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INFORMATION TECHNOLOGY ACCEPTANCE IN THE FINNISH SOCIAL AND HEALTHCARE SECTOR
Exploring the Effects of Cultural Factors

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The lazy manage to keep up with the earth's rotation just as well as the industrious.

Mason Cooley (1988) "City Aphorisms".

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Turku, 20 March 2007

Reetta Raitoharju

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1 INTRODUCTION

The objective of this study is to explore the effects of cultural factors on information technology acceptance in the Finnish social and healthcare sector. This chapter presents the starting point of the study. The phenomena of interest are described and the main constructs of the thesis are defined. Then the motivations of this thesis are discussed and gaps in the current research are recognized. Then the research field is presented; the special characteristics of information systems research in the healthcare sector followed by a description of the Finnish social and healthcare sector. Finally, the structure of the study is summarized. The purpose of this chapter is to specify the purpose of the research, its main phenomena and the research field. In short, this chapter summarizes what is studied and why.

1.1 Phenomena of interest

Users' acceptance of information technology (IT) has been in the interests of both researchers and practitioners for decades. Understanding the user's decision to accept IT has appeared to be one of the most challenging IT implementation and management issues. By introducing new IT, organizations normally aim at enhancing performance, cutting down costs, or attaining strategic advantage. These expectations, however, do not materialize unless the users accept the technology. As the use of IT is becoming more pervasive and reaching new professionals and working environments, the acceptance issues are becoming increasingly important.

The terms *acceptance*, *adoption* and *diffusion* are often vaguely and not systematically used in the IT acceptance research[1]. However, there are some differences based on the research contexts in which these terms are normally used. *Acceptance* has been defined as '*the demonstrable willingness to employ information technology for the tasks it is designed to support'* (Dillon & Morris 1996, 16) and it is used often in longitudinal studies where new IT has recently been implemented (e.g. Venkatesh & Davis 2000) or where no IT has yet been implemented but the intentions to use IT in the future are measured as

[1] '*IT acceptance research'* refers to the stream of research that explores the determinants of IT usage.

the dependent variable (e.g. Hu, Patrick, Chau, Liu & Kar 1999). The studies using the term *acceptance* are typically conducted using the Technology Acceptance Model (Davis, Bagozzi & Warshaw 1989) as the theoretical approach. The term *adoption* is often used in a research context where IT is already in use and the implementation has already been made (e.g. Karahanna, Straub & Chervany 1999; Lewis, Agarwal & Sambamurthy 2003). Moreover, this term is normally used within studies using Theory of Reasoned Action (Ajzen 1991) as the theoretical basis. Differing from the term *acceptance, adoption* refers to a more stable situation where the user is already familiar with the IT in question and where the attitudes towards its use are formed through the actual use. *Diffusion* refers to the extent of IT deployment in a wider population, e.g. within a nation. It is regularly used in studies using Innovation Diffusion Theory (Moore & Benbasat 1991) and often refers to a larger scale adoption of IT (e.g. Meijers 2006). A more systematic approach to the differences in the terminology in IT acceptance research is, according to Cooper and Zmud (1990), based on the stage of the innovation process. These stages are in the time order of initiation, adoption, adaptation, acceptance, routinization and infusion. Within this thesis the terms *acceptance, adoption* and *diffusion* are used as the authors of the cited articles have been using them, albeit this leads to an overlapping use of these terms to some extent. The stream of research that is exploring the determinants of system usage is herein referred to as *IT acceptance research.*

IT acceptance has been a popular topic in IS research and an array of theoretical perspectives has been created to understand its determinants. The most generally applied measures of IT acceptance in previous years has been user satisfaction (Khalifa & Liu 2004; Mahmood, Burn, Gemoets & Jacquez 2000) and system usage (Lee, Kozar & Larsen 2003; Legris, Ingham & Collerette 2003). Although some effort has been made to combine these two streams of research (Wixom & Todd 2005), the stream exploring system usage has been especially popular over the past few decades. Several models have been created to understand the antecedents of system usage (e.g. Ajzen 1991; Davis et al. 1989; Moore & Benbasat 1991; Venkatesh, Morris, Davis & Davis 2003) and these models have explored various aspects that influence IT acceptance. These aspects have focused on how beliefs are formed (Lewis et al. 2003), how organizational actions such as training affect IT acceptance (Venkatesh 1999), or how individuals differ in their IT acceptance processes (Agarwal & Prasad 1999; Venkatesh & Morris 2000). The common denominator of these theoretical approaches is to explain which variables lead to an increased amount of IT use.

One of the possible denominators of IT acceptance is culture. The effect of culture on work behavior has become apparent (Erez & Earley 1993) and the

IS research discipline has noticed the potential of cultural differences in explaining IT-related issues. The evidence for this increased interest in addressing cultural issues can be traced to special issues of IS journals concentrating on cultural issues (Aladwani 2003; Davison & Martinsons 2003). A recent literature review of IS culture research[2] (Leidner & Kayworth 2006) identified 82 articles that addressed the question of culture. The themes covered in the review were, to mention a few, IT development, IT adoption and diffusion, IT use and outcomes, and IT management and strategy, showing a wide variety of studies on cultural issues in IS research. However, even though the first IS culture studies appeared in the early 1980s and numerous studies have since been conducted, the field has been relatively scattered. This is likely due to the fact that culture is a challenging variable to research with its divergent definitions and measurements (Leidner & Kayworth 2006).

The ubiquitous use of the construct *culture* has led to a multitude of different definitional approaches. Kroeber and Kluckhohn (1952), for instance, identified 164 definitions of culture in the early 1950s. Similarly, Faure (1993) has collected 160 different definitions of organization culture. Perhaps the most frequently used definition of culture in management research comes from Hofstede (2001, 25), for whom culture is *'the collective programming of the mind which distinguishes the members of one human group from another'*. This definition is based on the idea that culture distinguishes individuals from each other and classifies them as members of different groups. Culture is also considered something that is learned in a society, as Schein (1999, 29) defines: '*the sum total of all the shared, taken-for-granted assumptions that a group has learned throughout its history'*. This definition emphasizes the historical dimension of culture. Thus culture is something learnt and historical. Schein`s (1985, 19) definition adds to the discussion by including a functional dimension: '*culture is a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems'*. Culture is useful for groups (and, through that, individuals) to survive and is considered important to pass on to the new members of the group. In an organizational setting, culture could be collectively experienced successful problem solving and is thus relevant in situations where organization members are confronted with new challenges. Opposite to the above-mentioned definitions that assume culture to be a group level phenomenon, Triandis' (1972, 4) definition introduces the notion of

[2] '*IS culture research'* in this thesis refers to the stream of research that combines cultural issues with IS research.

subjective culture: '*culture is defined as an individual's characteristic way of perceiving the man-made part of one's environment. It involves the perception of rules, norms, roles, and values, is influenced by various levels of culture such as language, gender, race, religion, place of residence, and occupation, and it influences interpersonal behavior'*. It can thus be assumed that the specific extent to which the organization's culture affects an individual is also a matter of individual perception. Schmidt (2002, 8) provides more specificity when he claims that '*a company's culture is the values, norms and behaviors that characterize the company and its work environment. It encompasses the way people behave, how they are held accountable, and the way they're rewarded. In a nutshell, it's the modus operandi'*.

To sum up the definitions, culture distinguishes the members of a group from the members of other groups. It actualizes in shared values, beliefs and patterns of behavior within a group, and these shared basic assumptions help the group to survive. Culture can be tracked in different levels of society (e.g. national, organizational or professional) and, ultimately, can be seen as an individual's characteristic way of perceiving one's environment.

Several studies have explored the role of culture in IT acceptance (see Leidner & Kayworth 2006). These studies differ in the level of analysis (e.g. national/organizational) as well as the aspects of conceptualizing and measuring. However, this previous stream of studies combining IT acceptance and IS culture research suggest that culture could be a useful construct to explain successes and failures in IT acceptance. Resistance to new IT in the working environment can be due to the inconsistency in the values (and in that way the culture) of that organization. The sub-cultures within an organization can also affect the failure of IT usage. Different sub-groups may have different significance and meaning for IT, and this can lead to conflicts (Orlikowski & Gash 1994). As the culture forms the way individuals perceive their environment, and, moreover, it has an effect on the behavior, it is in the interest of this study to explore how culture affects IT acceptance.

