writing my master's thesis.

To my parents, who gave me the best gift ever "life", and let me search, challenge and find my own way. I have had always their supports during my personal, professional, and educational life.

Finally, I would like to express my very profound gratitude to my lovely husband "Mehdi", for encouraging me to pursue my dreams, and for providing me with unconditional love and support during all these years, throughout my personal life, job, education, and writing this thesis.

Matin

Åbo, 2019

## INTRODUCTION

Digitalization is rapidly being embraced in industries. With the ongoing digital transformation wave, opportunities are arising from the use of collected data and analyzing the accumulating data e.g., supporting decision-making, and platforms for sharing information within and between firms. Accordingly, firms need to gain speed and agility to cope with the digital changes happening around them.

The growing importance of digital transformation has resulted in a shift to focus on how employees in the workplace can interact with and use the information that technology has generated. Consequently, digital workplaces are becoming increasingly complex in ways that are exerting enormous pressure on the staff. Therefore, the necessity and the importance of information literacy have been considerably highlighted in the workplace. Literacy is no longer perceived as a skill that an individual either has or is lacking. But it is considered as a range of knowledge, abilities, and strategies acquired by people in different situations of their lives and through the relationship with their colleagues and with the communities in which they interact (Panel, 2002). Furthermore, according to Bruce (1977), information literacy is the skill to access, analyze, organize, and apply information for learning, problem-solving, and making decisions in various learning contexts such as at workplaces, personal life and in the educational environment. Hence, the key factor of success in organizations is having information-literate staff who are able to search, analyze and ultimately productively use the needed information (Lloyd, 2003; Oman, 2001; O'Sullivan, 2002, cited by Kirton and Barham, 2005). Individuals who have learned how to learn are information-literate people. They realize how to organize and utilize information and are engaged with lifelong learning (Rader, 1991). Furthermore, the emergence of the new dimension of literacy such as digital literacy, technical literacy, cognitive literacy, social-emotional literacy, media literacy, visual literacy, and financial literacy emphasizes the key role of literacy, particularly between digital immigrant and digital native in the workplaces. According to Prensky (2001a), individuals who were born roughly after 1980 are considered as "Digital Natives". On the other hand, people who were born before 1980 are considered as "Digital Immigrants". Moreover, Prensky (2001a) argues that these two groups act differently in many contexts. The brains of digital natives probably are physically distinct because of the digital input they have

received. Digital natives usually quickly receive information. They are able to processes parallel and multi-tasked functions. On the other side, digital immigrants generally are not appreciated for these new abilities and skills that the digital natives have gained and improved through years of interaction and practice. The digital immigrants are almost entirely unfamiliar with these abilities, since they learn by themselves and usually prefer to teach individually, slowly, separately, and above all seriously (Prensky, 2001a). Hence, in terms of creating and sharing information, a gap between digital natives and digital immigrants is not evitable. Moreover, digital natives seem to be more able to adopt new digital technologies in their workplaces and social lives compared to digital immigrants. As a result, if access and technology capabilities are the only components of the digital divide, what we need is data to assist us with the perception of literacy and practical use of the digital divide (Panel, 2002). In the following, the main objectives and research questions will be presented. Next, the research methodology and structure of this thesis will be presented.

## 1.1 Objectives and aims

Today's workplace is well-equipped with new technologies such as computers and Internet access around employees. The Internet and Web-based IT tools not only have changed the individual employee but also have influenced the whole realm of human resource development (HRD) professionals (Benson et al., 2002). Even leader companies that can effectively leverage technology, often encounter challenges with the new digital transformation and the underlying technologies. Today's emerging technology like social networks, mobile, data analytics, and embedded devices, require different attitudes, and skill sets than prior transformative technology waves (Fitzgerald et al., 2014). Therefore, the way digital natives and digital immigrants adopt and use the new technology, and the way they perceive the new technological innovations can play a fundamental role in the success of digital workplaces. This study investigates the factors influencing digital technology acceptance in the workplace. Moreover, the traditional gap between digital natives and digital immigrants will be evaluated and possible solutions will be presented.

## 1.2 Research Question

In order to meet the objectives of the research, this thesis aims to answer the following research question and sub-questions.

RQ: What antecedent factors influence employees' intention to use digital technology?

- How gender could impact on employees' intention to use digital technology?
- How the frequency of use could impact on employees' intention to use digital technology?
- How proficiency in digital technology could impact on employees' intention to use digital technology?

## 1.3 Research Methodology

In order to achieve the objectives of this thesis, quantitative research seems to be an appropriate approach. To do so, the literature on literacy in the context of digital technology will be reviewed and the results of literature review will be used to develop a comprehensive conceptual model that explains a large percentage of variance in the intention to use digital technology. To collect data, an online survey questionnaire will be used as the collecting instrument. Data are collected through an online questionnaire prepared for the digital natives and the digital immigrants distributed in social media such as Facebook and LinkedIn. Regarding the analysis of collected data Structural Equation Modeling (SEM) using SmartPLS is employed. In this thesis, SEM analysis (a regression-based method) is used to identify the correlations between independent and dependent variables. This method is used to analyze the networks of relationships between measured variables and latent constructs.

## 1.4 Structure of the thesis

The remainder of this thesis is structured in the following way:

In **Chapter two**, a relevant literature review on the different dimensions of literacy, digital immigrants and digital natives, and intention to use will be presented in detail. An

in-depth explanation of the concepts and their origins will be presented that are closely relevant to the context, research problem and research question.

In **Chapter three**, a theoretical background will be conducted, and the results will be presented. The results will be discussed, and the variables will be identified to provide the underlying basis for a multidimensional literacy and intention to use digital technology model. The constructed conceptual model, as well as the proposed hypotheses will be presented.

In **Chapter four**, the research methodology will be thoroughly discussed. The data collection method as well method of data analysis of this thesis will be reviewed.

In **Chapter five**, the actual empirical analysis, results, and finding are presented. The measurement model and the structural model are presented to discuss the reliability and validity of the study. Additionally, we go through the formed hypotheses to assess whether or not they are supported by the data provided by the participants of the survey questionnaire.

In **Chapter six** we aim to present and discuss the findings and attempt to provide an answer to the research question. Additionally, the theoretical contributions, as well as the proposed practical implications are further discussed. In this chapter, the limitations are also highlighted and proposals for future work and research are presented.

# 2 LITERATURE REVIEW

## 2.1 Digital Transformation

Digital transformation has revolutionized organizations in every industry by leveraging a profound transformation of organizational processes, activities, communications, and capacities. Furthermore, the main aim of digital transformation is to exploit digital technologies such as improvements in productivity, creativity, and cost reduction (Hess et al., (2016). Accordingly, digital transformation has provided opportunities to solve the problems and perform operations in more effective and flexible ways through the use of digital technology. In recent years, most organizations in almost all industries have managed creativity to explore new digital technology and to utilize their benefits. This process often includes transformations of major activities of the company and impacts products and procedures, as well as organizational design and structure of management (Matt et al., 2015).

Nonetheless, it is more challenging to apply digital transformation than traditional operations and requires more expertise, knowledge, and skills. Unfortunately, there are many organizations that have failed to keep pace with the reality of new digital technologies. Due to the emergence of challenge-driven digital transformation and the ever-increasing need to remain competitive in the global markets, business leaders require to create and implement strategies that adopt the impacts of digital transformation and drive improvement of operational performance (Hess et al., 2016).

Despite the fact that the need for digitalization has been widely acknowledged, most firms grapple to perceive clear business benefits from new digital technologies. The main reason is the lack of vigorous management, knowledge, and relevant experience to effectively conduct digital transformation through technology (Fitzgerald et al., 2014). Hence, employees required to be equipped with the knowledge of operating digital technologies in order to create new products, services, and efficiently utilize digital technologies in their workplaces.

## 2.2 The Digital workplace

The digital transformation is having a profound impact on workplaces. According to Hess et al. (2016), digital transformation is an intricate problem affecting many or all of the company's sections. Managers must simultaneously evaluate the exploration and exploitation of the company's assets to gain organizational agility, which plays a key role in the success of digital transformation in their firms. Thus, the emergence of digital technologies such as the Internet, computers, mobiles, and other digital platforms is transforming the roles of employees in the workplace to improve individual and organizational performance.

The identification of the work and the key roles of human resource development (HRD) professionals in providing the effective performance of employees, firms, and processes have been significantly changed due to the confluence of the information era and the industrial revolution (Benson et al., 2002). Therefore, technology-driven changes in the workplace underline the need for employees to gain new skills and knowledge in the digital fields. More skill sets are needed to preserve complicated equipment, and there is a growing need for knowledge workers with high-level mental abilities who are able to think about symbolic and abstract concepts (Grubb, 1984).

The changes invoked by digital technologies do not necessarily result in the effective use of technology. According to Davis et al (1989), computer systems are not able to enhance organizational performance unless they are effectively utilized. Unfortunately, many employees may refuse using digital technologies in many companies. Thus, many executives' and managers' resistance to end-user systems is a common issue. We need to identify why individuals accept or reject digital technologies in order to clarify, explain and increase technology acceptance among workers (Davis et al., 1989). Prior studies (e.g., Prenski 2001a; Bennett, 2012; Nikou et al., 2018; Nikou et al., 2019) showed that one of the main reasons is that many employees are a generation that is basically resistant to change. Furthermore, the theory of technology acceptance model (TAM) considers the two constructs perceived ease of use and perceived usefulness of technology as factors that can influence an individual's attitude toward using technology.

In 1975, Martin Fishbein and Icek Ajzen developed the theory of reasoned action which shows that attitude toward technology can directly influence performance behavior such

as using technology. Furthermore, built on the theory of reasoned action (TRA) and theory of perceived behavior (TPB), subjective norms which are defined as "the perceived social pressure to perform or not to perform the behavior" (Ajzen, 1991, p. 188) and perceived behavior such as self-efficacy are considered as basic factors influencing intention to use technology.

In the next part, I will introduce digital natives and digital natives and discuss more the main gaps between these generations.

## 2.3 Digital Immigrants and Digital Natives

The concepts Native and Immigrants were firstly presented by Barlow (1995) in his paper entitled: *Declaration of the Independence of Cyberspace.*

"You are terrified of your own children, since they are natives in a world where you will always be immigrants" (Barlow, 1995). Besides, Mark Prensky (2001a) introduced and popularized the terms "Digital Native" and "Digital Immigrant". According to Prensky (2001a) people who were born before 1990, are considered as digital immigrants and individuals who were born after 1990 are considered as digital natives. "What should we call these "new" students of today? Some refer to them as the N-[for Net]-gen or D-[for digital]-gen. But the most useful designation I have found for them is Digital Natives" (Prensky, 2001a, p. 1). According to Prenski (2001a), today's students are able to interact with digital language of all new technologies such as computer, the Internet, and online games. But on the other hand, there are digital immigrants who always will be compared to digital natives. Rest of people who were born before the digital revolution but have access to them later in their lives and become interested in and embraced most of the aspects of modern technology in their lives (Prensky, 2001a).

Furthermore, many researchers also have elaborated on the concepts, digital immigrants and digital natives. According to Bayne and Ross (2007), young people have applied computers and the Internet in their daily lives and are naturally skillful and expert with modern technologies and digital environments, whereas older people will always be in competition with them and a step behind digital natives in their communication with the digital technology. "What is more, young learners' immersion in digital technologies creates in them a radically different approach to learning, one which is concerned above

all with speed of access, instant gratification, impatience with linear thinking and the ability to multi-task" (Bayne and Ross, 2007, p. 1). Additionally, according to Bennett (2012), a 'digital native' can be defined as an individual who was born and has grown up engaged in digital technology and is technologically proficient and involved. In contrast to digital native's descriptions, 'digital immigrant' is defined as individuals who having been introduced to digital technology later in their lives and they are usually afraid of it, do not trust it and are unable to efficiently use the new technology. Prensky (2001a) claimed that digital natives and digital immigrants act differently such as in learning and they recognize and use technology in different ways and contexts. "It is very likely that our students' brains have physically changed and are different from ours – as a result of how they grew up. But whether or not this is literally true, we can say with certainty that their thinking patterns have changed" (Prensky, 2001a, p. 1).

Prensky (2001a) described Digital Natives as those who are really fast in receiving information. They are interested in the parallel and multi-tasked process. They prefer to visualize texts before writing them rather than the opposite. They are proficient in prefer random access and networked tasks. They are usually successful in receiving instant fulfilment and frequent rewards and instead of serious tasks they prefer to do games. On the other side, digital Immigrants generally show little interest in new digital skills that the natives have gained and proficiently have acted through years of interaction and practice (Prensky, 2001a).

Prior studies have shown that there is a chasm between digital immigrants and digital natives in using digital technology in educational environments between students and teachers (e.g., Helsper & Eynon, 2010; Nikou et al., 2018; Nikou et al., 2019). Although some studies (e.g., Colbert et al., 2016) have shown this chasm in the context of workplace, further research is required to provide evidence of the gap between digital immigrants and digital natives in using digital technologies in the workplace context.

The gap between digital natives and digital immigrants has been found as the main factor that influences digital technology acceptance and usage (Nikou et al., 2018; Nikou et al., 2019). Thus, based on the importance of information literacy and digital literacy in the context of workplace, in the next parts of this section, they will be introduced and defined.

## 2.4 Information Literacy

Over recent decades, the definition of literacy has significantly changed. The traditional definition of literacy is the ability to read and write at a basic level. Additionally, according to the United States Workforce Investment Act of 1998, literacy is "an individual's ability to read, write, speak in English, compute, and solve problems at levels of proficiency necessary to function on the job, in the family of the individual, and in society". According to The American Library Association (ALA, 1989), information literacy is a set of skills requiring individuals "to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information". Moreover, based on The Association of College and Research Libraries (ACRL, 2000), "Information literacy forms the basis for lifelong learning. It is common to all disciplines, to all learning environments, and to all levels of education. It enables learners to master content and extend their investigations, become more self-directed, and assume greater control over their own learning. An information literate is able to:

- Determine the extent of information needed
- Access the needed information effectively and efficiently
- Evaluate information and its sources critically
- Incorporate selected information into one's knowledge base
- Use information effectively to accomplish a specific purpose

  Understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally" (ACRL, 2000).

Similarly, Bruce (1997) defined information literacy as the ability to access, evaluate, organize and use information in order to learn, problem-solve, make decisions - in formal and informal learning contexts, at work, at home, and in educational settings. Besides, according to Behrens (1994), information literacy has a conceptual meaning. It is a nicely packaged and imaginative descriptive expression as a metaphor that is not literally relevant or readily interpretable, suggesting something more qualitative than can be inferred from the old meaning of the two distinct words literacy and information

(Behrens, 1994). Information literacy seems to be representative of the capacity to use information, or maybe the ownership of the knowledge of information (Behrens, 1994). Despite the fact that individuals with the organization are required to be information literate, Drucker (1992) emphasized that not only the managers require to be information literate, but also the organizations. Organizations should learn to ask what information they need. Moreover, When, how, and where do they need the information?

In 2006, Lloyd assessed information literacy by considering the nature of the phenomenon across three landscapes: schools, tertiary education institutions, and the workplace. She proposed a much broader definition of information literate people and of information literacy that seeks information literacy as a phenomenon that is closely linked to formal and informal meaning-making activities of individuals in all environments. She suggests that information literacy should not be described on the basis of a series of decontextualized skills. Instead, information literacy should be defined as the ability to know a context and ultimately through involvement and experience with information explore a meaning from this (Lloyd, 2006).

The many current advancements in information literacy indicate that significant energy is being spent in this field. The main idea is to move into the workplace and society and beyond the educational sector, which has been its main home for twenty years or more (Bruce, 2000).

### 2.4.1 Information Literacy at the Workplace

Due to digital technologies and resources such as the Internet and computers, information literacy is essential for today's workplaces. Thus, today's digital workplace requires employees who are able to promote their problem-solving techniques, decision-making approaches and critical thinking skills. For many years, the concept of information literacy, which is widely described as the ability to locate, assess, analyze, and effective use of information, has been a serious issue in educational context, whereas in the workplaces, managers and executives have preferred to concentrate on the need for IT tools and information technology skills (Bruce, 1999). The significance of information literacy has been broadly emphasized by many researchers. According to Breivik (2005), due to the ever-increasing attempts to manage knowledge to conduct a strategic advantage

within today's global market, today's workplace environment seems to require the most information literacy skills. Accordingly, the number of business leaders who seek information literate employees has been on the rise (Breivik, 2005).

Over recent decades, although the library and educational sector have focused on information skills that are claimed to be comprehensive and interactable, few researchers have conducted studies to emphasize that this is indeed the case (Lloyd, 2011). As we leave the twentieth century, we can witness that information literacy issues becoming engaged more strongly outside the library context, which will challenge us to contribute new forms of management to interested others (Bruce, 2000). Despite the fact that information technology becomes more flawless and user-friendly, it is more important to ask how individuals are actually able to interact with and apply the information which modern technology makes accessible. In companies where individuals continue to resist information technology, the ongoing need for decision-making, problem-solving and research, also indicates the need for staff who are able to interact with information per se as being of key role (Bruce, 1999).

In addition, Bruce (1999) considered people into three groups likely to be interested in workplace experiences of information literacy:

(1) "Managers with a concern for staff members' professional development and ability to respond to change.

(2) Information managers with an interest in training and educating their clientele to effectively use the organization's information services.