1.2 Motivations and aims of the study

The motivations of this study derive from three different streams of IS research: IS culture research, IT acceptance research and health IT research[3]. Gaps in the current research are recognized and they are the motivators of this

[3] Within this thesis the term Health IT research is used as suggested by Wilson and Lankton (2004) to refer to the stream of research that combines issues from IS and healthcare.

thesis. The aim of the study is to fill these shortcomings and to provide both a theoretical and a practical contribution to these different fields.

Several problems in the current IS culture research has been acknowledged by a number of authors (e.g. Gallivan & Srite 2005; Karahanna, Evaristo & Srite 2005; Myers & Tan 2002; Straub, Loch, Evaristo, Karahanna & Srite 2002). The main criticisms have arisen from the weak conceptualizing of culture, which has led to obscurity in the evaluation and comparisons of the results. In order for the field of IS culture research to mature and establish itself as an IS research discipline, there is a need for a more rigorous, theory-based conceptualizing of culture that, furthermore, is explicitly measured in empirical studies.

First, critics have targeted the popular tendency of oversimplifying culture by using the notion of *national culture*. Although the concept *national culture* has dominated the IS research literature, it has been criticized for being too simplistic (Myers & Tan 2002; Walsham 2002). It is argued that national culture does not reflect the true cultural beliefs present within different countries. When based on the assumption that artificial national borders lead to a common cultural environment for all of its members, the notion of *national culture* is ignoring the existence of subcultures (Myers & Tan 2002). Moreover, the studies based on the notion of *national culture* often base their assumption of cultural differences on previous results concerning cultural differences at the national level and do not explicitly measure culture. Hofstede´s (1980) previous work on cultural differences is repeatedly referred to as explaining the differences between different nations. For more criticisms of Hofstede, see Myers and Tan (2002).

Second, in IS culture research, culture is often studied from a fragmentary perspective (Gallivan & Srite 2005). IS culture studies consistently concentrate on one perspective on culture (e.g. national or organizational culture) and ignore the possibility of combinations of different cultural perspectives. For instance, a car manufacturing company and a retail store both working in China might have cultural differences based on the organizational differences (e.g. industry, personnel etc.). Similarly, two car manufacturing companies, one operating in China, one in Germany, might have different cultures based on the national differences. Thus culture can be seen as a combination of these different perspectives. Moreover, in today's global markets it is not uncommon to have a Finnish company having a factory in Taiwan with a manager from the U.S. These combinations of nations, organizations and employees require a multi-perspective approach to cultural studies.

Third, the static nature of culture has been criticized (Myers & Tan 2002; Walsham 2002). Culture is expected to be a static, unchanging element and the

effects of culture are expected to actualize independent of the action in hand. However, for certain actions the national culture may be the stronger one, for others the organizational culture. Changes in environment are also expected to change the culture. Culture should be seen as something constantly being produced and reproduced in a social context (Myers & Tan 2002). To overcome the problems in the IS culture research, the suggestions have been:

- *'A possible solution to the problem* (i.e. current insufficient operationalizing of culture in IS research*) is to adopt a theory-based conceptualization and measurement of an individual's culture'* (Straub et al. 2002, 21).
- *'There is a need for a more holistic approach to defining culture and understanding how it shapes individual and group behavior'* (Gallivan & Srite 2005, 326).
- *'IS researcher should adopt a more dynamic view of culture – one that sees culture as contested, temporal and emergent'* (Myers & Tan 2002, 13).

This study aims at conceptualizing culture using the suggestions above. Moreover, the aim is to operationalize this concept of culture and use it in an empirical test. Although there have been several suggestions for the conceptualizing of culture (see Gallivan & Srite 2005; Karahanna et al. 2005; Leidner & Kayworth 2006; Straub et al. 2002), there is a lack of empirical evidence on how these constructs can be operationalized and what the outcomes of studies using such constructs might be. This study further extends the previous work by operationalizing and empirically testing a proposed construct of culture. Therefore, one aim of this study is to conceptualize a construct of culture that is theory-based, uses a multi-perspective approach and considers the dynamic nature of culture, and contributes to the IS culture research by operationalizing and empirically testing this construct. Furthermore, one goal is to measure how this construct affects information technology acceptance.

In relation to the IT acceptance research, the motivations and aims of this thesis lay in the advancement and replication of the theory. The Technology Acceptance Model (TAM) is a popular approach (see Lee et al. 2003) and numerous studies have been conducted using TAM. These studies have been executed within different user populations and different information systems. However, despite this wide stream of research, some gaps can be identified:

- TAM studies have only examined one information system within a homogenous group of subjects and have not proven TAM to be capable of explaining acceptance in a more heterogeneous environment (Lee et al. 2003).

- Most of the studies have been conducted in the U.S. (Straub, Keil & Brenner 1997) or Asia (e.g. Chau & Hu 2002b; Wu, Chen & Lin 2007; Yi, Jackson, Park & Probst 2006), while studies conducted in Europe are in a minority.

In order to contribute to this stream of research, TAM will be tested in a very heterogeneous environment consisting of several different professional groups, fields of activities and, most of all, numerous different information technologies in use. The aim is also to provide more evidence on how TAM explains IT acceptance in a European context.

Finally, the motivations to conduct the study in the social and healthcare sector are derived from the fact that IT use in healthcare is lagging behind other industries (Menon, Lee & Eldenburg 2000). Moreover, social care is even lagging behind healthcare in utilizing IT (Riley & Smith 1997). No stream of social care-specific IS research exists; therefore, social care is here considered a part of health IT research. Major barriers to the successful implementation of IT in healthcare are related to financial or technological issues, but institutional barriers such as organisation culture and medical norms may also limit IT diffusion (Robinson, Savage & Sydow-Campbell 2003). There are shortcomings in the technology acceptance studies that are characteristic of the social and healthcare sector:

- There is still little evidence of what affects an individual professional's acceptance of IT, especially among healthcare professionals (Menon et al. 2000; Yi et al. 2006).
- Technology acceptance research has not been conducted in a wide range of social and healthcare professionals and is mostly limited to physicians' acceptance of telemedicine (Chau & Hu 2001; 2002a; 2002b; Gagnon, Godin, Gagné, Fortin, Lamothe, Reinharz & Cloutier 2003; Gagnon, Lamothe, Fortin, Cloutier, Godin, Gagné & Reinharz 2005; Yi et al. 2006).

This thesis aims at contributing to the health IT research by providing evidence of a social and healthcare professional's acceptance process and testing whether TAM is an appropriate model to describe IT acceptance behaviors in the healthcare setting. Based on the discussion above, the main research questions of this thesis are:

RQ 1: What affects a social and healthcare professional's decision to use IT?

RQ 2: How does culture affect IT acceptance?

To answer the first research question, different theoretical approaches are compared to find an appropriate model to measure IT acceptance among the

social and healthcare professionals. This model is then tested in the spirit of theory advancement and replication in the Finnish social and healthcare sector. In order to answer the second research question, this study first conceptualizes and operationalizes the construct *culture*. This is done by conducting a literature review of the existing IS culture studies and building on previous suggestions from the IS culture field. Then the effects of culture are evaluated by testing the moderating effect of culture on technology acceptance.

The results will provide a suggestion of how IT managers could personalize IT services or applications, or take action to enhance the use of IT. The results of this study will provide a broad set of tools to combine organizational, professional and individual level differences when planning to implement new IT or trying to get better results from promoting IT usage. Investigating the effects of culture will allow organizations to make adjustments to IT and provide the necessary training and support to overcome any cultural hindrances that may occur in IT adoption. The results can also be useful when designing new information systems for multi-cultural environments.