(3) Trainers and educators who wish to prepare learners for their chosen profession"

In the light of this, Bruce (1999) has developed "the seven faces of information literacy in the workplace

1. **The first face:** information literacy is experienced as using information technology for information awareness and communication
2. **The second face:** information literacy is experienced as finding information from appropriate sources
3. **The third face**: information literacy is experienced as executing a process
4. **The fourth face:** information literacy is experienced as controlling information

5. **The fifth face:** information literacy is experienced as building up a personal knowledge base in a new area of interest
6. **The sixth face:** information literacy is experienced as working with knowledge and personal perspectives adopted in such a way that novel insights are gained
7. **The seventh face:** information literacy is experienced as using information wisely for the benefit of others"

Additionally, based on Lloyd (2006), in order to understand information literacy in a workplace context, we need to recognize that information and knowledge are generated and shared socially, thus the access to it can be influenced by social interactions. To achieve this, learners need to change the tendency to learn toward the information and knowledge individually to the community of practice. Moreover, Lloyd (2011) stressed the need for more research in the context of workplace. She conceptualized information literacy from a workplace perspective and presented current work toward a theoretical framework. Education has been considered as the critical basis for information literacy research, while it is workplaces that should be applied to inform the provision of information literacy in the library and educational sectors. The objective of this reorientation is to create potential employees who are able to recognize and understand the key position that information, its creation, reproduction, communication, and sharing contribute to creating a sustainable workplace performance (Lloyd, 2011).

Besides, in the 21st first century as technologies become upgraded, not only the workers require to update their skill sets, but also it is a necessity for workplaces as a common feature (Ng, 2012). Thus, with the rapidly changing landscape of digital technology in workplaces, employees are expected to be not only information literate, but also educated in a various range of terms related to its literacy, such as ICT literacy, digital literacy, technology literacy, media literacy, net literacy, and online literacy.

## 2.5 Digital Literacy

The burgeoning advancement of digital technologies has resulted in new dimensions of literacy such as digital literacy. According to Reedy and Goodfellow (2012), digital literacy is linked to information literacy and overlaps with information literacy concept,

"digital literacy includes the ability to find and use information (otherwise known as information literacy) but goes beyond this to encompass communication, collaboration and teamwork, social awareness in the digital environment, understanding of e-safety and creation of new information. Both digital and information literacy are underpinned by critical thinking and evaluation" (Reedy and Goodfellow, 2012, p. 3). The importance of digital literacy cannot be negligible in today's modern workplaces. As mentioned by Eshet (2004), "digital literacy is a survival skill in the digital era". According to Martin (2005), "the concept digital literacy would include several key elements:

i. Digital literacy involves being able to carry out successful digital actions embedded within life situations, which may include work, learning, leisure, and other aspects of everyday life;
ii. Digital literacy, for the individual, will therefore vary according to his/her particular life situation, and also be an ongoing lifelong process developing as the individual's life situation evolves;
iii. Digital literacy is broader than ICT literacy, and will include elements drawn from several related "literacies", such as information literacy, media literacy and visual literacy;
iv. Digital literacy will involve acquiring and using knowledge, techniques, attitudes and personal qualities, and will include the ability to plan, execute and evaluate digital actions in the solution of life tasks, and the ability to reflect on one's own digital literacy development." (Martin, 2005, p. 135).

In light of these elements, Martin (2005) formulated the following brief definition:
"Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process" (Martin, 2005, p. 135).
Additionally, the definition of digital literacy has been presented in the British Future lab's handbook on *Digital Literacy across the Curriculum* as: "to be digitally literate is to have access to a broad range of practices and cultural resources that you are able to apply to digital tools. It is the ability to make and share meaning in different modes and

formats; to create, collaborate and communicate effectively and to understand how and when digital technologies can best be used to support these processes" (Hague and Payton, 2010, p. 2, cited by NG, 2012, p. 1067).

Eshet (2004) expanded the concept of digital literacy, which covers more aspects of digital literacy. Accordingly, "digital literacy involves more than the mere ability to use software or operate a digital device; it includes a large variety of complex cognitive, motor, sociological, and emotional skills, which users need in order to function effectively in digital environments" (Eshet, 2004). Built on this, in 2006, Aviram and Eshet proposed a new conceptual framework for the concept of digital literacy and suggested five types of literacies that are incorporated within the term 'digital literacy': "The five cognitive digital literacy skills that comprise the model are:

A) Photo-Visual Literacy: Learning to Read from Visuals
B) Reproduction Literacy: The Art of Creative Duplication
C) Branching literacy: Hypermedia and thinking or multiple-domain thinking
D) Information Literacy: The Art of Always Questioning Information
E) Socio-Emotional Literacy" (Aviram and Eshet, 2006).

According to Eshet (2004), due to the rapid development of digital technology, individuals require to develop the variety of their technical, cognitive, and sociological skills to be able to operate modern technologies and solve related problems in today's digital era. Moreover, Ng (2012) introduced a new framework of digital literacy to investigate the ease of using unfamiliar digital technology among digital natives in an educational context. In Ng's new framework, digital literacy is an intersection among the technical, cognitive, and social-emotional dimensions, see Figure 1.

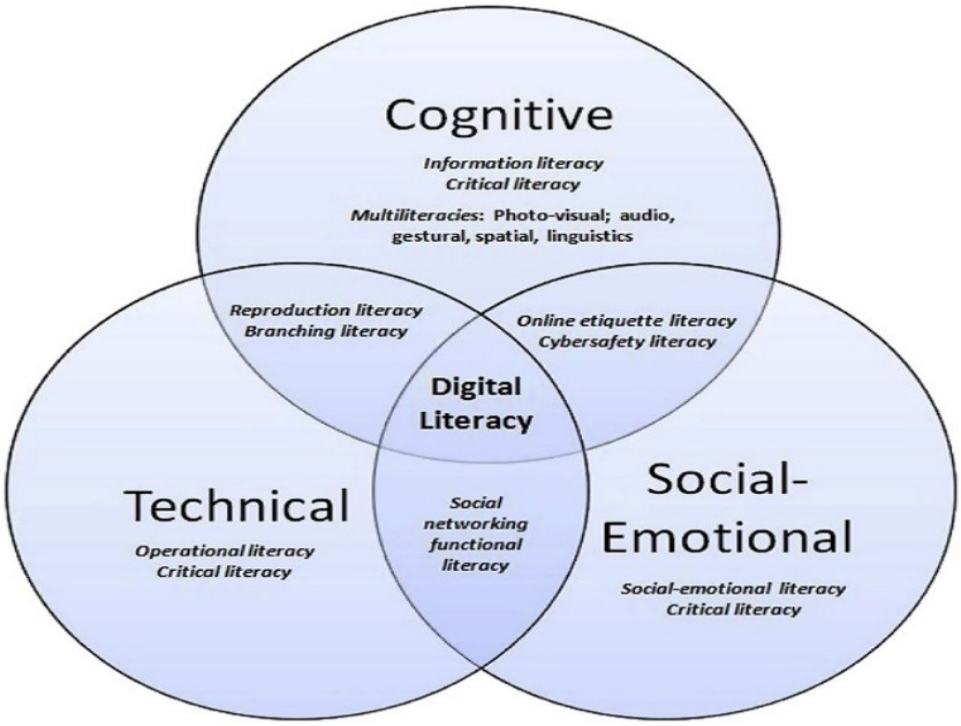



*Figure 1. Digital literacy model (Ng, 2012).*

According to Ng (2012), the **technical** dimension of digital literacy broadly means possessing technical and operational skills. Accordingly, the technical dimension of literacy is associated with the ability to properly operate ICT for collaboration, virtual conferencing, task management, e-learning, applications, company's platforms, and the systems that are required to access the necessary information and data for their daily tasks. According to Ng (2012), **cognitive** literacy is linked to the ability to critically consider the process of searching, evaluating and handling digital information. Moreover, cognitive literacy is associated with being able to assess and select suitable software programs to learn or perform a particular task. Furthermore, the cognitive dimension requires the individual to be aware of the ethical, moral and legal issues related to the Internet trading and content reproduction using digital resources such as copyrights and plagiarism. Moreover, according to Ng (2012), the **social-emotional** dimension of digital literacy involves being able responsible for using the Internet to communicate, socialize and learn by (a) following rules of contact as they do in face-to-face relationship such as being respectful and prevent misinterpretation and misapprehension by using suitable

language (b) protecting personal security and privacy by maintaining personal data as private as possible and not communicating more personal data (c) identifying the security, safety, and threats of the sources of information (Ng, 2012). For instance, the social-emotional dimension of digital literacy at a workplace can be considered how employees communicate with each other through internal channels in order to solve daily issues and how they protect their multiple passwords of different platforms within the company.

# 3 THEORITICAL BACKGROUNDS

## 3.1 Theoretical models and frameworks

As mentioned in chapter two, the core theoretical focus of this thesis is based on the seven concepts, i.e., information literacy, digital literacy, perceived usefulness, perceived ease of use, attitude toward using digital technology, self-efficacy, social norms, and intention to use. Prior studies have assessed these concepts in different contexts by making use of different theoretical frameworks and models. For example, Theory of Reasoned Action (TRA) developed by Fishbein (1967), Theory of Planned Behavior (TPB) proposed by Ajzen (1985), Unified Theory of Acceptance and Use of Technology (UTAUA) developed by Venkatesh et al. (2003), and Technology Acceptance Model (TAM) developed by Davis (1985). To illustrate how different dimensions of literacy can influence intention to use digital technology at the workplace, these theoretical models and frameworks will be reviewed. Finally, the conceptual model of this thesis will be thoroughly explained.

### 3.1.1 Theory of Reasoned Action and Planned Behavior

TRA was originally developed by Martin Fishbein and Icek Ajzen (1975) to illustrate and predict the relationships between attitudes, subjective norms, and intentions that influence an individual to behave in a particular way. According to Ajzen and Fishbein (1975), attitude toward the behavior can play a better role in predicting that specific behavior than an attitude to the object in which the behavior is directed. Ajzen (1991) added the variable perceived behavioral control to TRA, which resulted in the creation of the TPB.

TRA and TPB aim at constructs which concerned with factors determining the probability of performing a particular behavior. TRA and TPB consider behavioral intention as the best predictor of behavior, which is determined by the two constructs: attitude and social normative perceptions. Moreover, TPB is an extension of the TRA (Figure 2), which possesses an additional construct: perceived behavioral control (Montano and Kasprzyk, 2015). The main constructs of TRA and TPB are defined as the following:

**Subjective Norms (SN):** "The person's perception that most people who are important to him or her think he or she should not perform the behavior" (Ajzen and Fishbein, 1975).
**Attitude Toward Act of Behavior (AUT):** "Individual's positive and negative feeling about performing the target behavior" (Ajzen and Fishbein, 1975).
**Perceived Behavioral Control (PBC):** "The extent to which the person perceives that he or she can control the performance of the behavior" (Ajzen and Fishbein, 1980).

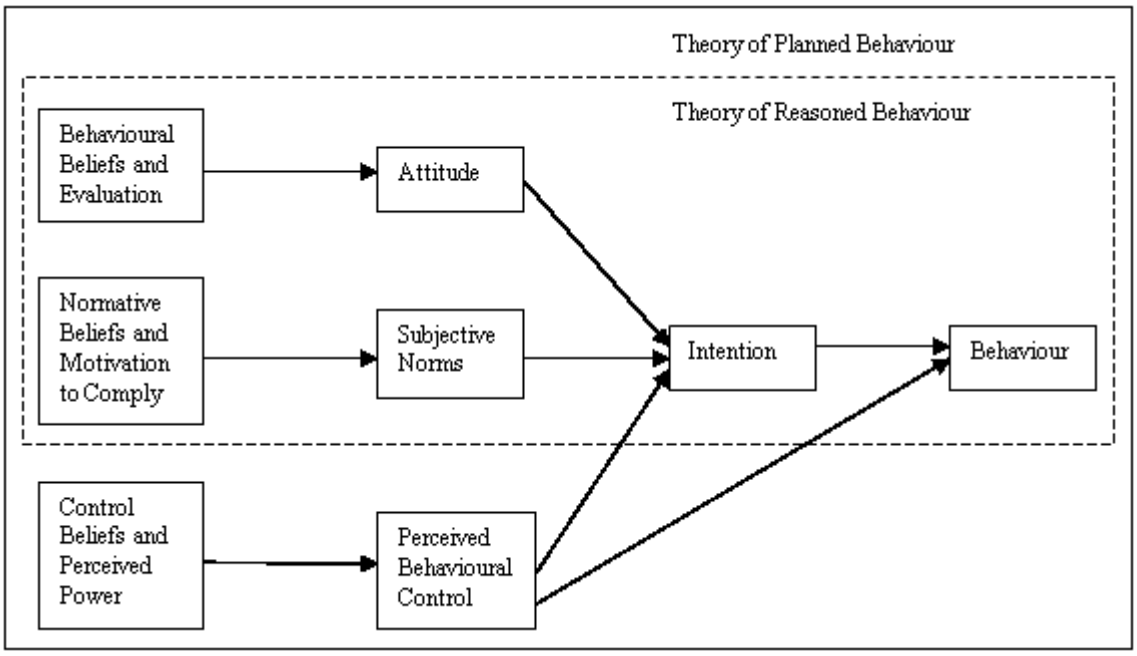



*Figure 2. Theory of Reasoned Action and Theory of Planned Behavior*

### 3.1.2 Technology Acceptance Model

This thesis introduces an empirical evaluation of an extension of Davis's (1989) Technology Acceptance Model (TAM) to assess how multidimensional literacy can impact on intention to use digital technology. The model referred to as Technology Acceptance Model (TAM), is considered as one of the most influential models of technology acceptance, which was developed by Davis (1985) to investigate the effect of system characteristics on user acceptance of computer-based information systems (Figure 3). The model consists of two primary factors influencing an individual's intention to use new technology: perceived ease of use (PEOU) and perceived usefulness (PU).

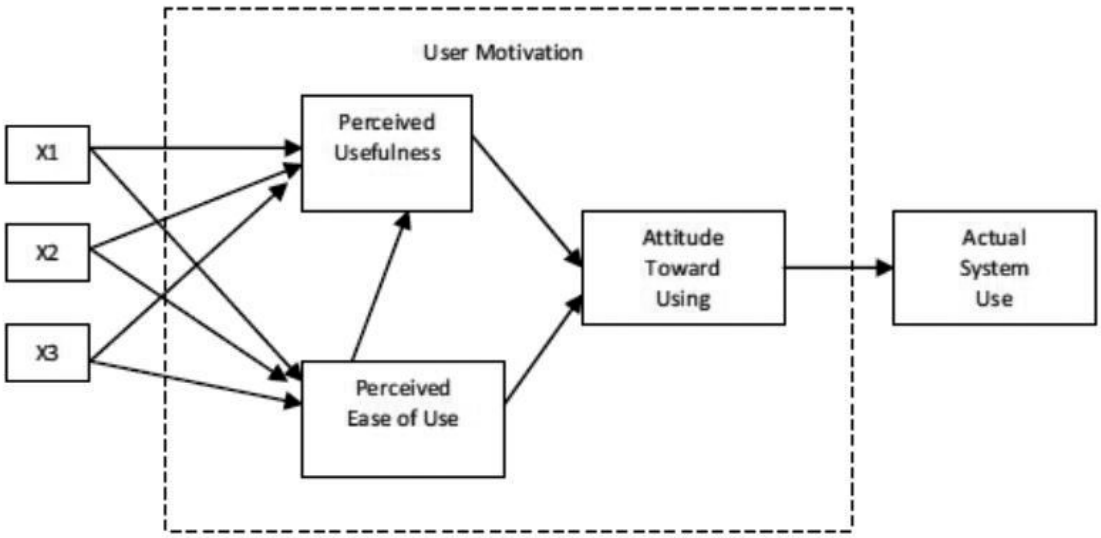



*Figure 3. Original Technology Acceptance Model (Davis, 1985)*

Davis (1985) defines these terms as below:

**Perceived usefulness**: "the degree to which an individual believes that using a particular system would enhance his or her job performance" (Davis, 1985, p. 26).
**Perceived ease of use**: "the degree to which an individual believes that using a particular system would be free of physical and mental effort" (Davis, 1985, p. 26).

### *3.1.2.1 Modified Version of Technology Acceptance Model*

Davis et al. (1989) developed the original TAM to investigate computer usage behavior. Moreover, it was modified to examine peoples' computer adoption by measuring their intentions and to explain their intention concerning their attitudes, subjective norms, perceived usefulness, perceived ease of use, and other related variables (Davis et al, 1989). TAM model utilizes the Theory of Reasoned Action (TRA) introduced by Ajzen and Fishbein (1975) as a theoretical basis for identifying the causal link between two main perspectives: perceived usefulness and perceived ease of use, and users' attitudes, intentions, and actual adoption behavior (Figure 4).

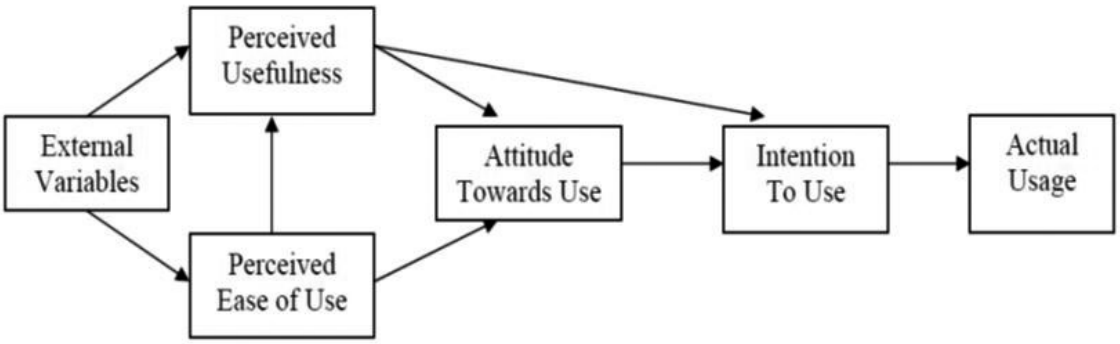



*Figure 4. First modified version of Technology Acceptance Model (TAM)*

### 3.1.3 Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUA) model was introduced by Venkatesh et al. (2003), which is an extension of TAM model (Figure 5). According to Venkatesh (2003), there are seven significant constructs, which can have direct impacts on individuals' intention or usage. Among these, four constructs remarkably determine user acceptance and usage behavior, which are performance expectancy, effort expectancy, social influence, and facilitating conditions. Furthermore, other constructs such as attitude toward using technology, self-efficacy, and anxiety do not directly determine the intention. In addition, gender, age, voluntariness, and experience are specified as the key moderators (Venkatesh et al., 2003).
According to Venkatesh et al. (2003), the main four constructs are defined as below:

**Performance Expectancy:** "Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 3003, p. 447).

**Effort Expectancy:** "Effort expectancy is defined as the degree of ease associated with the use of the system" (Venkatesh et al., 3003, p. 450).