1.3 Research context

In order to understand the research context of this study it is important to clarify the general social and healthcare-specific features. For that reason, the health IT research field is briefly presented and some characteristics of the healthcare sector that can affect the IT acceptance are summarized. Moreover, an overview of the Finnish social and healthcare system is provided. The structure, the financing and the personnel are briefly described in order to give a general picture of the surroundings of this study and, in the later part, discuss the generalization of the results. Information about the current state of IT use in the Finnish social and healthcare sector is also briefly provided.

Healthcare is a massive industry. In many countries healthcare spending accounts for an extensive proportion of GDP. For instance, in 2003 the provision of GDP used in healthcare expenditures was 15% in the U.S., 11% in Germany, 8% in the UK and Japan, and 7% in Finland. In addition, the healthcare sector is a substantial employer within many countries. In 2003 the percentage of people employed by the sector was 8% in the U.S., and 7% in Finland and the UK (OECD 2006). The extensive size of the industry has allowed the development of the special discipline of health informatics. Health informatics is an umbrella term that covers medical informatics, bio informatics, and other related areas and studies IT within medical and healthcare contexts (Wilson & Lankton 2004). IS research that is conducted as an interdisciplinary field in the area of healthcare is referenced as health IT

research, as suggested by Wilson and Lankton (2004). Health IT research covers various types of research that, although based on the general stream of IS research, have some special features. As Chiasson and Davidson (2004, 157) argue: '*healthcare represents a markedly different social and technical context compared with many of the industries where IS research is conducted'*. For instance, the healthcare industry is institutionalized, in terms of professional roles and regulatory oversight. Moreover, unlike the top-down hierarchy found in many industries (e.g. manufacturing, financial institutions), the healthcare sector has a dual administrative structure with medical personnel and administration (Chiasson & Davidson 2004).

Rapidly emerging information technologies have proven to have remarkable benefits in the healthcare sector. These benefits can be the improved quality of care or the accessibility of information (Åkesson, Saveman & Nilsson 2006). IT adoption has also been found to relate to improved financial outcomes in the healthcare sector (Menachemi, Burkhardt, Shewchuk, Burke & Brooks 2006). Despite the possible advantages, the use of IT in healthcare is lagging behind other industries (Menon et al. 2000). The reasons for that are many, as Chiasson and Davidson (2004) state: healthcare applications are technically complex and the software and hardware markets for medical technologies are less mature than for many other fields. Besides the technical challenges, the introduction of IT is also considered to have a major impact on cultural and social level (Bashshur, Reardon & Shannon 2001). One challenge is the diversity of stakeholders that are involved in IT implementation projects and their different roles in the complex healthcare setting (Pouloudi 1999).

The Finnish healthcare system is financed by two main mechanisms. About 70% of expenditure goes on services provided by municipalities. In addition, the National Health Insurance scheme reimburses part of the costs for clients who use private health services (Rissanen & Häkkinen 1999). Public health services provided by the municipalities are financed by municipal taxes, State subsidies and user charges (Rissanen & Häkkinen 1999). The private sector - i.e. organizations not financed by the municipalities or the State - produces about one-fifth of the health services in Finland. The private health service provides services both to public and private customers. Public customers include bodies such as local authorities or joint municipal boards, whereas private customers comprise private persons or households. In Finland, private health services are mainly purchased by private households. In 2002 a total of 16.5 million visits were paid to private healthcare service providers, which is about 30% of all health service visits, excluding overnight stays (Kauppinen & Niskanen 2005). The share of private provision in healthcare as a whole is evaluated here on the basis of personnel and expenditure. In 2002 the private

healthcare sector employed 27,000 people (Kauppinen & Niskanen 2005). The Finnish social and healthcare sector is in a state of flux. Ensuring the social and health services requires a sufficient number of professionally skilled personnel. Almost 70,000 social and healthcare professionals in Finland are expected to retire from the sector by the end of 2012 (Sosiaali- ja terveysministeriö 2003).

IT has been seen as an option to answer the demands of the future, and the use of IT has rapidly expanded in the Finnish healthcare sector in recent years. For instance, in 2005 electronic patient records were used in 96 % of primary care health centers, 89 % of private sector service providers and 20 out of 21 hospital districts, whereas two years ago they were used in 13 hospital districts (Winblad, Reponen, Hämäläinen & Kangas 2006). Other applications used were electronic communication systems between electronic patient records (45 % of primary healthcare centers, 16 hospital districts), teleradiology (29 % of primary healthcare centers, 18 hospital districts) and telematic exchange of laboratory data (64% of primary healthcare centers, 19 hospital districts) (Winblad et al. 2006). In 2005 the Finnish social and healthcare sector employees reported the use of IT to have increased from the year 1999 in almost every professional group, whereas the estimates of their own IT skills have decreased (Laine, Wickström, Pentti, Elovainio, Kaarlela-Tuomaala, Lindström, Raitoharju & Suomala 2006). A report on the social care sector employees' IT use in seven Finnish municipalities reported the Internet and e-mail to be the most widely used IT in the sector, but customer record systems were also in use (Kallio & Kontio 2006).

1.4 Structure of the study

The thesis is organized into nine main chapters. The introduction aims to present an outline of the phenomena of interest and define the main concepts. In addition, the motivations and aims of this study are presented and a description of the research context is given. Chapter 2 gives an overview of the existing research approaches to IT acceptance by presenting and comparing three dominant technology acceptance models. A literature review is presented in Chapter 3 to map previous studies on cultural issues in IT acceptance studies. The results on how culture has previously been conceptualized and measured in IT acceptance studies are presented, as well as the main findings of these studies. In Chapter 4, culture is conceptualized based on the literature review and previous suggestions from the IS field. This concept will be operationalized and used in the empirical part of the thesis. In Chapter 5 the research model and its constructs are established. In addition,

the hypotheses are drawn based on previous studies and theories. Chapter 6 describes the methodological choices and the research design. The validity and reliability of the measures is discussed and, finally, the analysis methods are introduced. Chapter 7 presents the results of the analysis; first the testing of the technology acceptance model, then the results of the moderating impact of culture. Chapter 8 discusses the findings of this study and, finally, Chapter 9 concludes the research and discusses future research and limitations of this study. The progress of the chapters in this thesis is presented in Table 1, which summarizes the contents and the purpose of each chapter.

Table 1 Structure of the study.

Chapter	***Contents***	***Purpose***
1. Introduction	Presenting the phenomena of interest, motivation, aim and study context	To explain what is studied and why
2. Technology acceptance research	Overview of existing technology acceptance approaches and their comparison	To present the theoretical background of technology acceptance
3. Cultural issues in IT acceptance studies	Literature review of culture in IT acceptance studies	To present the current state of IS culture studies on IT acceptance
4. Conceptualizing culture	Theory-based conceptualizing of the construct *culture* used in this study	To present the theoretical background to the conceptualization of culture
5. Research model and hypotheses	Research model, hypotheses and their theoretical base	To introduce what will be tested and why
6. Research methodology	Philosophical engagements, research design, measures and data analysis methods	To describe how the empirical part will be executed
7. Results	Results of the statistical analyses testing the research model and the hypotheses	To show the results of the statistical analyses
8. Discussion of the results	Discussion of the statistical results	To discuss and compare the results of the analysis
9. Conclusions	Contributions, limitations and future study prospects	To conclude what was achieved in the study, what implications for theory and practice the results can have

The structure of the thesis aims at logically proceeding from the research questions through previous studies and theories to empirical testing. Therefore, the purposes are first to outline the study in the Introduction and then present the theoretical background of the phenomena of interest

(technology acceptance and cultural issues in IT research). The conceptualization of culture aims at theoretical rigor in the thesis. The methodology is explained in as much detail as possible to make it possible to evaluate the empirical part of this study. The purpose is first to present the statistical results in Chapter 7 and then discuss the findings.