**Social Influence:** "Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 3003, p. 451).

**Facilitating conditions:** "Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 3003, p. 453).

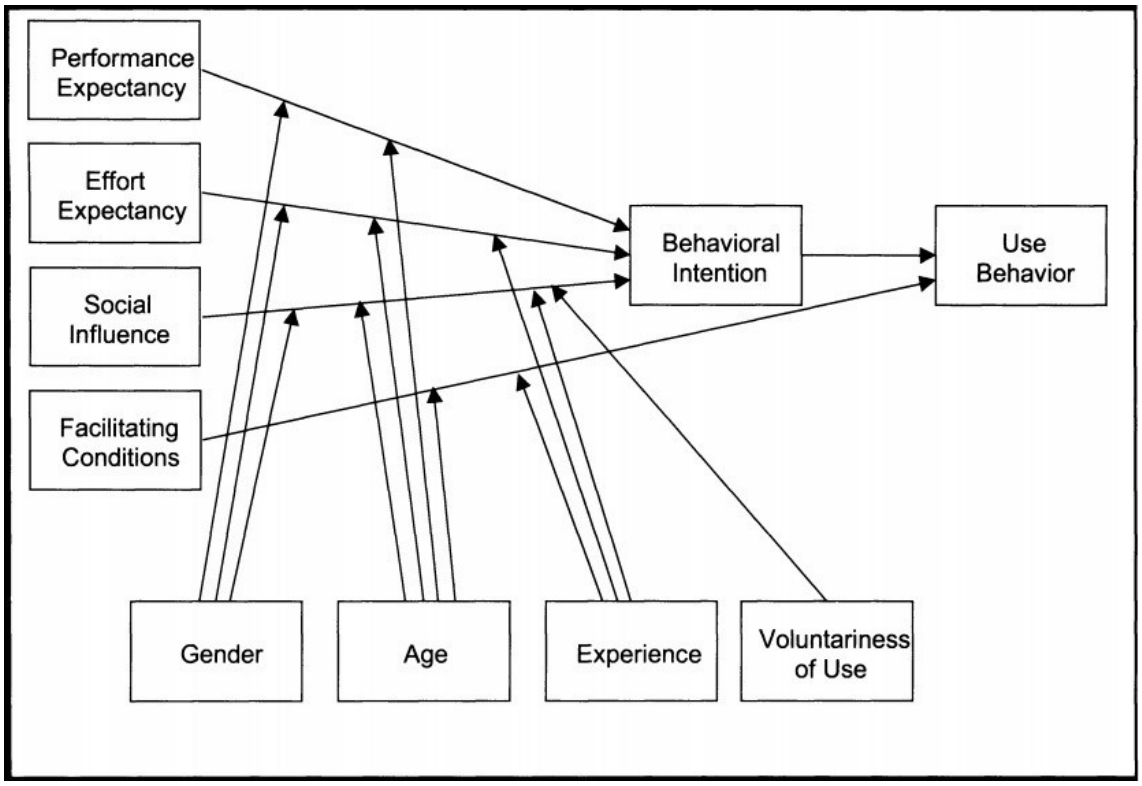



*Figure 5. The Unified Theory of Acceptance and Use of Technology (UTAUT)*

## 3.2 Research Model and Hypotheses

In this section, and according to the following observation, the overall leading theoretical model is explained. Six constructs of this thesis research model: perceived usefulness, perceived ease of use, attitude toward use, intention to use, social norms and self-efficacy are preliminarily selected from the theory of technology acceptance model (TAM) model, theory of reasoned action (TRA), theory of planned behavior and unified theory of acceptance and use of technology (UTAUT). We also include additional constructs i.e., information literacy and digital literacy that are not a part of TRA, TAM, TPB, and

UTAUT but have been explored in the literature and prior studies (Nikou et al., 2018; Nikou et al., 2019). The definitions of all constructs are discussed and introduced previously. In this section, their importance regarding this thesis will be explained to identify the factors that affect the intention to use digital technology at the workplace and based on this the hypotheses are formulated.

### *Self-efficacy*

In accordance with Bandura (1982), "Self-efficacy is associated with people's judgments of their own ability to perform specific tasks" and can be defined as "one's ability to recognize and execute the courses of action required to manage prospective situation" (Bandura, 1982).

Self-efficacy in the TPB model as perceived behavioral control (PBC) factor plays a key role in technology acceptance. People with low self-efficacy may think that things are harder than they really are, a conviction that increases stress, depression, and a limited vision of how best to solve an issue. On the other side, high self-efficacy enables one to build a sense of serenity when approaching challenging assignments and activities (Pajares, 1996). In many prior studies, this construct has been used to assess its impact on users' attitudes toward using technology. For example, Zhang et al. (2017) assessed the role of self-efficacy in individuals' acceptance of mobile health services. The results showed that self-efficacy plays a key role in individuals' acceptance of mHealth services, which also considerably moderate the effects of perceived usefulness and perceived ease of use on adoption intention of mHealth services (Zhang et al., 2017). Furthermore, Hsu and Chiu (2004) investigated the role of customers' self-efficacy as a factor that affects complex and high-risk services, such as online investment trading. The authors showed that self-efficacy considerably improves novice customers' financial performance perceptions and increases future usage intentions. Additionally, Wang et al. (2015) by integrating UTAUT and TAM models studied factors such as self-efficacy related to consumer's attitude toward adoption wearable technology in healthcare. The results indicated that self-efficacy is considered as a variable that users of medical device pay more attention to it.

As such, in this thesis self-efficacy is used to study how employees' self-assessment about their digital skills influence their intention to use digital technology, thus:

***H1**: Self-efficacy has a positive effect on attitude toward using digital technology.*

### *Social norms*

According to Thompson et al. (1991), social factors are defined as "the individual's internalization of the reference group's subjective culture and specific interpersonal agreements that the individual has made with others, in specific social situations". Further, social norms are "the specification of desirable behavior together with sanction rules in a community" (Kandori, 1992). Moreover, Venkatesh et al. (2003) defined social norms "as the degree to which an individual perceives that important others believe he or she should use the new system". In fact, "the individual's behavior is influenced by the way in which they believe others will view them as a result of having used the technology" (Venkatesh et al., 2003). In Venkatesh's (2003) model (UTAUT), social norms are considered as a key construct influencing users' intention to use technology. Many studies have shown that social norms are a significant factor influencing technology acceptance, particularly at the workplace. For example, Schepers and Wetzels (2007) undertook a quantitative meta-analysis of previous research on the technology acceptance model (TAM) to provide a well-grounded statement on the role of the subjective norm. The results showed a significant impact of subjective norm on attitude toward use of technology. Furthermore, the research was done by Yueh et al. (2016) on employees' acceptance of mobile technology in a workplace, indicated that social influence positively affects attitude toward mobile technology usage in the workplace. Furthermore, Vijayasarathy (2004) conducted a research to predict consumer intention to use on-line shopping by employing TAM and UTAUT models. Results indicated that self-efficacy as one of the constructs of the conceptual model is positively associated with on-line shopping. Accordingly, we argue that the factor social norms influence individuals' intention to use digital technology, thus:

***H2**: Social norms have a positive effect on attitude toward using digital technology.*

### *Perceived usefulness*

"Perceived usefulness (PU) is defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context" (Davis, 1989). Many studies have applied TAM model to investigate the impacts of perceived usefulness on the adoption of technology in the workplace. For instance, Bhattacherjee and Premkumar (2004) showed that perceived usefulness is the main belief driving IT usage intention in the workplace, the impact of which on the dependent variable is partly mediated by personal attitude. In other words, perceived usefulness and attitude are both significant predictors of IT usage intention (Bhattacherjee and Premkumar, 2004). In addition, Schierz et al. (2010), assessed the acceptance of mobile payment services among consumers through TAM model and they found a strong positive link between the perceived usefulness of mobile payment services and the attitude towards using mobile payment services. Furthermore, Vijayasarathy (2004) investigated the consumers' intention to use on-line shopping by applying TAM and UTAUT model. The results showed that perceived ease of use and perceived usefulness positively impact on consumers' intentions to use online shopping. In this thesis, we use perceived usefulness to assess how employees' perceptions of the usefulness of digital technology influences their attitude toward using digital technology.

***H3****: Perceived usefulness has a positive effect on intention to use digital technology.*

### *Perceived ease of use*

"Perceived ease of use (PEOU) refers to the degree to which the prospective user expects the target system to be free of effort" (Davis, 1989). Many studies have shown that perceived ease of use can positively influence on attitude and technology acceptance among users. For example, Schierz et al. (2010), assessed the acceptance of mobile payment services among consumers by applying TAM model. The results showed that the structural link from perceived ease of use to the attitude towards using mobile payment services is positive and significant. Furthermore, Fagan et al. (2008) investigated that perceived ease of use has a positive impact on the intention to use computers among

first-line managers in a mid-sized manufacturing organization. Moreover, Jahangir and Begum (2008) used the effects of ease of use and attitude as factors that can impact on customer adaptation mediated by customer attitude in the context of e-banking. Data was collected from 227 customers of private commercial banks in Bangladesh. The findings indicated that the ease of use and customer attitude are considerably and positively linked to customer adaptation. In this thesis, we argue that easier employees (digital native and digital immigrants) perceive the digital technology, the more positive their attitude toward using digital technology will be, hence:

***H4**: Perceived ease of use has a positive effect on intention to use digital technology.*

Furthermore, in TAM model it is shown that two constructs, perceived usefulness (PU) and perceived ease of use (PEU) are mainly relevant to users' computer acceptance behaviors. Furthermore, Perceived ease of use is hypothesized to have a considerable direct impact on perceived usefulness, Since, everything else is equivalent, a user-friendly system will lead to increased job performance for the user (Davis, 1985). Similarly, Schierz et al. (2010) assessed the acceptance of mobile payment services among consumers by applying TAM model. The relationship proposed between PU and PEU confirmed that perceived ease of use predicted the perceived usefulness of mobile payment services. Furthermore, Wang et al. (2003), studied factors that determine accept of Internet banking by users. The results indicated that the construct perceived ease of use of Internet banking has a significant impact on perceived usefulness of Internet banking. Thus, we propose that:

***H5**: Perceived ease of use has a positive effect on perceived usefulness of digital technology.*

***Attitude toward using technology***

According to Venkatesh et al., (2003) "attitude toward using technology is defined as an individual's overall affective reaction to using a system". Further, in accordance with

Bhattacherjee and Premkumar (2004), "user beliefs and attitudes are key perceptions driving information technology usage. These perceptions, however, may change with time as users gain first-hand experience with IT usage, which, in turn, may change their subsequent IT usage behavior" (Bhattacherjee and Premkumar, 2004). Built on TRA model, a person's attitude toward a behavior is defined by an individual's salient beliefs about the consequences of performing the behavior. Prior studies showed that attitude has a direct impact on the intention to use technology. For example, Rozell and Gardner's (1999) investigated 75 manufacturing employees participating in a computer-training course. The finding indicated that individuals with positive versus negative computer attitudes showed greater levels of computer efficacy and task-specific expectations. Moreover, Kennedy et al. (2008) assessed first year students' (digital natives) experiences with technology and the degree to which students' attitudes towards the use of new technology-based tools in their studies were linked to the frequency with which they currently used these tools. The results showed that there is a strong positive relationship between the degree to which students use technology and the degree to which they support their usage in their studies at university (Kennedy et al., 2008). Moreover, Schierz et al. (2010) assessed acceptance of mobile payment services among consumers by applying TAM model. Results showed that there is a significant and positive relationship between the attitude towards using mobile payment services and the intention to use mobile payment services. Accordingly, in this thesis, we argue that the more confident employees are with their ICT skills, the more positive their attitude toward using digital technology will be, hence:

***H6**: Attitude toward using digital technology has a positive effect on intention to use digital technology.*

### *Digital literacy*

According to Ng (2012), a digitally literate person is considered as an individual having technical and operational skills to use technology for different purposes. Digital literacy constitutes a system of skills and strategies used by learners and users in digital environments. By employing different types of digital literacy, users improve their

performance and "survive" a variety of obstacles and stumbling blocks that lie in the way within this special medium (Eshet, 2004). Besides, digital literacy can be considered as an intersection of three dimensions of technical, cognitive, and social-emotional Ng (2012). In terms of technical dimension, employees are expected to be knowledgeable with ICT and have the ability to properly operate digital technologies such as the Internet, computers, and company's platforms in their workplace. Furthermore, the use of cognitive abilities usage significantly increase network navigation efficiency, avoids disorientation issues, and improves the knowledge building ability (Lee and Hsu 2002, cited by Eshet 2004). The cognitive dimension of digital literacy can be considered as employees' ability to operate digital technology critically such as evaluating and properly managing digital information. This dimension requires the employee to learn the ethical, moral and validity of information resources (Ng, 2012). Mohammadyari and Singh (2015) investigated the impact of digital literacy on the intention of New Zealand accountants working in small and medium-sized enterprises (SMEs) to continue using e-learning and their performance by applying UTAUT model. The results showed a significant relationship between digital literacy on the users' performance and their intentions to continue using Web 2.0 tools. In addition, Nikou et al. (2018) investigated how different dimensions of literacy such as digital literacy can impact digital immigrants and digital natives' intention to use digital technology in an educational environment. Due to the lack of research in a workplace context, this thesis concentrates on the impact of digital literacy (Ng's (2012) framework) on the intention to use digital technology among employees in the digital workplace context. In the context of this study, we expect the employees to possess digital literacy ability and based on that they have intention to use digital devices, platforms, and tools to perform their daily tasks, hence:

***H7**: Digital literacy has a positive effect on intention to use of digital technology.*

### *Information literacy*

According to Bruce (1999), "Information literacy is about peoples' ability to operate effectively in an information society. This involves critical thinking, an awareness of

personal and professional ethics, information evaluation, conceptualizing information needs, organizing information, interacting with information professionals and making effective use of information in problem-solving, decision-making and research" (Bruce, 1999). According to Ng (2012), an information literate person is a critical thinker who has the ability to locate, evaluate web-based information productively. In addition, the need for instructing information literacy in the workplace is emphasized by many researchers. "While the term 'information literacy' may not be common, understood or applicable in any given context, the ability to effectively use information, including locating, evaluating, storing, retrieving, communicating, is vital to the success of any organization" (Kirton and Barham, 2005). Naveed and Rafique (2018) assessed information literacy in the context of workplace (among 121 scientists working at the Pakistan Council of Scientific and Industrial Research (PCSIR)). The findings showed a significant lack of formal information literacy training among scientists throughout their entire career.

Prior studies (e.g., Kerka, 1999; Nikou et al., 2018; Nikou et al., 2019) pointed out that the ability to effectively locate, evaluate, share and use information influence the attitude toward using the technology. An information literate person is expected to possess the ability to recognize his or her information needs, identify the credibility, originality of information sources, and make effective use of it. We content that information literacy is strongly associated with attitude toward using digital technology, hence:

***H8**: Information literacy has a positive effect on intention to use of digital technology.*

### *Intention to use*

In this thesis, intention to use is used as the independent variable. In many prior studies, users' intentions have been broadly considered as the construct that influences user technology acceptance particularly among digital immigrants and digital natives. In 2013, Gu et al. conducted a research model with related factors influencing technology acceptance. The results showed that the gap between teachers (digital immigrants) and students (digital natives) associated with the technology is based on how they use technology and how important they perceived it to be. Moreover, Wang et al. (2012),

observed that intention to use is a strong factor for technology acceptance in the educational field among digital immigrants and digital natives. Moreover, Behringer and Sassenberg (2015) assessed 315 employees within an organization to identify the impact of employees' intentions on the adoption of new technologies. The findings clearly supported that intention can impact on employees' future usage of social media for knowledge exchange within the organization. Therefore, this construct is used in this thesis to assess digital natives and digital immigrants' intentions to use digital technology. Accordingly, we propose the following research model, see Figure 6.

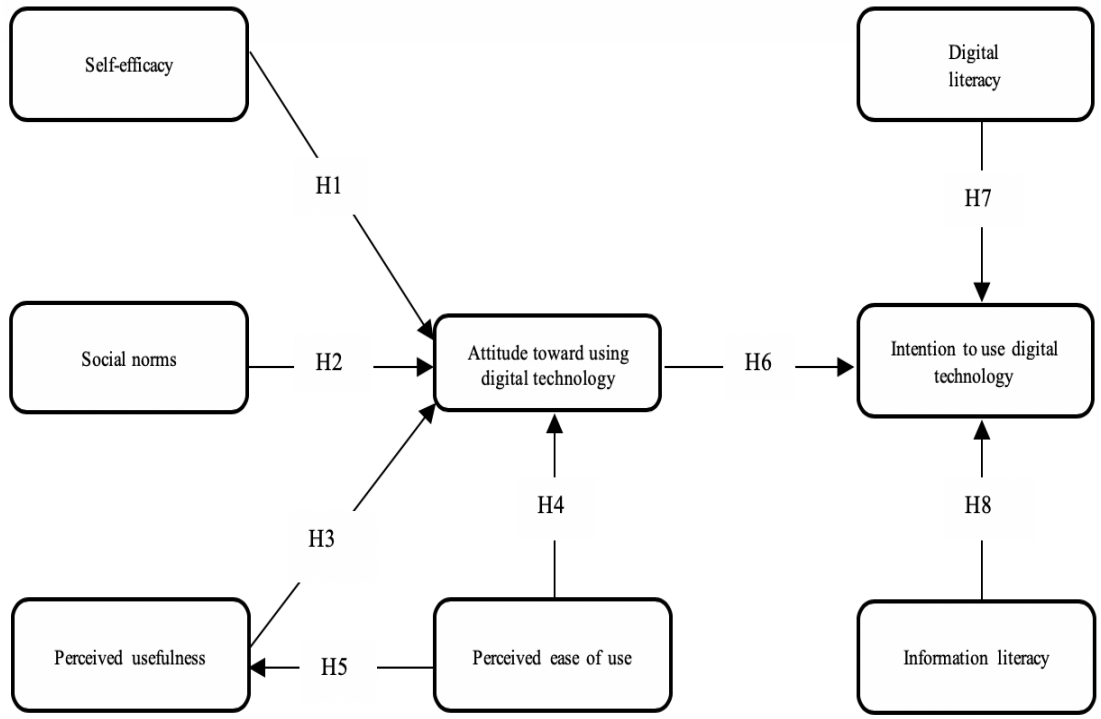



*Figure 6. Research model*

# 4 METHODOLOGY

In this chapter, an overview of the research methodology, which is applied in this thesis will be presented and discussed. To start with, a general view of the research and data collection method is introduced as well as the survey questionnaire. Next, the description of the selected research method for providing answers to the research question will be presented

## 4.1 Research method

In terms of the research method, a convenience sampling approach is used in this thesis to collect the required data on the intention to use digital technology at the workplace. According to Hox and Boeije (2005), basically, there are two types of data; primary and secondary.

**Primary data:** "Original data collected for a specific research goal".
**Secondary data:** "Data originally collected for a different purpose and reused for another research question". Furthermore, according to Greener (2008), two different types of research methods can be used to conduct research; qualitative and quantitative research.

**Quantitative research:** "A quantitative approach to research is likely to be associated with a deductive approach to testing theory, often using number or fact and therefore a positivist or natural science model, and an objectivist view of the objects studied" (Greener, 2008, p. 17).
**Qualitative research:** "A qualitative approach to research is likely to be associated with an inductive approach to generating theory, often using an interpretivist model allowing the existence of multiple subjective perspectives and constructing knowledge rather than seeking to "find" it in "reality" (Greener, 2008, p. 17).

In addition, according to Pekrum et al. (2002), quantitative measures are required for more strict testing of hypotheses, basically, qualitative methods may be ideally suited for explaining new areas. Also, quantitative evaluation is required to analyze the effects and

causes more accurately (Pekrum et al., 2002). As a result, since the data are collected for a specific purpose of this thesis, and then data will be generated into measurable data and usable statistics, primary data and quantitative research are employed to conduct this thesis.

## 4.2 Data collection method and sample

In order to collect data and test the research hypotheses, a convenience sampling method is employed. In this approach, an online survey questionnaire is used as the research instrument through the Webropol platform. The survey questionnaire was aimed at employees in Finland and is constructed based on the variables deriving from the conceptual model. In this thesis, a total of 47 measurement items are utilized to describe the 8 chosen variables. According to Boon and Boon (2012), a 7-point Likert-type scale is suitable for survey questionnaires, which examine attitude and behavior. Furthermore, in order to increase the reliability of this thesis, these measurement items are derived from prior studies (e.g., Nikou et al., 2018; Nikou et al., 2019) which have been conducted in different contexts using 7-point Likert scale and the results showed accurate measurements. Thus, a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) is used in the construction of the survey questionnaire in this thesis. Additionally, in order to test the consistency and transparency of the questions of the survey questionnaire, a pilot study was performed including 10 participants by using the initial version of the survey questionnaire. "The term 'pilot studies' refers to mini versions of a full-scale study (also called 'feasibility' studies), as well as the specific pretesting of a particular research instrument such as a questionnaire or interview schedule" (Van and Hundley, 2002). A pilot study may not guarantee the success of the research, but it can improve the probability (Van and Hundley, 2002). Built on the results of the pilot study, the structure and some of the questions of the survey questionnaire were revised. In the following step, the questionnaire was opened and distributed on 12.08.2019. Also, the questionnaire was sent by email to 950 employees working in different industries. Moreover, the survey questionnaire was posted using the author's social media connections such as Facebook and LinkedIn among many users. The respondents were asked to share the post with other employees to obtain more responses to the survey questionnaire. After the course of 4

weeks, the questionnaire was closed on 11.09.2019. In total, 121 questionnaires were returned by employees. Fifteen responses were invalid and thus were discarded, thus 106 questionnaires are used for data analysis of this thesis. The survey questionnaire of this thesis is presented in Appendix 2.

### 4.3 Chosen Method for Analysis

In this thesis, Structural Equation Modeling (SEM) method using SmartPLS has been used for data analysis. Prior studies have applied this method (Nikou et al., 2018; Nikou et al., 2019). According to Hair et al. (2014), two distinct methods can be applied to conduct research: CM-SEM and PLS-SEM. Although SEM seems to be equivalent to a covariance-based approach, it requires to employ partial least squares SEM (PLS-SEM) as a unique and functional approach. The methods of CB-SEM and PLS-SEM have a major difference. While the goal of PLS-SEM is similar to using multiple regression analysis through maximizing the amount of variance explained of the dependent latent constructs of the model, CB-SEM aims at creating the covariance matrix, without considering the explained variance. PLS-SEM enable researchers to work efficiently with a large variety of sample sizes and complex model. Furthermore, in contrast with CM-SEM, measuring the constructs are less limited to PLS-SEM and even constructs with fewer items can be analyzed. Furthermore, CM-Sem is used when the main goal of research is to do a test and confirmation, but PLS-SEM is appropriate when the research goal is to predict and create theory. Built on this, significant benefits of PLS-SEM have resulted in extensive usage of PLS-SEM among researchers over recent years (Hair et al., 2011). Furthermore, there are three main premises for using PLS-SEM: non-normal data, small sample size, and formatively measured constructs. These main justifications show that in estimating parameters, PLS-SEM has more improved effectiveness and statistical power than CB-SEM (Hair et al., 2011). In addition, according to Hair et al. (2011), the researcher should consider a set of criteria while choosing the research method such as the goal of research, measurement model specification, structural model, data characteristics, and model evaluation.

**Research goals**

The main criterion for selecting the research model is based on the research's objectives. According to Hair et al. (2011), if constructing the causal model is based on strong theory and the researcher's goal is to perform a test and confirm the model, CB-SEM would seem to be the best statistical method. On the other hand, when the researcher confronts an undeveloped theory and the main goal is not about performing a test and confirmation PLS-SEM is the appropriate method since the research objective is to develop a theory and predict it. This feature is one of the CB-SEM's limitations since it is unable to facilitate the prediction of research objectives. The objective of this thesis is to apply and extend four main theories and predict the hypothesis, thus PLS-SEM is selected as an appropriate statistical method for the research goal.

**Measurement Model Specification**

If the structural model of the research includes formative constructs, PLS-SEM will be the appropriate method for data analysis. According to Hair et al. (2011), the CB-SEM can include a formative construct, but some restrictions and certain rules should be considered. Moreover, when additional specifications such as covariance are required for error terms, CB-SEM is more suitable (Hair et al., 2011). In the structural model of this thesis, the items form the constructs than reflect them; thus, the constructs are formative and less reflective. Accordingly, PLS-SEM is considered as a suitable research method for this study.

**Structural Model**

The structural model is another determinant of choosing a method. If the structural model consists of many constructs and the model is complex, PLS-SEM will be the preferred method (Hair et al., 2011). On the contrary, if the structural model is non-cursive, CB-SEM will be suggested (Hair et al., 2011). In this thesis, the structural model is seemingly complex since it consists of eight distinct constructs. Thus, PLS-SEM is satisfactory.

**Data Characteristics and Algorithm**

Another factor for selecting the method between PLS-SEM and CB-SEM is the sample size. According to Hair et al. (2011), when the sample size is large, many indicator

variables can be applied to estimate the dependent constructs. Thus, there would be no difference in the results of PLS-SEM and CB-SEM. Conversely, if the sample size is relatively small, PLS-SEM will be the appropriate one. In this case, the sample size should follow these two rules: "(1) ten times the largest number of formative indicators used to measure one construct or (2) ten times the largest number of structural paths directed at a particular latent construct in the structural model" (Hair et al., 2011, p. 144). Furthermore, when the data set is normal CB-SEM and PLS-SEM results are relatively close to each other, but if the data set is rather non-normal, PLS-SEM is the best choice (Hair et al., 2011). In this thesis, due to the small sample size (106) that merely meets the CB-SEM conditions, PLS-SEM is employed for the data analysis.

**Model Evaluation**

According to Hair et al. (2011), if latent variable scores are intended to be used in future analysis, PLS-SEM is typically the appropriate approach. On the other side, if the global goodness-of-fit is required in research, CB-SEM would be employed. In this study, the main motivation is to examine each path coefficient and the variance, rather than the overall model fit. Hence, The PLS-SEM is considered as the right approach for this research.

# 5 RESULTS AND ANALYSIS

In this thesis, in order to examine employees' intention to use digital technology at the workplace, an online questionnaire was distributed, and data were collected over the course of four weeks. A total of 121 questionnaires were returned, and after cleaning the data and removing unengaged respondents (e.g., scored the same value for all items), we obtained 106 responses in a total.

The purpose of this chapter is to present a comprehensive data analysis collected through the survey questionnaire. The first step is to summarize the data by conducting a descriptive analysis. In the second stage, we apply PLS-SEM analysis by using SmartPLS software to evaluate the conceptual model of this thesis.

## 5.1 Descriptive Analysis

The first part of the questionnaire was designed in a way that it collected some basic demographic information from the participants. Furthermore, here descriptive analysis is used to provide the basics and summaries of the respondents' background information. The sample of participants was not limited to a specific workplace, and we aimed to collect data from employees in different industries and sectors who perform their work activities through the use of digital technologies. As suggested by Hair et al. (2011), the non-response bias test was performed, comparing the first 25% of respondents with the final 25% of respondents for all survey items in the constructs using the chi-square test. The non-response bias test shows that the respondents do not differ significantly, thus we concluded that data is not biased. In Table 1, the characteristics of the respondents are shown. Among the respondents participating in this research, 59% (N = 63) are males and 39 % (N = 41) are females, two respondents did not indicate their gender. The average age of the respondents is 34.68 years old with the minimum being 22 and maximum being 62 years old. Furthermore, of the respondents 38 were digital native and 68 were digital immigrant based on their age characteristics.

*Table 1. Characteristics of respondents*

| **Demographic (N = 106** | | | | | | |
|---|---|---|---|---|---|---|
| | **Digital Natives** | | **Digital Immigrants** | | **Total** | |
| Gender | N | % | N | % | N | % |
| Female | 16 | 42.11 % | 25 | 36.76 % | 41 | 38,68 % |
| Male | 20 | 52.63 % | 43 | 63.24 % | 63 | 59,43 % |
| Other | 2 | 5.26 % | 0 | 0,00 % | 2 | 1,89 % |
| Grand Total | 38 | 100,00 % | 68 | 100,00 % | 106 | 100,00 % |
| **Age** | | | | | | |
| Min age | 22 | | 30 | | | |
| Max age | 29 | | 62 | | | |

Moreover, Table 2 shows the education level of the participants. The majority of the participants are educated and most of them have master's degree (N = 55) and bachelor's degree (N = 33).

*Table 2. Education degree of respondents*

| **Demographic (N = 106)** | | | | | | |
|---|---|---|---|---|---|---|
| Education level | **Digital native** | | **Digital immigrant** | | **Total** | |
| High school diploma | 2 | 5.26 % | 4 | 5.88% | 6 | 5.66% |
| Bachelor's degree | 21 | 55.26 % | 15 | 22.06% | 36 | 33.96% |
| Master's degree | 14 | 36.84% | 41 | 60.29% | 55 | 51.89% |
| PHD | 0 | 0.00% | 6 | 8.82% | 6 | 5.66% |
| Other | 1 | 2.63% | 2 | 2.94% | 3 | 2.83% |

When we asked in which type of organization they work for, 71 of them (66.98%) respondents mentioned they work for the private sector, 24 (22.64%) respondents indicated they work for the public sector, and the only 5 respondents work for the non-profit sector (4.73%). Table 3 shows the descriptive analysis of respondents in terms of the type of organization.

*Table 3. Type of organization*

| **Demographic (N = 106)** | | | | | | |
|---|---|---|---|---|---|---|
| Type of organization | **Digital native** | | **Digital** | | **Total** | |
| Public sector | 9 | 23.68% | 15 | 22.06% | 24 | 22.64% |
| Private sector | 24 | 63.16% | 47 | 69.12% | 71 | 66.98% |
| Non-profit sector | 1 | 2.63% | 4 | 5.88% | 5 | 4.72% |
| I don't know | 1 | 2.63% | 0 | 0.00% | 1 | 0.94% |
| Other | 3 | 7.89% | 2 | 2.94% | 5 | 4.72% |

In terms of occupation level of respondents, most of them mentioned that they are trained professionals 22.64%, followed by middle management and researchers 14.15%, see Table 4.

*Table 4. Occupation level*

| **Demographic (N = 106)** | | | | | | |
|---|---|---|---|---|---|---|
| Occupation level | **Digital native** | | **Digital immigrant** | | **Total** | |
| Upper Management | 1 | 2.63% | 6 | 8.82% | 7 | 6.60% |
| Middle Management | 1 | 2.63% | 14 | 20.59% | 15 | 14.15% |
| Junior Management | 4 | 10.53% | 7 | 10.29% | 11 | 10.38% |
| Administrative staff | 2 | 5.26% | 4 | 5.88% | 6 | 5.66% |
| Support Staff | 1 | 2.63% | 0 | 0.00% | 1 | 0.94% |
| Trained Professional | 6 | 15.79% | 18 | 26.47% | 24 | 22.64% |
| Skilled Laborer | 1 | 2.63% | 1 | 1.47% | 2 | 1.89% |
| Consultant | 2 | 5.26% | 2 | 2.94% | 4 | 3.77% |
| Temporary Employee | 3 | 7.89% | 2 | 2.94% | 5 | 4.72% |
| Researcher | 6 | 15.79% | 9 | 13.24% | 15 | 14.15% |
| Student | 10 | 26.32% | 1 | 1.47% | 11 | 10.38% |
| Self-employed | 1 | 2.63% | 3 | 4.41% | 4 | 3.77% |

In terms of the type of organization which respondents work for, the majority of them indicated that they work for the scientific or technical services industry and educational organization 13.21 % and 11.32%, respectively, followed by software and information services accounted for 9.43%. Appendix 1 shows the types of industries in which respondents work in detail.

## Frequency and proficiency of digital technology usage

In the survey questionnaire, we asked respondents to mention how often they use digital technology. Table 5 shows the frequency use of digital tools and devices in the workplace. As can be seen, smartphones, laptops and mobile Internet are being extensively used by at least over 83% of the respondents, smartphones being almost to 100%.

*Table 5. The frequency of use of digital tools at workplaces*

| | I do not use | A few times a week | A few times a day | Once a day | Several times a day |
|---|---|---|---|---|---|
| Mobile (smart) phone | 1.47 | 0.00 | 0.00 | 1.47 | 97.06 |
| Desktop computer | 45.59 | 7.35 | 2.94 | 5.88 | 38.24 |
| Laptop computer | 2.94 | 1.47 | 4.41 | 4.41 | 86.76 |
| Tablet | 41.18 | 23.53 | 14.71 | 10.29 | 10.29 |
| MP3/4 player or iPod | 94.12 | 4.41 | 0.00 | 1.47 | 0.00 |
| Wearable devices | 54.41 | 8.82 | 8.82 | 1.47 | 26.47 |
| Mobile Internet | 2.94 | 1.47 | 0.00 | 0.00 | 95.59 |

Furthermore, in the survey questionnaire respondents were asked to mention their level of proficiency in relation to the digital devices. The proficiency of the respondents regarding the digital devices, software and applications was measured and as "1: Not proficient at all, 4: Neutral and 7: Very proficient". As can be seen from Table 6, respondents have scored above the average in all items. For instance, over 90% of them mentioned they are proficient or very proficient with Microsoft Office and as much as 85% mentioned they are proficient with file sharing applications. The less proficiency was on ERP systems, as perhaps many of the respondents do not use it in their workplaces.