2 TECHNOLOGY ACCEPTANCE RESEARCH

Technology acceptance has been one of the most explored topics of IS research for decades. A variety of theoretical perspectives have been advanced in order to understand what affects the user's decision to accept information technology. The rationale behind this stream of research has been that in order to get the intended benefits from the IT investments the users should accept and use the systems. This task, however, has proven to be hard to solve and even though this topic has been under vivid research effort, a lot stills remains unknown about the determinants of an individual's decision to accept IT. Based on the existing wide stream of research, this chapter presents three IT acceptance models derived from the intentions and innovations in the literature. These models were selected because of their dominance in the IS field and because of their good explanation rates in different research contexts. The approaches are: Technology Acceptance Model (TAM) (Davis 1989), Theory of Planned Action (TBP) (Fishbein & Ajzen 1975) and Innovation Diffusion Theory (IDT) (Rogers 1995). The models and their core constructs are presented together with the main findings from previous studies. In addition, an overview of the technology acceptance research in the healthcare sector is given. Finally, the different models are compared. The purpose of this chapter is to give an overview of the technology acceptance research. By comparing the dominant models in the field and by reviewing previous literature in the healthcare sector, this chapter aims at forming a theoretical background to the research model.

2.1 Technology Acceptance Model

The Technology Acceptance Model (TAM) (Davis 1989; Davis et al. 1989) has been one of the most widely cited and influential models for explaining the acceptance of IT for the past two decades (Lee et al. 2003). According to the Social Science Citation Index, TAM had been cited in 424 journal citations by the year 2000 (Venkatesh & Davis 2000). TAM is an intention-based model that was especially formed to explain the user's acceptance of computer technology. Based on Theory of Reasoned Action (TRA) (Fishbein & Ajzen 1975), Davis (1989; Davis et al. 1989) further adapted the causal chain to specifically predict the user's acceptance of IT. According to TRA, the

attitudes toward the behavior are determined by beliefs about the consequences of the behavior. In other words, an individual's subjective assessment of the probability of the consequences concerning a particular behavior, together with the affective evaluation of these consequences, generates positive or negative feelings about a particular behavior. Attitude determines the behavioral intentions, which, in turn, shape the actual behavior (Fishbein & Ajzen 1975).

TAM posits that *perceived usefulness* (PU) and *perceived ease of use* (PEOU), together with *attitude* toward using, are the main determinants of behavioral intention to use IT. Behavioral intention refers to the '*strength of one's intention to perform a specified behavior*' (Fishbein & Ajzen 1975, 288) and it is expected to lead to actual system use. The definitions of the core constructs of TAM are provided in Table 2.

Table 2 Core constructs of TAM.

Core construct	***Definition***
PU	*'the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context'* (Davis et al. 1989 , 985)
PEOU	*'the degree to which the prospective user expects the target system to be free of effort'* (Davis et al. 1989, 985)
Attitude	*'an individual's positive or negative feelings (evaluative affect) about performing the target behavior'* (Fishbein & Ajzen 1975, 216)

TAM explains IT acceptance by positing that PU and PEOU are the two primary determinants of intention to use, which, in turn, determines the actual IT use (Davis 1989; Davis et al. 1989). Attitude is expected to mediate the effect of the beliefs. The intention to use a system is jointly determined by the individual's attitude towards use and PU. The behavioral intention to use solely determines the degree of actual system use (Davis et al. 1989). The model posits that the higher the user's PEOU and PU, the higher the attitude. The degree of PU and attitude lead to a higher degree of behavioral intention and, through that, actual system usage. Therefore, it is expected that a higher degree of PU and PEOU will result in a higher level of actual system use, which typically is a self-reported measure of time, the frequency of system use, actual amount of use or the diversity of use (Lee et al. 2003). Moreover, a relationship is expected between PU and PEOU. PEOU is, therefore, expected to influence the intention to use through both PU and attitude. Figure 1 presents the relationships between the core constructs of TAM.

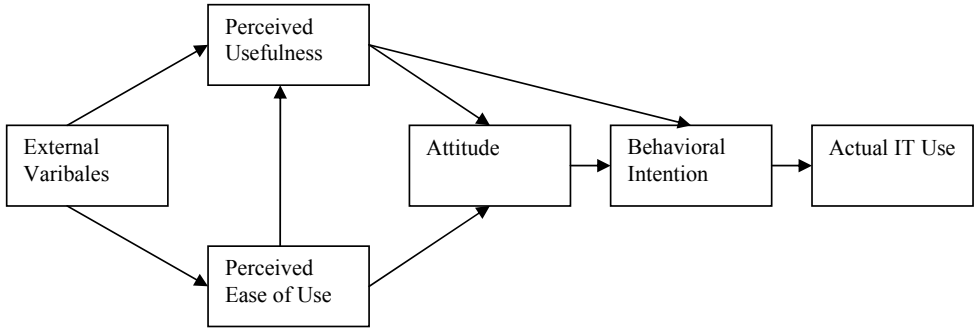

Figure 1 Original TAM (Davis et al. 1989).

External variables shape behavior through their impact on beliefs (i.e. PU and PEOU). External variables can be, for instance, user features such as level of education (e.g. Burton-Jones & Hubona 2005) or gender (e.g. Venkatesh & Morris 2000), or organization features such as training for IT use (e.g. Venkatesh 1999). Regardless of the type of external variables, PEOU and PU are expected to fully mediate their impact on behavioral intention.

TAM has been widely tested in several research contexts as well as with several types of information technologies (for a review, see Lee et al. 2003; Legris et al. 2003). These technologies have evolved over time, following the general development, and have covered technologies such as e-mail (e.g. Szajna 1996), word processing (e.g. Agarwal & Prasad 1999), and more recently e-commerce (e.g. Chen & Tan 2004; Klopping & McKinney 2004) and wireless IT (e.g. Fang, Chan, Brzezinski & Xu 2005/2006; Lu, Yu, Liu & Yao 2003; Mao, Srite, Thatcher & Yaprak 2005; Wang, Lin & Luarn 2006). TAM attempts to provide an explanation for the determinants of IT acceptance that are general and transferable to a broad range of user populations and technologies. Empirical tests have shown that, to a relatively large extent, TAM explains the variance in usage intention (Chau & Hu 2002; 2002a; Hu et al. 1999) as well as actual use (Venkatesh & Morris 2000).

2.2 Extensions of Technology Acceptance Model

To further develop TAM, Venkatesh and Davis (2000) extended the original TAM to include antecedents for PU (*subjective norm, image, job relevance, output quality and results demonstrability*). In addition, *voluntariness* and *experience* were added as moderators for the relationships with *subjective norm*. This model, named TAM2, was shown to explain up to 60 % of

variance in perceived usefulness (Venkatesh & Davis 2000). TAM2 has since been empirically tested in a few studies (e.g. Chan & Lu 2004).

The next step to extend TAM was the Unified Theory of Acceptance and Use of Technology (UTAUT) developed and tested by Venkatesh, Morris et al. (2003). The model was developed through a review of the constructs of eight models explaining IS usage behavior, and it explains user intentions to use IT and is based on four key constructs (*performance expectancy, effort expectancy, social influence, and facilitating conditions),* which are direct determinants of *usage intention* and actual *use behavior* (Figure 2). Gender, age, experience and voluntariness of use are expected to moderate the impact of the four key constructs on usage intention and behavior (Venkatesh et al. 2003).

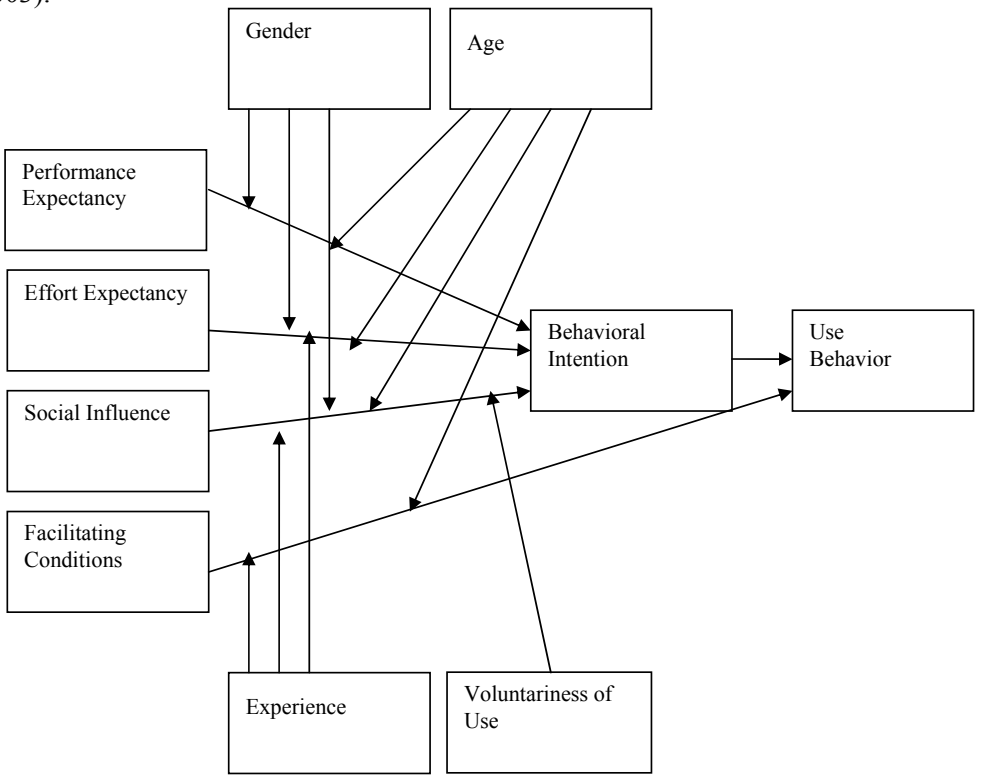

Figure 2 UTAUT model (Venkatesh et al. 2003).

UTAUT was found to explain 70% of the variance in usage intention (Venkatesh et al. 2003) and has since been used in a few studies (e.g. Gartfield 2005).

2.3 Theory of Planned Behavior

Theory of Planned Behavior (TPB) (Ajzen 1991) is similar to TAM based on TRA (Ajzen and Fishbein 1980). Similarly, the core mechanism of TPB is the assumption that individual behavior is influenced by the behavioral intentions. According to TPB, human behavior is guided by three sets of beliefs: behavioral, normative and control. TPB posits that the main determinants of behavioral intentions are: *attitude toward behavior*, *subjective norm* and *perceived behavioral control* - as presented in Table 3.

Table 3 Core constructs of TPB.

Core construct	***Definition***
Attitude towards behavior	*'an individual's positive or negative feelings (evaluative effect) about performing the target behavior* (Fishbein & Ajzen 1975, 216)
Subjective norm	*'the person's perception that most people who are important to him think he should or should not perform the behavior in question'* (Fishbein & Ajzen 1975, 302).
Perceived behavioral control	*'the perceived ease of difficulty of performing the behavior'* (Fishbein & Ajzen 1975, p. 188) *and in the context of IS research, 'perceptions of internal and external constraints on behavior'* (Taylor & Todd 1995, 149)

Perceived behavioral control is determined by the skills, resources and opportunities available, as well as the perceived importance of the skills, resources and opportunities to achieve the outcomes (Ajzen 1991). TPB has been used in a wide set of research in the reference disciplines but an attempt has also been made to apply TPB to IS research. This has been done by introducing a Decomposed Theory of Planned Behavior (Taylor & Todd 1995). Taylor and Todd (1995) suggest, largely consistent with TAM, that PU, PEOU and compatibility are the antecedents of attitude towards behavior.

TPB asserts that behavioral intention is a direct determinant of behavior together with behavioral control. Behavioral intention is a function of attitude, subjective norm and behavioral control. TPB views the control that people have over their behavior as varying from behaviors that are easily performed to those requiring considerable effort. TPB is suitable for conditions where individuals do not have complete control over their behavior (Taylor & Todd 1995). The relationships between the core constructs of TPB are presented in Figure 3.

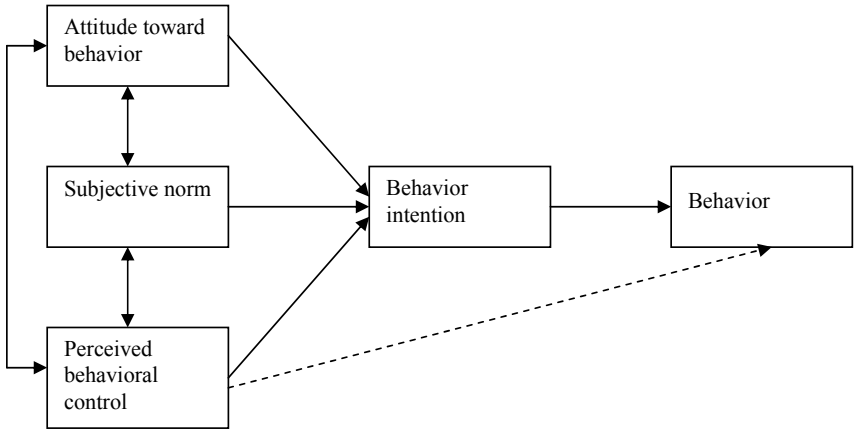

Figure 3 Theory of Planned Behavior (Ajzen 1991).

TPB has been widely applied across a range of other disciplines and, while not as extensively studied as TAM, the literature provides several references in the IS research field (e.g. Brown & Venkatesh 2005; Chau & Hu 2001; Chau & Hu 2002; Harrison, Mykytyn & Riemenschneider 1997; Hsu & Chiu 2004; Leonard, Cronan & Kreie 2004; Liao, Shao, Wang & Chen 1999; Pavlov & Fygenson 2006; Venkatesh, Morris & Ackerman 2000). These studies have tested a wide variety of technology acceptance, such as acceptance of telemedicine (Chau & Hu 2001; 2002b), e-commerce (Pavlov & Fygenson 2006), IT etchics (Leonard et al. 2004), www (Hsu & Chiu 2004) and virtual banking (Liao et al. 1999). These studies have shown TPB to be a suitable theoretical approach for several study contexts.

2.4 Innovation Diffusion Theory

Diffusion of Innovation Theory's (DOI) (Rogers 1995) primary intention is to provide information on the manner in which innovations move from the stage of new invention to a stage of use. The theory explains, among many things, the process of the innovation decision process that determines the rate of adoption in various categories of adopters. DOI suggests that individuals can be classified according to their speed of uptake of innovation. These categories are: innovators, early adopters, early majority, late majority and laggards. These categories are assumed to be normally distributed (Rogers 1995).

DOI also posits four innovation characteristics that affect the diffusion: *relative advantage*, *complexity*, *trialability*, and *observability*. *Relative advantage* is the degree to which an innovation offsets improvement over

currently used tools. *Compatibility* is the consistency of the innovation with current social practices and norms. *Complexity* is the ease of use and learning of the innovation. *Trialability* refers to the opportunity to try the innovation before making the decision of use. (Rogers 1995) Moore and Benbasat (1991) expanded upon the five factors impacting the adoption of innovations presented by Rogers (1995) by adding five factors (voluntariness, image, result, demonstrability, and visibility) that impact the adoption of IT. The core constructs of this model, referred as Innovation Diffusion Theory (IDT), are presented in Table 4.

Table 4 Core constructs of IDT.