*Table 6. Proficiency level of using digital tools*

| **Self-report rating of proficiency on digital tools and devices** | **Mean** |
|---|---|
| Microsoft Office | 5.98 |
| File sharing (e.g., Google Drive, Dropbox) | 5.72 |
| Photo/image editing (e.g., Photoshop, PhotoScape) | 4.17 |
| Mobile devices organizer (e.g., address book, calendar) | 5.75 |
| Email services (e.g., Outlook, Gmail) | 6.26 |
| Social media (e.g., Facebook, Instagram) | 5.62 |
| Microsoft Teams | 3.79 |
| Skype for business | 4.97 |
| ERP system | 2.6 |
| SAP | 2.37 |

## 5.2 Measurement Results (Outer model)

In order to ensure that the model's constructs are precisely presented and measured, in the first stage of PLS-SEM, we examine the reliability and validity of the outer model. Starting with the evaluation of the outer models, the researcher can ensure that the constructs that form the baseline for the evaluation of the inner model relations are correctly calculated and presented (Hair et al., 2014). Thus, by using PLS algorithm the factor loadings of each measurement items are examined. According to Hair et al. (2014), the researcher should take each indicator's reliability into account. The factor loading values for each item should be at least 0.7 or higher to indicate that the main constructs describe more than 50 percent of the measuring item variance (Hair et al., 2014). In addition, Hair et al. (2014) indicated that generally speaking, loading indicators between 0.40 and 0.70 should be excluded from the model if the removal of these indicators results in an improvement in composite performance. Moreover, according to Awang (2012), the

recommended factor values are above the threshold 0.60, which has been applied to the model of this thesis.

Reliability and validity are also checked through Composite Reliability (CR), Cronbach's alpha, and Average Variance Extracted (AVE). Construct reliability assessment generally aims at composite reliability as an estimate of a construct's internal consistency. In contrast, Cronbach's alpha composite reliability does not suppose that all indicators are equally reliable. This character can be considered more appropriate for PLS-SEM since it ranks indicators based on their reliability during the estimation of the model (Hair et al., 2011). Accordingly, Table 7 shows conclusive results of the outer model reliability and validity values for complete data, it also includes items with factor loadings below .60 (DL10, IL2, IL7, SN3) that are removed from the final analysis.

While in exploratory research composite reliability values of 0.60 to 0.70 are considered satisfactory, in advanced level of research values from 0.70 to 0.90 are regarded as satisfactory (Nunnally and Bernstein 1994, cited by Hair et al., 2011), and values below 0.60 shows a lack of reliability (Hair et al., 2011). Furthermore, Van Griethuijsen et al. (2015) recommended the values for Cronbach's alpha should be at least 0.6 or preferably above 0.7. The next step is to measure convergent validity in which the average variance extracted (AVE) needs to be examined. The desirable AVE value is 0.50 and higher which shows that the latent variable represents more than 50 percent of the variance of its indicators, which is a suitable degree of convergent validity, (Hair et al., 2011).

Accordingly, the two convergent and discriminant validity tests were examined to validate the measurement model in this thesis. Convergent validity is illustrated in Table 7, which is assessed by composite reliability, average variance, and Cronbach's alpha. As Table 7 shows, the results of composite reliability and AVE for data, which are above the recommended value of 0.70 and 0.50, respectively.

*Table 7. Reliability and validity for complete data*

| Constructs | items | Factor loading | Cronbach's α | CR | AVE |
|---|---|---|---|---|---|
| **Digital literacy** | DL1 | .895 | .932 | .943 | .648 |
| | DL2 | .869 | | | |
| | DL3 | .775 | | | |
| | DL4 | .803 | | | |
| | DL5 | .757 | | | |
| | DL6 | .818 | | | |
| | DL7 | .769 | | | |
| | DL8 | .853 | | | |
| | DL9 | .686 | | | |
| **Information literacy** | IL1 | .777 | .821 | .871 | .578 |
| | IL3 | .695 | | | |
| | IL4 | .661 | | | |
| | IL5 | .796 | | | |
| | IL6 | .855 | | | |
| **Self-efficacy** | SE1 | .835 | .937 | .950 | .760 |
| | SE2 | .878 | | | |
| | SE3 | .908 | | | |
| | SE4 | .907 | | | |
| | SE5 | .827 | | | |
| | SE6 | .873 | | | |
| **Social norms** | SN1 | .785 | .688 | .829 | .619 |
| | SN2 | .848 | | | |
| | SN4 | .720 | | | |
| **Perceived usefulness** | PU1 | .919 | .939 | .954 | .805 |
| | PU2 | .931 | | | |
| | PU3 | .919 | | | |
| | PU4 | .874 | | | |
| | PU5 | .842 | | | |
| **Perceived ease of use** | PEOF1 | .859 | .917 | .935 | .705 |
| | PEOF2 | .825 | | | |
| | PEOF3 | .854 | | | |
| | PEOF4 | .811 | | | |
| | PEOF5 | .846 | | | |
| | PEOF6 | .840 | | | |
| **Attitude toward use** | ATT1 | .809 | .897 | .911 | .672 |
| | ATT2 | .857 | | | |
| | ATT3 | .809 | | | |
| | ATT5 | .838 | | | |
| | ATT6 | .784 | | | |
| **Intention to use** | IU1 | .734 | .899 | .921 | .626 |
| | IU2 | .838 | | | |
| | IU3 | .907 | | | |
| | IU4 | .875 | | | |
| | IU5 | .744 | | | |
| | IU6 | .762 | | | |
| | IU7 | .647 | | | |

When the convergent validity and reliability are successfully initiated, in the next step, to assess discriminant validity, we calculated the square root of the AVE. In this thesis, first, the Fornell and Larcker's criterion and cross-loadings table are employed to assess the

discriminant validity. Furthermore, the Heterotrait-Monotrait ratio of correlations is applied as the third method of discrimination validity.

**a) Fornell-Larcker criterion**

According to Hair et al. (2014), two methods are recommended for evaluating discriminant validity. Firstly, "the AVE of each latent construct should be higher than the construct's highest squared correlation with any other latent construct (Fornell–Larcker criterion)" and secondly, "an indicator's loadings should be higher than all of its cross loadings" (Hair et al., 2014). In terms of Fornell_Larcker criterion, the square root of the AVE values for all the eight constructs for data are shown in Table 8. The results indicate that the measured values are greater than the correlations among them, thus we confirm discriminant validity.

*Table 8. Farnell-Larcker criterion*

| Constructs | ATT | DL | IL | INT | PU | PEOU | SEFFI | SN |
|---|---|---|---|---|---|---|---|---|
| Attitude toward use | **.820** | | | | | | | |
| Digital literacy | .509 | **.813** | | | | | | |
| Information literacy | .494 | .579 | **.760** | | | | | |
| Intention to use | .381 | .494 | .503 | **.791** | | | | |
| Perceived ease of use | .557 | .738 | .668 | .526 | **.839** | | | |
| Perceived usefulness | .539 | .448 | .407 | .406 | .498 | **.897** | | |
| Self-efficacy | .594 | .480 | .469 | .388 | .485 | .506 | **.872** | |
| Social norm | .456 | .387 | .383 | .333 | .417 | .367 | .423 | **.786** |

Note: Attitude toward use = ATT; Digital literacy =DL; Information literacy =IL; Intention to use =INT; Perceived ease of use =PEOU: Perceived usefulness =PU; Self-efficacy =SEFFI; Social norm =SN

**b) Cross-loadings**

Next, as the second method for checking discriminant validity, we examined the measurement items' cross loading. In this method, each item's loadings should be greater than all of its cross loadings (Hair et al., 2014). Based on the cross-loading table of this thesis in Appendix 2, the results show that the requirements for each item are met. Thus, based on the results of cross loadings method, it can be concluded that the recommended requirements for discriminant validity are satisfied.

**c) Heterotrait-Monotrait Ratio (HTMT)**

Finally, Heterotrait-Monotrait Ratio (HTMT) method is also applied for the assessment of discriminant validity. Due to the lack of sufficient sensitivity for discriminate validity

in variance-based SEM analysis such as Fornell-Larcker criterion and cross-loadings evaluation, the alternative criterion Heterotrait-Monotrait ratio (HTMT) is introduced. Heterotrait-Monotrait Ratio (HTMT) allows a structural discriminant validity evaluation to establish construct validity (Henseler et al., 2015).

According to Henseler et al. (2015), three criteria are considered in HTMT method including HTMT $_{.85}$, HTMT $_{.90}$ and HTMT$_{inference,}$ and their main difference is concerning their specificity. "The actual choice of criterion depends on the model set-up and on how conservative the researcher is in his or her assessment of discriminant validity" (Henseler et al., 2015).

Of the three criterion HTMT.85 is the strictest criterion, which achieves the lowest specificity rates. This means that if the HTMT value is less than .85, the discriminant validity is initiated between a pair of reflective constructs. "HTMT.85 can pint to discriminant validity problems in research situations in which HTMT.90 and HTMT$_{inference}$ indicate that discriminant validity has been established" (Henseler et al., 2015). Moreover, the most liberal criterion is HTMT$_{inference}$. "Even if two constructs are highly, but not perfectly, correlated with vales close to 1.0, the criterion is unlikely to indicate a lack of discriminant validity, particularly when (1) the loadings are homogeneous and high or (2) the sample size is large" (Henseler et al., 2015). This means that HTMT proportion should be less than 1.0 to initiate the discriminant validity between a pair of reflective constructs. On the other side, HTMT.90 criterion leads to a much lower specificity rate under a large majority of circumstances compared to HTMT$_{inference}$, which means if HTMT value is less than .90 the discriminate validity is initiated between a pair of reflective constructs. Built on the recommendation of Hensler et al. (2015), HTMT$_{.80}$ is employed in the model of this thesis. The results are illustrated in Table 9, indicating that all values are below .80, which means the recommended requirements for discriminant validity are satisfied.

*Table 9. Heterotrait-Monotrait ratio of correlations*

| Constructs | ATT | DL | IL | INT | PU | PEOU | SEFFI | SN |
|---|---|---|---|---|---|---|---|---|
| Attitude toward use | | | | | | | | |
| Digital literacy | **0.565** | | | | | | | |
| Information literacy | 0.578 | **0.639** | | | | | | |
| Intention to use | 0.412 | 0.494 | **0.527** | | | | | |
| Perceived ease of use | 0.596 | 0.800 | 0.766 | **0.567** | | | | |
| Perceived usefulness | 0.585 | 0.479 | 0.437 | 0.432 | **0.520** | | | |
| Self-efficacy | 0.639 | 0.522 | 0.522 | 0.409 | 0.516 | **0.522** | | |
| Social norm | 0.573 | 0.485 | 0.508 | 0.430 | 0.513 | 0.457 | **0.523** | |

Note: Attitude toward use = ATT; Digital literacy =DL; Information literacy =IL; Intention to use =INT; Perceived ease of use =PEOU: Perceived usefulness =PU; Self-efficacy =SEFFI; Social norm =SN

## 5.3 Structural Results (Inner model)

Following analysis of the outer model, the next step of the smart PLS-SEM analysis is assessing the inner model, which is done by applying bias-correcting and accelerated bootstrapping method by Ringle et al. (2015). R-squared level and significance of the path coefficients are the main evaluation criteria for the structural model (Hair et al., 2011). Moreover, in the PLS structural model, the individual path coefficients can be considered as standardized beta coefficients of ordinary least squares regressions. (Hair et al., 2011).

According to Wong (2013), SmartPLS operates bootstrapping method to create T-statistics for significance testing of both the inner and outer model. This method employs a large number of subsamples from the original sample with substitution to give bootstrap standard errors. The total number of subsamples is recommended to be set to 5000 (Wong, 2013). Thus, the number of subsamples in this thesis is set to 5000. Furthermore, smart PLS generates t-statistics and p-value which facilitates us to test the significant of each path coefficient in this study. According to Hair et al. (2011), the recommended critical estimation for *t*-values for a two-tailed test are 1.65 (significance level $p < 10\%$), 1.96 (significance level $p < 5\%$), and 2.58 (significance level $p < 1\%$).

R-squared is another statistical measure which indicates the closeness of data is a to the fitted regression line. According to Hair et al. (2011), in the structural model the consideration of $R^2$ values depends on research discipline. “Whereas $R^2$ results of 0.20 are considered high in disciplines such as consumer behavior, $R^2$ values of 0.75 would be perceived as high in success driver studies. In marketing research studies, $R^2$ values of

0.75, 0.50, or 0.25 for endogenous latent variables in the structural model can, as a rule of thumb, be described as substantial, moderate, or weak, respectively" (Hair et al., 2011, p. 147).

The research hypotheses of this thesis are tested by employing bootstrapping procedures. Thus, the inner model indicates the significance of the hypotheses of this thesis. The presentation of statistical results is in the following format: ($H_x$, β, *t*, *p*) where $H_x$ = tested hypothesis, β = path coefficient, *t* = t-statistics, *P* = p-value. The hypotheses are as follow:

***H1****: Self-efficacy has a positive effect on attitude toward using digital technology.*

***H2****: Social norms have a positive effect on attitude toward using digital technology.*

***H3****: Perceived usefulness has a positive effect on intention to use digital technology.*

***H4****: Perceived ease of use has a positive effect on intention to use digital technology.*

***H5****: Perceived ease of use has a positive effect on perceived usefulness of digital technology.*

***H6****: Attitude toward using digital technology has a positive effect on intention to use digital technology.*

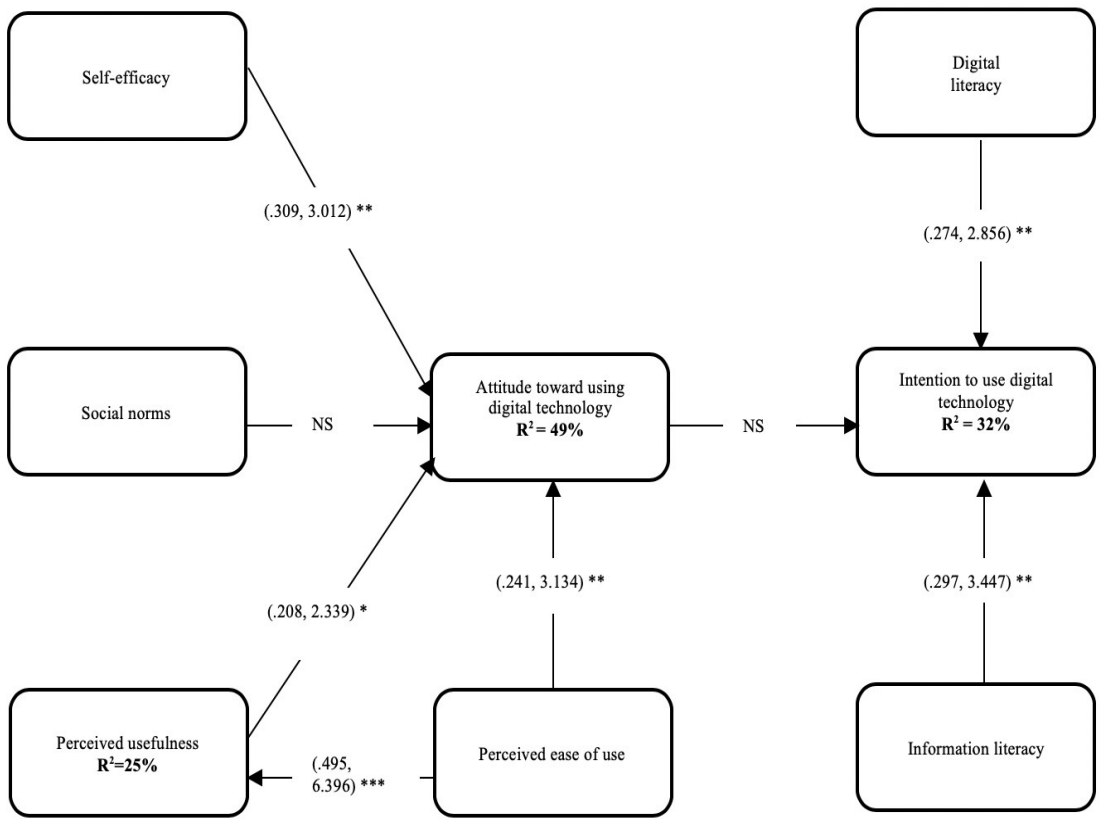
***H7****: Digital literacy has a positive effect on intention to use of digital technology.*

***H8****: Information literacy has a positive effect on intention to use of digital technology.*

The results of the measurement model, which is assessed through structural equation modeling (SEM) for the complete data are presented in Figure 7. To start with, the dependent variable of this thesis, i.e., intention to use digital technology was accounted for variance value of 32%. Attitude toward using digital technology was accounted for variance values of 49%.

As indicated in Figure 7, self-efficacy has a significant relation with attitude toward using digital technology (H1, β = 0.309, *t* = 3.012, *p* < 0.01), thus H1 is supported. Moreover, social norms have a no relationship with attitude toward using digital technology (H2, β = 0.149, *t* = 1.149, *p* = 0.080), which means H2 is rejected. Perceived usefulness has a

significant relation with attitude toward digital technology (H3, β = 0.208, $t$ = 2.339, $p$ < 0.05), thus H3 is supported. In addition, perceived ease of use has a positive influence on attitude toward digital technology (H4, β = 0.241, $t$ = 3.134, $p$ < 0.01). The results show that perceived ease of use has a significant influence on perceived usefulness (H5, β = 0.498, $t$ = 6.396, $p$ < 0.001), which means H5 is supported. Further, the results of the analysis revealed that attitude toward using digital technology shows no direct impact on intention to use digital technology (H6, β = 0.095, $t$ = 0.938, $p$ = 0.348), thus H6 is rejected. In hypotheses H7 and H8, it was proposed that digital literacy and information literacy have direct effect on intention to use digital technology; the results confirmed both hypotheses (H7, β = 0.274, $t$ = 2.856, $p$ < 0.01, and H8, β = 0.297, $t$ = 3.447, $p$ < 0.01).




Note: *, **, *** *indicate significance at the 0.05, 0.01, 0.001 level, respectively.*

*Figure 7. Structural model results*

## 5.4 Mediation effect

With the regard to the mediating role of attitude toward using digital technology between four independent variables (self-efficacy, social norms, perceived usefulness, and perceived ease of use) to intention to use and the mediating role of perceived usefulness between perceived ease of use and attitude, following observations were found. As there is a positive direct relationship between perceived ease of use and attitude, the results show that perceived usefulness partially mediates ($\beta = 0.104$, $t = 2.222$, $p < 0.05$) this path. As the main hypothesis of this thesis, which is the impact of attitude on intention is rejected, no particular mediation was observed on other paths.