Core construct	***Definition***
Relative advantage	*'the degree to which an innovation is perceived as being better than its precursors'* (Moore & Benbasat 1991, 195)
Ease of use	*'the degree to which an innovation is perceived as being difficult to use'* (Moore & Benbasat 1991, 195)
Image	*'the degree to which use of an innovation is perceived to enhance one's image or status in one's social system'* (Moore & Benbasat 1991, 195)
Visibility	*'the degree to which one can see others using the system in the organization'* (Moore & Benbasat 1991, 195)
Compatibility	*'the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of potential adopters'* (Moore & Benbasat 1991, 195)
Results demonstrability	*'the tangibility of the results of using the innovation, including their observability and communicability'* (Moore & Benbasat 1991, 203)
Voluntariness of use	*'the degree to which use of the innovation is perceived as being voluntary, or of free will'* (Moore & Benbasat 1991, 195)

IDT has been applied and adapted in numerous ways. Rogers (1995) stated that an innovation's relative advantage, compatibility, complexity, trialability and observability were found to explain 49–87% of the variance in the rate of adoption. Research has, however, consistently found that technical compatibility, technical complexity and relative advantage (perceived need) are important antecedents to the adoption of innovations (Bradford and Florin, 2003; Crum et. al., 1996). Tornatzky and Klein (1982) found that only three innovation characteristics - relative advantage, complexity and compatibility – consistently relate to the adoption IT. The core concepts of IDT and their relationships are presented in Figure 4.

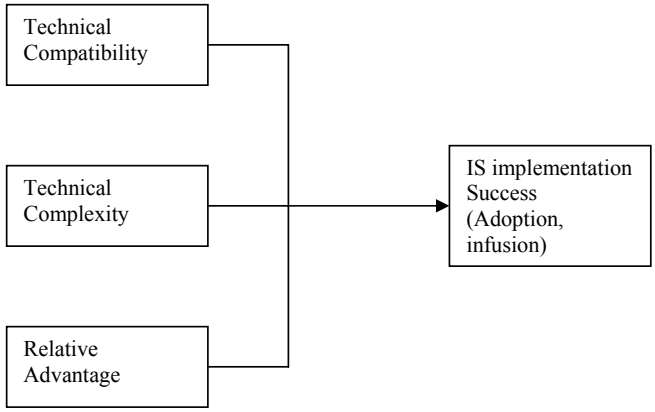

Figure 4 Innovation Diffusion Theory (Agarwal and Prasad 1998).

IDT has been used in several IS studies (e.g.Agarwal & Prasad 1998; Beatty, Shim & Jones 2001; Carter, Jambulingam, Gupta & Melone 2001; Chen, Gillenson & Sherrell 2002; 2004; Fichman 2001; Hovav, Patnayakuni & Schuff 2004; Karahanna et al. 1999). These studies have found that compatibility is the only perception that necessitated a significant change in the work behavior (Agarwal & Prasad 1998). With the TAM constructs of perceived usefulness and perceived ease of use, compatibility was found to be the primary determinant of consumer attitude towards using virtual stores (Chen et al. 2002). Image, visibility and result demonstrability have also been found to positively relate to attitudes toward adoption (Karahanna et al. 1999).

2.5 Technology acceptance research in healthcare

In the healthcare environment, technology acceptance has been previously studied with TAM (Chau & Hu 2001; 2002a; 2002b), TPB (Chau & Hu 2001; 2002b) and integrated models based on TAM, TPB and IDT (Chau & Hu 2002a; Gagnon et al. 2003; Wu, Wang & Lin 2006; Yi et al. 2006). The studies in this sector have been conducted in different countries, within different professional groups and by concentrating on different types of IT. To give an overview of the IT acceptance studies conducted in the healthcare sector, Table 5 collects some of the most recent articles published in the most appreciated journals in the field, and summarizes the theoretical approaches, study contexts, IT in question and main findings.

Table 5 Sample of technology acceptance studies in healthcare setting.

Citation	*Theory basis*	*Study context*	*IT*	*Findings*
(Hu et al. 1999)	TAM	Physicians in Hong Kong (n=421)	Telemedicine	Intention to use was explained by 44%. PU was the most important determinant of intention to use.
(Chau & Hu 2001)	TAM, TBP and decomposed TBP	Physicians in Hong Kong (n=421)	Telemedicine	TAM and TPB explained 40% and 32% of the intention to use respectively.
(Chau & Hu 2002a)	TAM, TBP (integrated model)	Physicians in Hong Kong (n=421)	Telemedicine	Integrated model was able to explain 43% of the intention to use. PU was the strongest determinant.
(Chau & Hu 2002b)	TAM, TBP (comparison)	Physicians in Hong Kong (n=421)	Telemedicine	TAM explained intention to use by 42%, TPB 37%. PU was the strongest determinant of intention to use.
(Gagnon et al. 2003)	Theory of Interpersonal Behavior (based on TAM and TBP)	Physicians in US (n=519)	Telemedicine	Model explained 81% of the intention to use.
(Yi et al. 2006)	TAM, TBP, IDT (integrated model)	Physicians in US (n=222)	PDA	The integrated model explained 57% of the intention to use. PU was the most important determinant of behavioral intention.
(Wu et al. 2006)	TAM, IDT (integrated model)	Physicians, nurses and medical technicians in Taiwan (n=123)	Mobile healthcare systems	The model explained 70% of the variance of mobile healthcare systems acceptance. PEOU was found to be the strongest determinant of use.

The review shows that previous studies of technology acceptance in the healthcare environment have mainly focused on physicians (Chau & Hu 2001;

2002; 2002b; Gagnon et al. 2003; Hu et al. 1999; Yi et al. 2006), whereas only one study has used a multi-professional sample (Wu et al. 2006). TAM was found to explain intention to use IT from 40-44% in these studies and it was considered to be a more appropriate model to explain physicians' acceptance of IT than TPB (Chau & Hu 2001; 2002b). PU was found to be the strongest determinant of intention to use IT in most of the studies. These basic findings were the same, regardless of the national culture. The studies were conducted in the U.S (Yi et al. 2006), Hong Kong (Chau & Hu 2002; 2002a; Hu et al. 1999) and Taiwan (Wu et al. 2006), suggesting that PU could be one of the most important determinants of technology acceptance in healthcare. The research on the acceptance of telemedicine has been dominant, with the two exceptions of mobile devices (Wu et al. 2006; Yi et al. 2006). In general, these technology acceptance approaches tested in the healthcare context have provided relatively good explanatory rates for IT use or intention to use.

2.6 Comparison of the IT acceptance models

Studies combining constructs from the different theoretical approaches, such as TAM, TBP and IDT, are popular. These combinations of models have included: TAM and TBP (Reimenschneider, Harrison & Mykytyn 2003; Taylor & Todd 1995), TRA and TAM (Davis et al. 1989), IDT and TAM (Agarwal & Prasad 1998; Karahanna et al. 1999; Lewis et al. 2003; Wu & Wang 2005), and TAM, IDT and TPB (Yi et al. 2006), suggesting that the constructs of the different approaches are combinable and the basic logic behind each of these theoretical approaches does not differ to a large extent.

Besides being combined, the IT acceptance models have also been compared. Taylor and Todd (1995) compared TAM and TPB and found TPB to explain behavioral intention to use slightly better than TAM, but there was no difference in explanation rates of actual usage behavior. Chau and Hu (2001) found TAM to explain 40% of the variance in physicians' intention to use telemedicine, whereas TPB explained 32%. Similarly, Mathieson (1991) compared TAM and TPB and suggested that the TAM determinants PU and PEOU are not context-specific and are, therefore, easier to apply to different user contexts than TPB. The social variables of TPB were proposed to provide a more accurate explanation of user intention than TAM, which does not include any social determinants. Moreover, TAM was found to explain attitude better than TPB. In general, Mathieson (1991) concluded that TAM is easier to use than TPB and that the constructs of TPB usually require a pilot study because of the context-specificity. The findings of Chau and Hu (2002b)

suggest that TAM may be a more appropriate model than TPB and that their integrated model did not provide significant additional explanatory power.

Moreover, the constructs of the models have many similarities. For instance, PU (‘*the prospective user’s subjective probability that using a specific application system will increase his or her job performance within an organizational context’* (Davis et al. 1989, 985)) and relative advantage (‘*the degree to which an innovation is perceived as being better than its precursors’* (Moore & Benbasat 1991, 195)) are both measuring the extent to which IT is perceived as useful for the user’s work. Likewise, PEOU from TAM (*‘the degree to which the prospective user expects the target system to be free of effort’* (Davis et al. 1989, 985)) and the perceived behavioral control from TPB (*´the perceived ease of difficulty of performing the behavior´* (Fishbein & Ajzen 1975, 188)) and ease of use of IDT (*‘the degree to which an innovation is perceived as being difficult to use’* (Moore & Benbasat 1991, 195)) are all measuring the extent to which the user perceives IT as being easy to use.

To sum up the comparisons: TAM has been stated to be a more parsimonious model and more suitable for various research settings and user populations. However, it has been criticized for neglecting the social aspects of the IT acceptance process. In general, these different theoretical approaches have many similarities and even some shared constructs. None of the approaches have proven to be transcendent compared with each other and each of the models seems to vary in appropriateness according to the research settings. Therefore, which model would provide the most suitable theory-based background on which to build the research models is due to the setting of the study at hand.

3 CULTURAL ISSUES IN IT ACCEPTANCE STUDIES

Earlier studies of cultural issues in IS research are reviewed in this chapter. The chapter begins with an overview of the previous literature review of IS culture studies. Then, a description of the review approach is presented with an explanation of how and with which criteria the review was conducted. The purpose of the literature review is to concentrate on cultural issues in IT acceptance studies and, moreover, to provide an update to previous literature reviews. After presenting the distribution of reviewed articles, an overview of the purposes, research contexts, measures and main findings is given. Finally, there is some discussion of the current state of cultural issues in IT acceptance studies and the main problems. The purpose of this chapter is to screen the current literature on IT acceptance and culture, and classify and summarize the articles to get a picture of the current state of cultural issues in IT acceptance research.

3.1 Previous literature reviews of culture in IS research

The studies combining cultural issues with IS research have covered a wide variety of topics. Leidner and Kayworth (2006) reviewed 82 articles that addressed the relationship between culture and IT. The themes covered were classified as:

- culture and IT development
- culture, IT adoption and diffusion
- culture, IT use and outcomes
- culture, IT management and strategy
- IT's influence on culture
- IT culture.

Covering the same theme, Gallivan and Strite (2005) identified more than 70 articles. They classified the themes as:

- Studies on IT adoption, implementation or use of a specific system or technology
- Studies on the diffusion of IT, broadly defined within an international context

- Studies comparing IT professionals with human resource practices across different countries
- "Key issues" studies of senior managers' beliefs and practices related to IT management.

Studies on information systems development have the main general idea that the variation across cultures could lead to differing perceptions and approaches in information systems development (Leidner & Kayworth 2006). For instance, national culture has been found to affect the reporting of failure in information system development processes in such a way that more individualistic cultures were more predisposed to report bad news than collectivistic cultures (Tan, Smith & Keil 2003). The commitment behavior in software development has been found to be affected by culture in such a way that low uncertainty avoidance cultures have lower perceptions of risks in the system development process than high uncertainty avoidance cultures (Keil, Tan, Wei, Saarinen, Tuunainen & Wassenaar 2000).

The most popular approach within IS culture studies has been to explore culture's impact on IT adoption and diffusion (see Gallivan & Srite 2005; Leidner & Kayworth 2006). A popular approach has been to explore whether culture influences the adoption and diffusion of IT within one or more cultural contexts. For instance, phenomena such as adoption of e-mail and fax has been found to vary across different countries (Straub 1994; Straub et al. 1997). The general idea within this type of research has been that uncertainty avoidance is a significant determinant of adoption and diffusion of IT since it is assumed to be inherently risky to implement IT (Leidner & Kayworth 2006). This was found in many studies (e.g. Hasan & Ditsa 1999; Thatcher, Srite, Stepina & Liu 2003).

The central importance in the studies on culture's impact on IS use has been to explore whether the same IT was used similarly across different cultures, and if it resulted in similar benefits, what cultural values are able to predict user satisfaction and success with IT implementation (Leidner & Kayworth 2006). One main finding from these studies was that IT is more favorably perceived in countries with lower power distance and uncertainty avoidance than in cultures with high uncertainty avoidance and power distance (Calhoun, Teng & Cheon 2002; Leidner, Carlsson, Elam & Corrales 1999).

Cultural issues in IT management and strategy covered studies on IT personnel, governance, ethics and privacy. Husted (2000), for instance, found that software privacy is more prevalent in more individualistic cultures. IT strategies were found to be related to innovative-type cultures (Kanungo, Sadavarti & Srinivas 2001). Another example of this type of study is that individualistic culture nations and collectivist culture nations resulted in different approaches to IS employment structures (Slaughter & Ang 1995).

The relationship between culture and IT can also be studied in the reverse order. Although relatively few articles have examined culture as a dependent variable instead of moderating or independent, a handful of studies have studied the possible cultural transformation caused by IT on an organizational level (Leidner & Kayworth 2006). Doherty and Doig (2003) found that improvements in a firm's data warehousing affected the customer service, flexibility, empowerment and integration values. On a project team level, Brannon and Salk (2000) found that a culturally diverse project team interacted and affected cultural values among team members.

In the review by Leidner and Kayworth (2006), the studies examining culture from a national level were more popular (51 articles) while 31 articles studied culture from an organizational level. Similarly, Gallivan and Strite (2005) concluded that the national level was the most popular approach in IS culture research. Over 60% of articles in the review by Leidner and Kayworth (2006) utilized Hofstede's cultural dimension. Hofstede (1980; 2001) surveyed 116,000 people and, based on the data, identified four cultural dimensions that differentiated employees across regions. These dimensions have since been used in numerous studies in IS research. These dimensions are presented in Table 6.

Table 6 Hofstede´s cultural definitions (Hofstede 1980).

Hofstede´s Dimension	***Definition***
Uncertainty Avoidance	Degree to which people prefer structured over unstructured situation
Power Distance	Degree of inequality that people perceive as normal
Masculinity/femininity	Degree to which masculine values (e.g. performance, competition) prevail over feminine (e.g. personal relationships, solidarity)
Individualism/collectivism	Degree to which people act as individuals rather than a collective

Uncertainty avoidance is '*the extent to which the members of culture feel threatened by uncertain or unknown situations'* (Ford, Connelly & Meister 2003, 10). High uncertainty avoidance cultures try to mitigate and minimize the uncertainty, and thus prefer stability and avoid stress (Hofstede 1980). Power distance is *'the extent to which the less powerful members of institutions and organization within a country expect and accept that power is distributed unequally'* (Ford et al. 2003, 10). In a high power distance culture, decisions are often made by superiors without consulting the employees (Hofstede 1980). The masculinity-femininity continuum is defined in terms of

assumed social gender roles and is often viewed in terms of competitiveness and material success, as opposed to nurturance and quality of life (Ford et al. 2003). Finally, individualist cultures have looser ties between individuals than in collectivist cultures. Moreover, in collectivist cultures individuals are integrated into cohesive groups (Ford et al. 2003).

As this thesis is especially focusing on cultural differences in IT acceptance, a new literature review was conducted. Although being highly extensive, the current reviews are lacking the most recent articles on the topic (for Leidner and Kayworth (2006) as well as for Gallivan and Strite (2005), the last articles included in the review are dated 2003). Therefore, the literature review was conducted in order to get an up-to-date picture of the culture-related studies in the field of IT acceptance studies.

3.2 Description of literature review approach

The literature in IS research discipline journals that address the joint themes of this thesis – IT acceptance and culture –was reviewed. Although some studies have also been published in other research traditions (e.g. psychology, sociology), this review concentrated on the IS literature. The literature review located articles published in both mainstream IS journals and speciality journals whose focus is on international or cross-cultural management. This decision was made in order to get a systematic overview of the more established publications with (assumingly) a more rigorous background reflecting the more mainstream research. As an alternative, the speciality journals were chosen to give an outlook on exploratory research and alternative ways of measuring and exploring cultural issues in IS research. Health IT journals were excluded. Although providing some interesting insights into cultural issues in the healthcare sector (e.g. Moen 2003; Shortliffe, Patel, Cimino, Octo Barnett & Greenes 1998; Timpka 1995), these studies mainly focus on healthcare-specific dimensions of culture and ignore the conceptualizing of culture as such.