## 5.5 Moderation effect

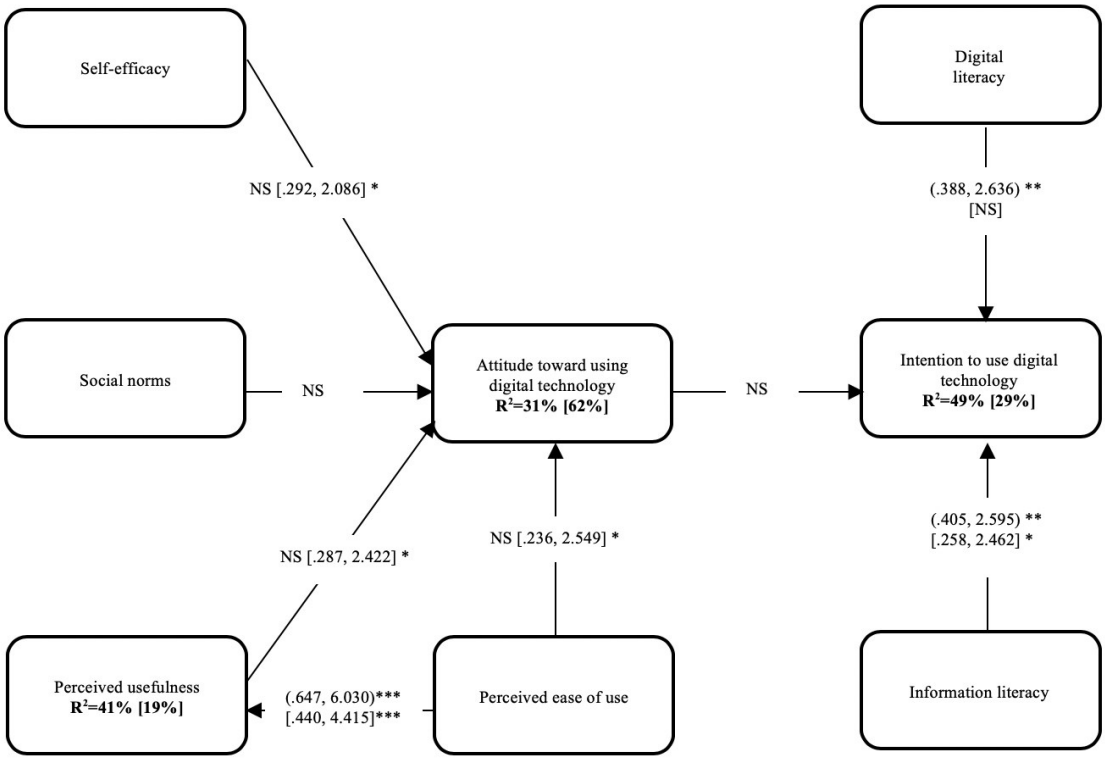
### 5.5.1 Multi-Group Analysis (MGA)

In the next following steps, Multi-Group Analysis (MGA) will be applied to the model. Firstly, this analysis was conducted through different groups including age and gender. Following age and gender analysis, we were interested to explore other factors that may impact employees' intention to use. Thus, regardless of age and gender, we explored how the frequency of using digital technology and employees' proficiency might positively impact on intention to use digital technology at the workplace.

#### *5.5.1.1 Multi-group analysis: Age*

In the following analysis, the results of measurement model that is assessed through structural equation modelling (SEM) are presented for the two different group age; digital natives (born after 1990) and digital immigrants (born before 1990). As indicated in Figure 8, self-efficacy has no relationship with attitude toward using digital technology for digital natives, but is significant for digital immigrants ($H_{1DN}$, $\beta = 0.345$, $t = 1.485$, $p = 0.138$, [$H_{1DI}$, $\beta = 0.292$, $t = 2.086$, $p < 0.05$]), thus H1 is supported in digital immigrant group and rejected in digital native group. Moreover, the SEM analysis revealed that social norms has no relationship with attitude toward using digital technology in both groups ($H_{2DN}$, $\beta = 0.031$, $t = 0.156$, $p = 0.876$, [$H_{2DI}$, $\beta = 0.174$, $t = 1.726$, $p = 0.084$]),

which means H2 is rejected in both groups. Further, perceived usefulness has no relationship with attitude toward using digital technology among digital natives, but shows significant relation with digital immigrants ($H_{3DN}$, $\beta = 0.122$, $t = 0.594$, $p = 0.553$, [$H_{3DI}$, $\beta = 0.287$, $t = 2.422$, $p < 0.05$]), thus H3 is rejected in digital natives, but it is supported in digital immigrants group. Perceived ease of use has no relationship with attitude toward using digital technology among digital natives, but this path positively impacts digital immigrants ($H_{4DN}$, $\beta = 0.240$, $t = 1.125$, $p = 0.261$, [$H_{4DI}$, $\beta = 0.236$, $t = 2.549$, $p < 0.05$]), which means H4 is rejected in digital natives, but it is supported in digital immigrants group. The SEM analysis showed that perceived ease of use has a significant relation with perceived usefulness in both groups ($H_{5DN}$, $\beta = 0.647$, $t = 6.030$, $p < 0.001$, [$H_{5DI}$, $\beta = 0.440$, $t = 4.415$, $p < 0.001$]), thus, H5 is supported for both groups. Furthermore, it was found that attitude toward using digital technology has a no relationship with intention to use digital technology in both groups ($H_{6DN}$, $\beta = 0.010$, $t = 0.060$, $p = 0.952$, [$H_{6DI}$, $\beta = 0.128$, $t = 0.923$, $p = 0.356$]), which indicates that H6 is rejected in both groups. Moreover, the most interesting finding is in relation with digital literacy and information literacy. According to SEM analysis, as it was postulated digital literacy significantly influence on intention to use digital technology in digital native group, whereas this relationship is rejected in digital immigrant group ($H_{7DN}$, $\beta = 0.388$, $t = 2.636$, $p < 0.01$, [$H_{7DI}$, $\beta = 0.254$, $t = 1.875$, $p = 0.061$]), thus H7 is supported only in digital native group. Finally, information literacy shows more significance effect on intention to use digital technology in digital native group than in digital immigrant group ($H_{8DN}$, $\beta = 0.405$, $t = 2.595$, $p < 0.01$, [$H_{8DI}$, $\beta = 0.258$, $t = 2.462$, $p < 0.05$]), which indicates H8 is supported in both groups.




Note: **, **, *** indicate significance at the 0.05, 0.01, 0.001 level, respectively.*

*Figure 8. Structural model result; digital natives [digital immigrant]*

### *5.5.1.2 Multi-group analysis: Gender*

Next, in this thesis gender is selected as the second moderating effect on the supported hypotheses which is checked by employing a Multi-Group Analysis (MGA). The main goal is to assess whether there are any significant differences in path coefficients among gender subgroups in the sample data. With regard to the main differences between male and female in the sample data, it was found that in female group perceived usefulness has a significant relation with attitude toward using digital technology ($H_{3\text{-female}}$, $\beta = 0.457$, $t = 2.603$, $p < 0.05$), while in male group this relationship is rejected ($H_{3\text{-male}}$, $\beta = 0.194$, $t = 1.370$, $p = 1.171$). Furthermore, the results show that the path relationship digital literacy and intention to use digital technology is rejected in female group ($H_{7\text{-female}}$, $\beta = -0.047$, $t = 0.393$, $p = 0.695$), whereas this relationship is relatively significant in male group ($H_{7\text{-male}}$, $\beta = 0.424$, $t = 3.063$, $p < 0.01$). Also, the path relationship between

information literacy and attitude more significant among female ($H_{8\text{-female}}$, $\beta = 0.413$, $t = 2.840$, $p < 0.01$), compared to male group ($H_{8\text{-male}}$, $\beta = 0.243$, $t = 2.103$, $p < 0.05$).

Further, it was observed that although in female group the path relationship between perceived ease of use to attitude toward using digital technology is rejected ($H_{4\text{-female}}$, $\beta = 0.059$, $t = 0.331$, $p = 0.741$), there is a positive relationship in male group ($H_{4\text{-male}}$, $\beta = 0.374$, $t = 3.312$, $p < 0.01$). Finally, it was observed that although the path relationship between social norms and attitude toward using digital technology is rejected ($H_{2\text{-female}}$, $\beta = 0.035$, $t = 0.196$, $p = 0.845$), this path is relatively significant is male group ($H_{2\text{-male}}$, $\beta = 0.215$, $t = 2.021$, $p < 0.05$). No particular difference was observed on the other path relationships.

#### *5.5.1.3 Multi-group analysis: Frequency*

In the next step, we examined our model based on the frequency of using digital technology. Based on the frequency table (see Table 5) we divided participants into two groups; first group members are those who frequently use digital technology (frequent users) and the second group members are those who use digital technology infrequently (non-frequent users). The main purpose is to examine whether there is a significant relationship between the frequent use of digital technology and intention to use digital technology at the workplace.

In terms of the main distinction between frequent users and non-frequent users, it was observed that the path relationship between perceived ease of use and attitude is more significant in non-frequent users ($H_{4\text{-non-frequent}}$, $\beta = 0.240$, $t = 2.117$, $p < 0.05$), whereas this relationship is rejected among frequent users ($H_{4\text{-frequent}}$, $\beta = 0.184$, $t = 1.226$, $p = 0.221$). In terms of the relationship between perceived usefulness and attitude toward using digital technology, it was observed that this relationship is rejected among non-users ($H_{3\text{-non-frequent}}$, $\beta = 0.141$, $t = 1.348$, $p = 0.178$), whereas this relationship is significant among frequent users ($H_{3\text{-frequent}}$, $\beta = 0.369$, $t = 2.052$, $p < 0.05$). Furthermore, the results show that the path between digital literacy and intention to use is rejected in non-frequent users group ($H_{7\text{-non-frequent}}$, $\beta = 0.235$, $t = 1.176$, $p = 0.240$), while this relationship is significant in frequent users ($H_{7\text{-frequent}}$, $\beta = 2.299$, $t = 2.412$, $p < 0.05$). Moreover, it was

found that the path relationship between information literacy and intention to use digital technology is rejected in non-frequent users ($H_{8\text{-non-frequent}}$, $\beta = 0.227$, $t = 1.674$, $p = 0.095$), but this relationship is significant in frequent users ($H_{8\text{-frequent}}$, $\beta = 0.499$, $t = 3.709$, $p < 0.001$). We found no particular difference on the other path relationships.

#### *5.5.1.4 Multi-group analysis: Proficiency*

In the last step of multi-group analysis, we examined our model based on the proficiency of users in digital technology usage. Based on the proficiency table (see Table 6) we divided participant into two groups; first group members are those who proficiently use digital technology (proficient users) and second group members are those who are not generally proficient in using digital technology (non-proficient users). The main purpose is to examine whether there is a significant relationship between the level of proficiency of using digital technology and intention to use digital technology at the workplace. In terms of major differences between proficient and non-proficient, it was observed that the relationship between information literacy and intention to use is considerably more significant among proficient users ($H_{8\text{-proficient}}$, $\beta = 0.633$, $t = 5.212$, $p < 0.001$), compared to non-proficient users ($H_{8\text{-non-proficient}}$, $\beta = 0.197$, $t = 1.904$, $p < 0.05$). In terms of relationship between digital literacy and intention to use, in the proficient group this relationship is rejected ($H_{7\text{-proficient}}$, $\beta = 0.111$, $t = 0.637$, $p = 0.524$), while in the non-proficient group this relationship is significant ($H_{7\text{-non-proficient}}$, $\beta = 0.344$, $t = 3.140$, $p < 0.01$). Also, the path relationship between perceived ease of use and intention to use is significant among proficient users ($H_{4\text{-proficient}}$, $\beta = 0.290$, $t = 2.240$, $p < 0.05$), while this relationship is rejected among non-proficient users ($H_{4\text{-non-proficient}}$, $\beta = 0.196$, $t = 1.823$, $p = 0.069$). We found no particular difference on the other path relationships.

# 6 DISCUSSION AND CONCLUSION

This chapter covers the findings and discussion of the data analysis. This chapter concludes the thesis by presenting the findings concerning prior research on the intention to use digital technology. In accordance with the results, the research questions of this thesis will be answered. Furthermore, practical implications, the theoretical contributions of this thesis are discussed and finally, limitations of this study and some recommendations for future research are presented.

## 6.1 Main findings and research question

In this section, the main findings of this thesis are presented and discussed. Based on the findings, the research question and sub-questions of the thesis are answered. Moreover, the results of the hypotheses are summarized in Table 10.

As discussed in Chapter 4, this thesis applies determinants from widely used acceptance theories, i.e., the theory of Technology Acceptance Model, Theory of Reasoned Action/Theory of Planned Behaviour, and Unified Theory of Acceptance and Use of Technology. Many prior studies have used these models as a base to investigate technology acceptance among users. Such studies are, for instance, Zhang et al. (2017) employed an integration of UTAUT and TAM models studied factors such as self-efficacy related to consumer's intention to adopt wearable technology in healthcare. The results indicated that self-efficacy is considered as a variable that users of medical device pay more attention to it. Furthermore, Hsu and Chiu (2004) studied the role of customers' self-efficacy as a factor that affects complex and high-risk services, such as online investment trading. The results indicated that self-efficacy considerably improves novice customers' financial performance perceptions and increases future usage intentions. Moreover, similarly, the findings of Vijayasarathy's (2004) research showed that in predicting consumers' intention to use on-line shopping, self-efficacy is positively associated with their intention. As expected, this study also observed similar results. For example, employees' self-efficacy (Perceived Behavioral Control (TRA/TPB)) positively impacts their attitudes toward using digital technology.

In addition, According to TPB and UTAUT subjective norm as a determinant factor has a direct impact on technology adoption. Also, Schepers and Wetzels (2007) assessed a quantitative meta-analysis of previous research on the technology acceptance model (TAM), which showed there is a significant impact of subjective norm on attitude toward use of technology. Moreover, Yueh et al. (2016) conducted research on employees' acceptance of mobile technology in a workplace, which showed that social influence positively affects attitude toward mobile technology usage in the workplace. Contrary to these studies, the results of this study showed no relationship between social norms and attitude; thus, showing that the employee's attitude is not facilitated by social norms. This finding was somewhat interesting and challenges some of the structure of TPB and UTAUT.

Furthermore, in TAM perceived usefulness and perceived ease of use are considered as two main constructs influencing technology adoption. Many prior studies have employed these two constructs. For instance, Vijayasarathy (2004) studied the consumers' intention to use on-line shopping by applying TAM and UTAUT model. The results showed that perceived ease of use and perceived usefulness can be significant predictors of attitudes toward the use of online shopping. Furthermore, Bhattacherjee and Premkumar (2004) showed that perceived usefulness is the main belief driving IT usage intention in the workplace. In addition, Schierz et al. (2010), examined the acceptance of mobile payment services among consumers through TAM model and the results showed that perceived usefulness and perceived ease of use have a positive impact on the attitude towards using mobile payment services. Also, Fagan et al. (2008) investigated that perceived ease of use has a positive impact on the intention to use computers among first-line managers in a mid-sized manufacturing organization. As expected, this thesis also found similar results in terms of the impact of perceived usefulness and perceived ease of use on attitude to use digital technology at the workplace.

In addition, in TAM model perceived ease of use has a direct impact on the perceived usefulness of technology. Similarly, the study of Schierz et al. (2010) confirmed the relationship proposed between PU and PEU, which means that perceived ease of use predicted the perceived usefulness of mobile payment services. Also, in the research done

by Wang et al. (2003), the results indicated that the construct perceived ease of use of Internet banking has a significant impact on perceived usefulness of Internet banking. Similarly, in this study we found comparable results.

Furthermore, attitude toward use is considered as a significant determinant of intention to use in TAM. Attitude as an antecedent of intention to use has been confirmed to be a significant construct in many technology acceptances studies; For example, Rozell and Gardner's (1999) found that individuals with positive versus negative computer attitudes showed greater levels of computer efficacy and task-specific expectations. Also, Kennedy et al. (2008) found that there is a strong positive relationship between the degree to which students use technology and the degree to which they support technology usage in their studies at university (Kennedy et al., 2008). Contrary to these studies, the findings of this thesis showed no relationship between attitude toward and intention to use digital technology; thus, showing that employees' intention to use is not facilitated by their attitude.

In addition, digital literacy and information literacy are not a part of TRA, TAM, TPB, and UTAUT but have been presented in the literature and prior studies (Nikou et al., 2018; Nikou et al., 2019). The results of these studies showed that information literacy and digital literacy have a positive impact on the intention to use digital technology in the educational context. Similarly, in this study, both information literacy and digital literacy have a positive impact on employees' intention to use.

*Table 10. List of accepted and rejected hypotheses*

| ***Hypothesis*** | **Result** |
|---|---|
| ***H1**: Self-efficacy has a positive effect on attitude toward using digital technology.* | S |
| ***H2**: Social norms have a positive effect on attitude toward using digital technology.* | R |
| ***H3:** Perceived usefulness has a positive effect on intention to use digital technology.* | S |
| ***H4**: Perceived ease of use has a positive effect on intention to use digital technology.* | S |
| ***H5**: Perceived ease of use has a positive effect on perceived usefulness of digital technology.* | S |
| ***H6**: Attitude toward using digital technology has a positive effect on intention to use digital technology.* | R |
| ***H7**: Digital literacy has a positive effect on intention to use of digital technology.* | S |
| ***H8**: Information literacy has a positive effect on intention to use of digital technology.* | S |

**Significant findings of multi group analysis**

Build on the multi-group analysis between digital natives and digital immigrants, results show distinct differences in some path relationships. We observed that the two factors of digital literacy and information literacy are more significant among digital natives compared to digital immigrants. Which means that digital natives' intention to use digital technology is facilitated by their digital literacy and information literacy. Furthermore, we found that perceived ease of use is more significant among digital immigrants compared to the digital native group, which implicates that digital immigrants' attitude toward using digital technology at their workplaces is influenced by the level of easiness of digital technologies.

Furthermore, in the multi-group analysis based on gender, we found that while in female group perceived usefulness of digital technology impacts their attitude toward using digital technology, this construct has no influence on male group. More, perceived ease of use of digital technology has no impact on attitude toward the use of digital technology among women, whereas this construct can significantly impact male's attitudes toward use. Moreover, in female group digital literacy has no impact on their intention to use digital technology, while this construct positively influences on intention to use of digital technology among men. Finally, information literacy is another factor that more influence females' intentions compared to males.

According to the multi-group analysis based on frequency of using, the following observations were found. Perceived ease of use positively affects attitude toward using digital technology among non-frequent users, whereas this construct has no impact on frequent users' attitudes. Conversely, in the group of frequent users perceived usefulness of digital technology positively impacts their attitude toward using technology, while there is no such a relationship among non-frequent users. This means that non-frequent users' intentions to use digital technology are more facilitated by the easiness of digital tools, while this is not the same in the frequent user group. Frequent users' intentions are more influenced by usefulness of digital technology. Moreover, while the two constructs information literacy and digital literacy have a significant impact on intention to use

digital technology among frequent users, these two dimension of literacy have no relationship with intention to use among non-frequent users, which indicates that in terms of digital and information literacy, increase in the frequency of using digital technology can improve employees' intentions to use digital technology.

Moreover, in the multi-group analysis based on proficiency, we observed some distinct differences. While information literacy considerably impacts on the intention to use digital technology among proficient users, this construct has no impact on the intention to use among non-proficient users. In contrast, digital literacy does not affect proficient users' intention to use digital technology, whereas this construct significantly impacts non-proficient users. Moreover, proficient users' intentions are facilitated by their perceived ease of using digital technology, while this variable has no impact on non-proficient' intentions.

**Research question**

In the following, according to the literature review and the results of this study the research question and sub-questions are answered.

**RQ: What antecedent factors influence employees' intention to use digital technology?**

The main goal of this thesis has been to identify the main factors that impact employees' intention to use digital technology at the workplace. We proposed a conceptual model consisting of seven independent variables that might influence intention to use digital technology. Results indicate that self-efficacy, perceived ease of use, perceived usefulness, information literacy, and digital literacy might impact intention to use digital technology.

- **How gender could impact on employees' intention to use digital technology?**

The results revealed that in terms of digital technology acceptance, males and females do not behave in the same way. While information literacy and perceived usefulness are

more significant factors among females compared to males, perceived ease of use and digital literacy show more significant influence on males than females.

- **How the frequency could impact on employees' intention to use digital technology?**

Furthermore, we observed that although there is a distinct gap between digital native and digital immigrant's intention to use digital technology, increasing the frequency of usage might resolve this issue.

- **How the proficiency in digital technology could impact on employees' intention to use digital technology?**

Following frequency, proficiency in the use of digital technology is another factor that should be taken into consideration in the workplace. The distinct difference between proficient and non-proficient users revealed that becoming more proficient in using digital technology can decrease the gap between digital natives and digital immigrants.

## 6.2 Theoretical contributions

The main objective of this thesis was to provide new insights and knowledge on what factors can influence intention to use digital technology at the workplace. This is achieved by identifying and applying several key constructs from various technology acceptance theories into the proposed research conceptual model. Besides, several other significant theoretical implications were found.

First, in order to provide new insights and knowledge, the author of this thesis intended to proceed beyond the existing theoretical structures that were considered proper and merged them into a new conceptual model. As a result, TAM was modified and expanded with key constructs from other traditional theories and prior studies.

The findings of this thesis challenge the structure of prior theories used in the conceptual model. For example, social norm is considered as a determinant factor in TRA and

UTAUT, but in this thesis had no relationship with attitude toward using technology. Furthermore, as stated in TAM, attitude is assumed to have a significant impact on technology acceptance, but in this thesis no relationship was found between attitude and intention.

In addition, two constructs information literacy and digital literacy are applied to prior theories. Prior studies (Nikou et al., 2018; Nikou et al., 2019) employed these two constructs in their conceptual model in the educational context. Due to the lack of research in the domain of different dimensions of literacy's impact on technology acceptance in workplaces, we applied information literacy and digital literacy to the conceptual model of this study. Results showed that both information literacy and digital literacy have significant relationships with intention to use digital technology at the workplace. Therefore, different dimensions of literacy can impact on intention to use digital technology at the workplace. Thus, the theoretical contribution of this thesis can be essential to information studies.

## 6.3 Practical implications

Besides the theoretical contributions, this thesis also provides some practical implications for the organizations. First and foremost, in terms of digital technology acceptance, this thesis found a chasm between digital natives and digital immigrants. It indicates that many challenges should be taken into consideration if policymakers and executives tend to successfully implements and use efficiently the digital transformation in their firms. Thus, the findings facilitate policymakers to perceive the consideration of different dimensions of literacy for the social and financial growth of the firm. Consequently, the findings of this thesis have the possibility to influence practice by indicating that different training programs are required for digital natives and digital immigrants to make them familiar with new digital tools at the workplace. Moreover, the results of multi-group analysis based on gender show distinct differences between male and female behaviour in terms of digital technology acceptance. Therefore, the role of gender is also an important factor for firm policymakers to understand the differences between men and

women in terms of their skills and abilities. Furthermore, results showed that the frequency of using digital technology can elevate employees' intention to use digital technology. Thus, this thesis explored that in order to bridge the gap between digital native and digital immigrant and improve the processes of digitalization, some policies should be adopted to increase the frequency of using digital technology. In addition, proficiency in using digital technology is another factor that was considered in this thesis. We observed that increasing the proficiency of using digital technology can play a key role in reducing the gap between digital natives and digital immigrants. This finding highlights the important role of staff training, not only to make them familiar with digital tools and services but also to increase the level of employees' proficiency.

All in all, the finding of this thesis can facilitate executives to allocate an appropriate budget and right policies to invest in digital transformation.

## 6.4 Limitations

There are few limitations in this thesis that require to be addressed, some of which may have influenced the generalizability of the findings. First, it should be noted that this thesis has been conducted to examine the intention to use digital technology among employees in Finland. For this purpose, the data were collected through a convenience sampling approach. The sample for this purpose has been collected randomly among limited employees in different industries in Finland. The number of respondents to the survey was 121, which was relatively a small sample to examine the intention to use digital technology in different industries in Finland. Furthermore, according to descriptive statistics, the majority of the employees work in the research, software, and computer-related industries and fewer distributions are seen in other industries. Thus, it indicates that the sample size is relatively small in terms of providing a strong generalization base for the entire employees in Finland. Therefore, the generalizability of the results derived from analyses should be interpreted with caution.

Second, as the majority of the respondents reported themselves as digital immigrants, it made it difficult to conduct a multi-group analysis between digital natives and digital

immigrants. Another noteworthy issue that should be considered is that the responses in the survey were self-reported, thus the interpretation regarding information literacy and digital literacy skills might be biased.

Finally, despite the fact that different types of digital technologies are utilized in different workplaces, this thesis provides an overall view of digital technologies. This may lead to some uncertainty among respondents. If the main purpose is to find factors related to intention to use digital technology in a specific workplace, the different types of digital technology concerned with a particular work should be considered.

## 6.5 Recommendation for Future Research

This thesis can be a useful resource for future research on digital technology adoption at the workplaces. However, in order to obtain better results and generalize our findings to a larger population or geographical region, the sample size should be at increased. The distribution of the survey should be taken into consideration, as discussed in the limitation section, the questionnaire should be published equally among different industries to generalize the findings to the entire Finnish employees.

Furthermore, in this thesis, the digital literacy and information literacy have been used to measure employees' literacy skills at the workplaces. In the future study, we recommend using other dimensions of literacy such as media literacy or even cultural literacy to assess the differences between digital immigrants and digital natives at the workplaces. Finally, we considered self-efficacy, social norms, perceived usefulness, and perceived ease of use as antecedents of attitude to use digital technology at the workplaces. We urge other researchers to take further steps to include other possible factors related to use digital technology such as habitual behavior and hedonic motivation.

## REFERENCES

ACRL. (2000). *Information literacy competency standards for higher education*. Chicago, Illinois. The Association of College and Research Libraries. American Library Association.

ALA. (1989). Presidential committee on information literacy: Final report. American library association. Retrieved November 15, 2019, from http://www.ala.org/acrl/publications/whitepapers/presidential

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. *In Action control.* Springer, Berlin, Heidelberg. 11-39.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.

Aviram, A., & Eshet-Alkalai, Y. (2006). Towards a theory of digital literacy: Three scenarios for the next steps. *European Journal of Open*, *Distance and E-learning*. Retrieved November 15, 2019, from http://www.eurodl.org/?p=archives&year=2006&halfyear=1&article=223

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist*, 37(2), 122.

Barlow, j. (1996). Declaration of independence for cyberspace. Rederived November 14, 2019, from https://www.eff.org/cyberspace-independence

Bayne, S., & Ross, J. (2007). The 'digital native' and 'digital immigrant': a dangerous opposition. *In Annual Conference of the Society for Research into Higher Education (SRHE)* Brighton, Sussex, December 11-13

Behrens, S. J. (1994). A conceptual analysis and historical overview of information literacy. *College & Research Libraries*, 55(4), 309-322.

Behringer, N., & Sassenberg, K. (2015). Introducing social media for knowledge management: Determinants of employees' intentions to adopt new tools. *Computers in Human Behavior,* 48(1), 290-296.

Bennett, S. (2012). Digital natives. *In Z. Yan (Eds.), Encyclopedia of Cyber Behavior*, 1(1), 212-219.

Benson, A. D., Johnson, S. D., & Kuchinke, K. P. (2002). The use of technology in the digital workplace: A framework for human resource development. *Advances in Developing Human Resources,* 4(4), 392-404.

Bhattacherjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: A theoretical model and longitudinal test. *MIS Quarterly,* 28(2), 229-254.

Boone, H. N., & Boone, D. A. (2012). Analyzing Likert data. *Journal of extension*, 50(2), 1-5.

Breivik, P. S. (2005). 21st century learning and information literacy. *Change: The Magazine of Higher Learning,* 37(2), 21-27.

Bruce, C. (1997). *The seven faces of information literacy*. Adelaide: Auslib Press.

Bruce, C. (2000). Information literacy programs and research: an international review. *The Australian Library Journal*, 49(3), 209-218.

Bruce, C. S. (1999). Workplace experiences of information literacy. *International journal of information management,* 19(1), 33-47.

Colbert, A., Yee, N., & George, G. (2016). The digital workforce and the workplace of the future. *Academy of Management Journal*. 59(3), 731-739.

Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. Doctoral dissertation, Massachusetts Institute of Technology.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35(8), 982-1003.

Edison, H., Bin Ali, N., & Torkar, R. (2013). Towards innovation measurement in the software industry. *Journal of Systems and Software*, 86(5), 1390-1407.

Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of educational multimedia and hypermedia*, 13(1), 93-106.

Fagan, M. H., Neill, S., & Wooldridge, B. R. (2008). Exploring the intention to use computers: An empirical investigation of the role of intrinsic motivation, extrinsic motivation, and perceived ease of use. *Journal of Computer Information Systems,* 48(3), 31-37.

Fishbein, M. (1967). A consideration of beliefs and their role in attitude measurement. *Readings in attitude theory and measurement*, *New York: Wiley*,1(1), 257-266.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research*. Reading MA Addison-Wesley.

Fishbein, M., & Ajzen, I. (1980). *Understanding attitudes and predicting social behavior*. Eaglewood Cliffs, NJ: Prentice Hall.

Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). Embracing digital technology: A new strategic imperative. *MIT sloan management review*, 55(2), 1.

Greener, S. (2008). *Business research methods*. BookBoon.

Grubb, W. N. (1984). The bandwagon once more: Vocational preparation for high-tech occupations. *Harvard Business Review*, 54(4), 429-451.

Gu, X., Zhu, Y., & Guo, X. (2013). Meeting the "digital natives": Understanding the acceptance of technology in classrooms. *Journal of Educational Technology & Society,* 16(1), 392-402.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice,* 19(2), 139-152.

Hair, J. F., Sarstedt, M., Hopkins, L., & G. Kuppelwieser, V. (2014). Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. *European Business Review*, 26(2), 106-121.

Helsper, E. J., & Eynon, R. (2010). Digital natives: where is the evidence? *British educational research journal,* 36(3), 503-520.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science,* 43(1), 115-135.

Hess, T., Matt, C., Benlian, A., & Wiesböck, F. (2016). Options for formulating a digital transformation strategy. *MIS Quarterly Executive*, 15(2), 123-139.

Hox, J. J., & Boeije, H. R. (2005). Data collection, primary versus secondary. Encyclopedia of social management, 1(1), 593-599

Hsu, M. H., & Chiu, C. M. (2004). Internet self-efficacy and electronic service acceptance. *Decision support systems*, 38(3), 369-381.

Jahangir, N., & Begum, N. (2008). The role of perceived usefulness, perceived ease of use, security and privacy, and customer attitude to engender customer adaptation in the context of electronic banking. *African journal of business management*, 2(2), 032-040.

Kandori, M. (1992). Social norms and community enforcement. *The Review of Economic Studies,* 59(1), 63-80.

Kennedy, G. E., Judd, T. S., Churchward, A., Gray, K., & Krause, K. L. (2008). First year students' experiences with technology: Are they really digital natives? *Australasian journal of educational technology*, 24(1), 108-122.

Kerka, S. (1999). Consumer Education for the Information Age. *Practice Application Brief* (4), 12-15.

Kirton, J., & Barham, L. (2005). Information literacy in the workplace. *The Australian Library Journal,* 54(4), 365-376.

Legewie, N. (2013). An introduction to applied data analysis with qualitative comparative analysis. *Forum: Qualitative Social Research*, 14(3), 1-45.

Lin, K. Y., & Lu, H. P. (2015). Predicting mobile social network acceptance based on mobile value and social influence. *Internet Research*, 25(1), 107-130.

Lloyd, A. (2006). Information literacy landscapes: an emerging picture. *Journal of documentation,* 62(5), 570-583.

Lloyd, A. (2011). Trapped between a rock and a hard place: What counts as information literacy in the workplace and how is it conceptualized? *Library trends,* 60(2), 277-296.

Martin, A. (2005). DigEuLit–a European framework for digital literacy: a progress report. Journal of eLiteracy, 2(2), 130-136.

Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & Information Systems Engineering,* 57(5), 339-343.

Mohammadyari, S., & Singh, H. (2015). Understanding the effect of e-learning on individual performance: The role of digital literacy. *Computers & Education*, 82(1), 11-25.

Montano, D. E., & Kasprzyk, D. (2015). Theory of reasoned action, theory of planned behavior, and the integrated behavioral model. *Health behavior: Theory, research and practice,* 70(4), 231.

Naveed, M. A., & Rafique, F. (2018). Information Literacy in the Workplace: A Case of Scientists from Pakistan. *Libri*, 68(3), 247-257.

Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & education,* 59(3), 1065-1078.

Nikou, S., Brännback, M., & Widén, G. (2018). The Impact of Multidimensionality of Literacy on the Use of Digital Technology: Digital Immigrants and Digital Natives. In *International Conference on Well-Being in the Information Society* (pp. 117-133). Springer, Cham.

Nikou, S., Brännback, M., & Widén, G. (2019). The impact of digitalization on literacy: digital immigrants vs. digital natives. In *Proceedings of the 27th European Conference on Information Systems (ECIS)*, Stockholm & Uppsala, Sweden, June 8-14.

Nylén, D. (2015). *Digital innovation and changing identities: investigating organizational implications of digitalization*. Doctoral dissertation, Umeå Universitet.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of educational research,* 66(4), 543-578.

Panel, I. L. (2002). Digital transformation: A framework for ICT literacy. *Educational Testing Service.* Retrieved 15 November, 2019, from https://www.ets.org/research/policy_research_reports/publications/report/2002/cjik

Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational psychologist*, 37(2), 91-105.

Prensky, M. (2001). Digital natives, digital immigrants part 1. *On the horizon*, 9(5), 1-6.

Rader, H. B. (1991). Information literacy: a revolution in the library. *RQ*, 31(1), 25-30.

Reedy, K., & Goodfellow, R. (2012). Digital and information literacy framework. *Open University.*

Ringle, Christian M., Wende, Sven, & Becker, Jan-Michael. (2015). SmartPLS 3. Bönningstedt: SmartPLS. Retrieved Septermber 14, 2019, from http://www.smartpls.com.

Rozell, E.J. and Gardner III, W.L., 1999. Computer-related success and failure: a longitudinal field study of the factors influencing computer-related performance. *Computers in Human Behavior*, 15(1), 1-10.

Schepers, J., & Wetzels, M. (2007). A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Information & management*, 44(1), 90-103.

Schierz, P. G., Schilke, O., & Wirtz, B. W. (2010). Understanding consumer acceptance of mobile payment services: An empirical analysis. *Electronic commerce research and applications,* 9(3), 209-216.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: toward a conceptual model of utilization. *MIS Quarterly*, 15(1), 125-143.

van Griethuijsen, R. A., van Eijck, M. W., Haste, H., den Brok, P. J., Skinner, N. C., Mansour, N., & BouJaoude, S. (2015). Global patterns in students' views of science and interest in science. *Research in science education*, 45(4), 581-603.

Van Teijlingen, E., & Hundley, V. (2002). The importance of pilot studies. *Nursing Standard*, 16(40), 33-36.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS quarterly, 425-478.

Vijayasarathy, L. R. (2004). Predicting consumer intentions to use on-line shopping: the case for an augmented technology acceptance model. *Information & management,* 41(6), 747-762.

Wang, E., Myers, M. D., & Sundaram, D. (2012). Digital natives and digital immigrants: towards a model of digital fluency. ECIS 2012 Proceedings. Paper 39.

Wang, X., White, L., Chen, X., Gao, Y., Li, H., & Luo, Y. (2015). An empirical study of wearable technology acceptance in healthcare. *Industrial Management & Data Systems*, 115(9),1704-1723.

Wang, Y. S., Wang, Y. M., Lin, H. H., & Tang, T. I. (2003). Determinants of user acceptance of Internet banking: an empirical study. *International journal of service industry management*, 14(5), 501-519.

Wong, K. K. K. (2013). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Bulletin*, 24(1), 1-32.

Woodside, A.G., 2013. Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory. *Journal of business research*, 66(4), 463-472

Workforce Investment Act of 1998. Public Law 105-220. 112 Stat. 936. 105th Congress, August 8, 1998.

Yoo, Y., Lyytinen, K. J., Boland, R. J., & Berente, N. (2010). The Next Wave of Digital Innovation: Opportunities and Challenges: A Report on the Research Workshop 'Digital Challenges in Innovation Research'. Retrieved 15 November, 2019, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1622170

Yueh, H. P., Lu, M. H., & Lin, W. (2016). Employees' acceptance of mobile technology in a workplace: An empirical study using SEM and fsQCA. *Journal of Business Research*, 69(6), 2318-2324.

Awang, Z. (2012). *A handbook on SEM*. Structural equation modeling.

Zhang, X., Han, X., Dang, Y., Meng, F., Guo, X., & Lin, J. (2017). User acceptance of mobile health services from users' perspectives: The role of self-efficacy and response-efficacy in technology acceptance. *Informatics for Health and Social Care*, 42(2), 194-206.

# APPENDIX A: TYPE OF INDUSTRY

| **Demographic (N = 106)** | | | | | | |
|---|---|---|---|---|---|---|
| **Industry** | **Digital native** | | **Digital immigrant** | | **Total** | |
| Agriculture, Forestry, Fishing and Hunting | 1 | 2.63% | 0 | 0.00% | 1 | 0.94% |
| Arts, Entertainment, and Recreation | 1 | 2.63% | 0 | 0.00% | 1 | 0.94% |
| Broadcasting | 0 | 0.00% | 1 | 1.47% | 1 | 0.94% |
| College, University, and Adult Education | 6 | 15.79% | 6 | 8.82% | 12 | 11.32% |
| Computer and Electronics Manufacturing | 3 | 7.89% | 0 | 0.00% | 3 | 2.83% |
| Construction | 0 | 0.00% | 3 | 4.41% | 3 | 2.83% |
| Education | 2 | 5.26% | 6 | 8.82% | 8 | 7.55% |
| Finance and Insurance | 2 | 5.26% | 3 | 4.41% | 5 | 4.72% |
| Government and Public Administration | 1 | 2.63% | 2 | 2.94% | 3 | 2.83% |
| Health Care and Social Assistance | 0 | 0.00% | 2 | 2.94% | 2 | 1.89% |
| Hotel and Food Services | 4 | 10.53% | 1 | 1.47% | 5 | 4.72% |
| Information Services and Data Processing | 4 | 10.53% | 6 | 8.82% | 10 | 9.43% |
| Mining | 1 | 2.63% | 0 | 0.00% | 1 | 0.94% |
| Construction | | | | | | |
| Retail | 0 | 0.00% | 2 | 2.94% | 2 | 1.98% |
| Real Estate, Rental and Leasing | 0 | 0.00% | 1 | 1.47% | 1 | 0.94% |
| Scientific or Technical Services | 4 | 10.53% | 10 | 14.71% | 14 | 13.21% |
| Software | 4 | 10.53% | 6 | 8.82% | 10 | 9.43% |
| Telecommunications | 0 | 0.00% | 1 | 1.47% | 1 | 0.94% |
| Transportation and Warehousing | 0 | 0.00% | 2 | 2.94% | 2 | 1.89% |
| Utilities | 0 | 0.00% | 1 | 1.47% | 1 | 1.47% |
| Wholesale | 1 | 2.63% | 1 | 1.47% | 2 | 1.89% |
| Other industry | 4 | 10.53% | 14 | 20.59% | 18 | 16.98% |

# APPENDIX B: SURVEY QUESTIONNAIRE


**Dear participant!**

This survey is designed to investigate the role of different dimensions of literacies on the use of digital technology among digital natives (born after 1980) and digital immigrants (born before 1980) at the workplaces. This research is aimed at employees in Finland. We would be very grateful if you would agree to take part by completing this survey. Responses are anonymous and confidential and please give us your honest opinion! This survey will only take about 15-20 minutes of your time and will be opened until 30.08.2019.

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,

Matin Kanafi (matin.mahboobkanafi@abo.fi)

Shahrokh Nikou (shahrokh.nikou@abo.com)

1. What is your gender?
   Male
   Female
   Other

2. Which year were you born?
   Select

3. Which of the following categories best describes the industry you work in?
   Select
4. What is your occupation level?
   Select
5. The organization you work for is in which of the following:
   Select
6. What is your highest education?
   (A) High school diploma (B) Bachelor degree (C) Master degree
   (D) Ph.D. (E Other

7. How often do you use the following digital technologies.

| Access to digital technologies | I do not use | A few times a month | A few times a week | Once a day | Several times a day |
|---|---|---|---|---|---|
| Mobile (smart) phone | | | | | |
| Desktop computer | | | | | |
| Laptop computer | | | | | |
| Tablet | | | | | |
| MP3/4 player or iPod | | | | | |
| Wearable device | | | | | |
| Mobile internet | | | | | |

8. Self-Report Rating of Proficiency. Please choose a number between 1 and 7, where 1 represent "Not proficient at all" and 7 represents having " Very proficient" of the item.

| Digital Technologies | Not proficient at all | 2 | 3 | Neutral | 5 | 6 | Very proficient |
|---|---|---|---|---|---|---|---|
| Microsoft office | | | | | | | |
| File sharing (e.g., Google Drive, Dropbox) | | | | | | | |
| Photo/image editing (e.g., Photoshop, PhotoScape) | | | | | | | |
| Mobile devices organizer (e.g., address book, calendar) | | | | | | | |
| Email services (e.g., Outlook, Gmail) | | | | | | | |
| Social media (e.g., Facebook, Instagram) | | | | | | | |
| Microsoft Teams | | | | | | | |
| Skype for business | | | | | | | |
| ERP system | | | | | | | |
| SAP | | | | | | | |

9. How frequently do you use the following digital technologies?

| Digital Technologies | I do not use | A few times a month | A few times a week | Once a day | Several times a day | I do not use | A few times a month |
|---|---|---|---|---|---|---|---|
| Microsoft office | | | | | | | |
| File sharing (e.g., Google Drive, Dropbox) | | | | | | | |
| Photo/image editing (e.g., Photoshop, PhotoScape) | | | | | | | |
| Mobile devices organizer (e.g., address book, calendar) | | | | | | | |
| Email services (e.g., Outlook, Gmail) | | | | | | | |
| Social media (e.g., Facebook, Instagram) | | | | | | | |
| Microsoft Teams | | | | | | | |
| Skype for business | | | | | | | |
| ERP system | | | | | | | |
| SAP | | | | | | | |

For question 10-17, please, choose a number between 1 and 7, where 1 represents "Strongly disagree" and 7 represents having "Strongly agree" of the item.

10. Social Norms

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| Most people who are important in my life approve of my using of digital technologies | | | | | | | |
| Most people who are important in my life think it is desirable that I use digital technologies | | | | | | | |
| Most people who are important to me think I should not use digital technologies | | | | | | | |
| I use digital technologies because the majority of professionals in my field also use it. | | | | | | | |

11. Self-efficacy

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| I will be able to achieve most of the goals that I have set for myself by using digital technologies | | | | | | | |
| When facing difficult tasks, I am certain that I will accomplish them by using digital technologies | | | | | | | |
| In general, I think that I can obtain outcomes that are important to me by using digital technologies | | | | | | | |
| I will be able to successfully overcome many challenges by using digital technologies | | | | | | | |
| I am confident that I can perform effectively on many different tasks by using digital technologies | | | | | | | |

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| Even when things are tough, I can perform quite well by using digital technologies | | | | | | | |

## 12.Digital Literacy

| | 1: Strongly disagree | 2 | 3 | Neutral | 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 important new 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 | | | | | | | |
| I have good digital technology skills | | | | | | | |
| I am confident with my search and evaluate skills in regard 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 my university work from my friends over the Internet e.g. through Skype, | | | | | | | |

## 13. Attitudes towards Using Digital Technology

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| I like using digital technologies for working/learning | | | | | | | |
| I work/learn better with digital technologies | | | | | | | |
| Digital technologies make working/learning more interesting | | | | | | | |
| Please choose two (2) if you are reading this text. | | | | | | | |
| I am more motivated to work/learn with digital technologies | | | | | | | |
| Digital technologies enable me to be a self-directed and independent worker/learner | | | | | | | |

## 14. Information Literacy

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| When given a work task, I feel confident determining what information I need to search. | | | | | | | |
| I am sometimes unsure of how much information I need for solving work related problems. (reverse) | | | | | | | |

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| I can easily get my hands-on right information when needed. | | | | | | | |
| I understand the organization of information in my company. | | | | | | | |
| When looking for information I can easily identify the right information sources (e.g. organization's platforms, colleagues, clients) | | | | | | | |
| I can determine the authoritativeness, correctness and reliability of the information. | | | | | | | |
| I am not confident that the information I get is accurate. (reverse) | | | | | | | |

## 15. Perceived ease of use (PEOU)

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| I feel that the Smart Home is easy to install and use. | | | | | | | |
| I feel that it is easy for me to learn to use the Smart Home appliances. | | | | | | | |
| I feel that it is easy to get the Smart Home appliances and devices to do what I want them to do. | | | | | | | |
| I would find the Smart Home to be flexible to interact with | | | | | | | |

## 16. Perceived usefulness (PU)

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| I feel that the Smart Home would enable me to accomplish tasks more quickly | | | | | | | |
| I feel that installing and using the Smart Home would make things easier to do | | | | | | | |
| I feel that I would find Smart Homes useful for doing various tasks at home | | | | | | | |
| I feel that using Smart Homes would increase my productivity at home | | | | | | | |

## 17. Intention to Use

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| I will not hesitate to use digital technologies to access information. | | | | | | | |
| I plan to use digital technologies to seek information. | | | | | | | |
| I would expect to use digital technologies to seek for information. | | | | | | | |
| I intend to use digital technologies to seek for information. | | | | | | | |

| | 1: Strongly disagree | 2 | 3 | Neutral | 5 | 6 | 7: Strongly agree |
|---|---|---|---|---|---|---|---|
| I am very likely to use digital technologies to gain information. | | | | | | | |
| I will continue using digital technologies in the future | | | | | | | |
| I will recommend my colleagues to use digital technologies | | | | | | | |

18. 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.

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

# APPENDIX C: CROSS LOADINGS

| | ATT | DL | IL | INT | PEOU | PU | SEEF | SN |
|---|---|---|---|---|---|---|---|---|
| **ATT1** | 0.809 | 0.419 | 0.425 | 0.340 | 0.532 | 0.412 | 0.502 | 0.400 |
| **ATT2** | 0.857 | 0.432 | 0.331 | 0.377 | 0.422 | 0.522 | 0.455 | 0.395 |
| **ATT3** | 0.809 | 0.308 | 0.369 | 0.226 | 0.301 | 0.464 | 0.430 | 0.272 |
| **ATT5** | 0.838 | 0.379 | 0.392 | 0.209 | 0.432 | 0.408 | 0.479 | 0.306 |
| **ATT6** | 0.784 | 0.508 | 0.488 | 0.368 | 0.545 | 0.403 | 0.548 | 0.454 |
| **DL1** | 0.437 | 0.894 | 0.499 | 0.434 | 0.645 | 0.364 | 0.389 | 0.319 |
| **DL2** | 0.443 | 0.866 | 0.549 | 0.378 | 0.681 | 0.314 | 0.348 | 0.321 |
| **DL3** | 0.458 | 0.776 | 0.343 | 0.224 | 0.559 | 0.359 | 0.391 | 0.280 |
| **DL4** | 0.390 | 0.811 | 0.310 | 0.331 | 0.559 | 0.318 | 0.340 | 0.314 |
| **DL6** | 0.528 | 0.815 | 0.522 | 0.304 | 0.670 | 0.474 | 0.571 | 0.435 |
| **DL7** | 0.283 | 0.772 | 0.590 | 0.516 | 0.610 | 0.295 | 0.372 | 0.272 |
| **DL8** | 0.347 | 0.854 | 0.438 | 0.442 | 0.569 | 0.363 | 0.301 | 0.218 |
| **DL9** | 0.500 | 0.697 | 0.408 | 0.424 | 0.493 | 0.451 | 0.450 | 0.386 |
| **IL1** | 0.405 | 0.454 | 0.777 | 0.527 | 0.510 | 0.439 | 0.406 | 0.308 |
| **IL3** | 0.335 | 0.494 | 0.695 | 0.287 | 0.480 | 0.250 | 0.279 | 0.228 |
| **IL4** | 0.388 | 0.338 | 0.661 | 0.266 | 0.483 | 0.281 | 0.295 | 0.296 |
| **IL5** | 0.428 | 0.391 | 0.796 | 0.309 | 0.515 | 0.273 | 0.443 | 0.331 |
| **IL6** | 0.334 | 0.506 | 0.855 | 0.411 | 0.558 | 0.244 | 0.338 | 0.293 |
| **IU1** | 0.305 | 0.518 | 0.468 | 0.735 | 0.507 | 0.291 | 0.387 | 0.168 |
| **IU2** | 0.303 | 0.394 | 0.406 | 0.838 | 0.422 | 0.420 | 0.300 | 0.225 |
| **IU3** | 0.266 | 0.439 | 0.452 | 0.907 | 0.486 | 0.417 | 0.295 | 0.313 |
| **IU4** | 0.287 | 0.425 | 0.351 | 0.875 | 0.418 | 0.270 | 0.249 | 0.259 |
| **IU5** | 0.235 | 0.220 | 0.292 | 0.743 | 0.280 | 0.240 | 0.228 | 0.164 |
| **IU6** | 0.287 | 0.318 | 0.241 | 0.763 | 0.295 | 0.263 | 0.222 | 0.296 |
| **IU7** | 0.396 | 0.312 | 0.465 | 0.646 | 0.393 | 0.293 | 0.392 | 0.403 |
| **PEU1** | 0.518 | 0.647 | 0.566 | 0.457 | 0.859 | 0.447 | 0.431 | 0.394 |
| **PEU2** | 0.535 | 0.567 | 0.587 | 0.342 | 0.825 | 0.509 | 0.458 | 0.382 |
| **PEU3** | 0.391 | 0.666 | 0.599 | 0.508 | 0.854 | 0.379 | 0.408 | 0.337 |
| **PEU4** | 0.485 | 0.563 | 0.506 | 0.388 | 0.811 | 0.451 | 0.402 | 0.354 |
| **PEU5** | 0.405 | 0.648 | 0.594 | 0.502 | 0.846 | 0.374 | 0.367 | 0.308 |
| **PEU6** | 0.421 | 0.642 | 0.505 | 0.494 | 0.840 | 0.291 | 0.349 | 0.295 |
| **PU1** | 0.537 | 0.507 | 0.452 | 0.364 | 0.510 | 0.916 | 0.582 | 0.343 |
| **PU2** | 0.488 | 0.334 | 0.316 | 0.348 | 0.380 | 0.931 | 0.432 | 0.286 |
| **PU3** | 0.563 | 0.402 | 0.382 | 0.381 | 0.475 | 0.919 | 0.531 | 0.340 |
| **PU4** | 0.421 | 0.364 | 0.327 | 0.360 | 0.386 | 0.874 | 0.383 | 0.356 |
| **PU5** | 0.380 | 0.385 | 0.326 | 0.366 | 0.466 | 0.842 | 0.293 | 0.324 |
| **SE1** | 0.572 | 0.472 | 0.491 | 0.326 | 0.476 | 0.536 | 0.835 | 0.511 |
| **SE2** | 0.592 | 0.368 | 0.364 | 0.312 | 0.387 | 0.472 | 0.878 | 0.343 |
| **SE3** | 0.546 | 0.416 | 0.429 | 0.373 | 0.433 | 0.419 | 0.908 | 0.328 |
| **SE4** | 0.473 | 0.401 | 0.422 | 0.405 | 0.418 | 0.428 | 0.907 | 0.324 |
| **SE5** | 0.425 | 0.434 | 0.334 | 0.302 | 0.417 | 0.403 | 0.827 | 0.348 |
| **SE6** | 0.457 | 0.426 | 0.397 | 0.311 | 0.405 | 0.356 | 0.873 | 0.339 |
| **SN1** | 0.368 | 0.476 | 0.315 | 0.394 | 0.457 | 0.326 | 0.290 | 0.785 |
| **SN2** | 0.355 | 0.261 | 0.351 | 0.317 | 0.328 | 0.218 | 0.301 | 0.848 |
| **SN4** | 0.351 | 0.167 | 0.235 | 0.066 | 0.190 | 0.320 | 0.408 | 0.720 |