In the case of the mainstream journals, the review was made from journal issues in this millennium (2000-2006 August) in order to have an up-to-date review and avoid overlapping with previous literature reviews (i.e. Gallivan & Srite 2005; Leidner & Kayworth 2006). The journals reviewed were:

- MIS Quarterly
- Information & Management
- Information & Organization
- Information Systems Research
- European Journal of Information Systems Research

- IEEE Transactions on Engineering Management.

These journals were selected because they are ranked in many papers as the most prestigious journals in the IS field (Claver, Gonzáles & Llopis 2000) and because they represent a versatile selection of journals with different scopes and research traditions. The speciality journals were selected for their focus on international and multi-cultural IS research. Besides, many of the fundamental culture conceptualizing articles in the IS field are from these journals (e.g. Karahanna et al. 2005; Myers & Tan 2002; Straub et al. 2002) and they have been used in previous literature reviews of culture (Gallivan & Srite 2005). Due to the profusion of articles in these journals that are related to the topic of culture, these journals were only reviewed for the past six years (2000-2006 August). The journals reviewed were:

- Journal of Global Information Management
- Journal of Global Information Technology Management.

To search for appropriate literature for the review, information provided by the ABI/INFORM was used. This is a broad database indexing over 350 journals in this area and has been used in other similar studies (Claver et al. 2000; Leidner & Kayworth 2006). Each of the selected journals was searched using the words 'culture' and 'cultural' to find culture-related articles for further evaluation. First, the abstracts were read to find out if the article met the criteria for inclusion in the review. If the abstract did not offer enough information, the whole paper was screened in order to make the decision. The screening criteria for the relevant articles were the following. First, the study must focus on cultural issues - whether it be from a professional, national or individual cultural perspective. This broad recognition of culture should not be ignored when studying IT (Davison & Martinsons 2002). Second, the study must address IT behavior or belief (e.g. adoption, attitudes, use) from an end-user's perspective. Although there are a number of other approaches to culture and IT (e.g. studies comparing IT professionals in different cultures, practices related to IT management (Gallivan & Srite 2005; Leidner & Kayworth 2006)), these articles were excluded. Moreover, articles that focused on IT's impact on culture were also excluded (e.g. Doherty & Doig 2003).

Based on the criteria, 27 articles were identified and reviewed. The articles are summarized in Appendix 2. The distribution of the reviewed papers in the journals is presented in Table 7.

Table 7 The distribution of papers across journals.

Journal name	***Number of articles from sample***
Information & Organization	1
Information & Management	0
MIS Quarterly	2
Journal of Global Information Management	7
Journal of Global Information Technology Management	8
Information Systems Research	0
European Journal of Information Systems	4
IEEE Transactions on Engineering Management	5
Total	***27***

The distribution of the papers across journals showed that although the topic of cultural issues in IT acceptance and use is popular in speciality journals, not many have been recently published in mainstream journals. The European Journal of Information Systems and IEEE Transactions on Engineering Management had most of the publications on this topic, while the contribution of the other journals was marginal. On the other hand, the speciality journals (Journal of Global Information Management and Journal of Global Information Technology Management) were found to be very active in publishing articles meeting the criteria of this review. To provide an overview of the types of studies that discuss IT behavior and attitudes and culture, the purposes and research contexts of the studies are discussed as well as the conceptualizing and measuring of the culture construct within these studies. The main empirical findings from these studies are collected and a summary is provided to further discuss the findings of the literature review.

3.3 Purposes and research contexts

The articles reviewed covered a wide range of research purposes. Studies exploring culture's effect on system success found factors such as vision clarity or knowledge culture to lead to more successful utilization of IT (Al-Busaidi & Olfman 2005). The relationship between IS strategy and IS success was also found to be moderated by local culture (Lai & Wong 2003). The users showed more loyalty towards local websites than foreign websites (Cyr, Bonanni, Bowes & Ilsever 2005).

Studies concentrating on IT adoption were interested in how cultural differences affect different forms of IT adoption. Power distance, uncertainty avoidance and masculinity were found to affect the adoption of different forms of IT (such as PC, telephone) in 31 nations (Bagchi, Hart & Peterson 2004). Adoption was also found to differ between different organizational sub-cultures (Huang, Newell, Galliers & Pan 2003). Uncertainty avoidance was found to have an effect on perceived ease of use in an adoption of an enterprise resource system (Hwang 2005).

The target IT in the articles varied, with the most popular being e-commerce (Cyr et al. 2005; Dinev, Bellotto, Hart, Russo, Serra & Colautti 2006; Liu, Marchewka & Ku 2004; Rose, Evaristo & Straub 2003; Sagi, Carayannis, Dasgupta & Thomas 2004; Yap, Das, Burbridge & Cort 2006). Other applications explored were knowledge management systems (Al-Busaidi & Olfman 2005; Okunoye & Karsten 2002; Shore 2001), e-voting (Gefen, Rose, Warkentin & Pavlou 2005), decision support systems (Elbeltagi, McBride & Hardaker 2005), mobile services (Mao et al. 2005; Middleton & Cukier 2006) and software agents (Lim 2004), to mention few. Equally colorful was the range of countries in which the studies have been conducted, covering continents like Africa, Asia, Europe, and North America.

The usual tendency was to compare survey results between two or more countries and use culture as an explanation for the differences. Comparisons were made between Taiwan and the U.S. (Liu et al. 2004) , the U.S., Greece and England (Sagi et al. 2004) or the UK and Korea (Kim, Galliers & Yang 2005). Many studies combined results from several countries (Bagchi et al. 2004; Parboteeah & Parboteeah 2005; Png, Tan & Wee 2001; Yap et al. 2006).

3.4 Conceptualizing and measuring culture

The majority of the studies had a national perspective on culture. Of the 27 articles, 19 used a nation as a unit of culture while 6 articles concentrated on the organizational level. Two articles used a multi-perspective combining the two approaches. Most of the articles compensated for discussion of the notion of culture by presenting a set of definitions of culture. The most commonly used definition was Hofstede's (2001, 25) (*'the collective programming of the mind which distinguishes the members of one human group from another'*. However, many articles did not use any definitions of culture. Papers comparing certain phenomenon between different nations relied on the notion of national culture as the source of cultural differences and made no further comment on the culture and what is meant by it.

Several articles did not measure culture but assumed the differences based on Hofstede's (1980) previous work (e.g. Bagchi et al. 2004; Cyr et al. 2005; Dinev et al. 2006; Lai & Wong 2003; Liu et al. 2004; Mao et al. 2005; Parboteeah & Parboteeah 2005; Png et al. 2001; Yap et al. 2006). The values counted for the different dimensions for different countries were used either to conduct a statistical analysis or simply to work as an explanation for the differences found between samples from different nations. Some articles used Hofstede's dimensions as the basis of the measurement (e.g. McCoy, Everand & Jones 2005; Srite & Karahanna 2006).

The measurement and defining of culture was stronger in studies exploring cultural differences on an organizational level. The different dimensions measured were, for instance, vision clarity of the organization or the knowledge culture (e.g. Al-Busaidi & Olfman 2005), but Hofstede's (1980) dimensions were also used and explicitly measured (e.g. Hwang 2005).

3.5 Main findings

National cultural differences were found to impact in a case of IT acceptance on the degree of PU, usage and PEOU, and the impacts of these constructs on each other. Differences between nations were found between the U.S and South Africa (Gefen et al. 2005), the UK and Korea (Kim et al. 2005), and Singapore and Mauritius (Lim 2004). Studies conducted with an organizational culture approach found vision clarity and knowledge culture to have a correlation with system success (Al-Busaidi & Olfman 2005). Similarly, developmental and rational cultures and weaker hierarchical cultures were found to affect IT implementation success on an organization level (Harrington & Guimaraes 2005).

A popular issue was trust-related issues in different forms of IT use, such as website use (Cyr et al. 2005), e-commerce (Liu & Ma 2005) behavior or e-voting (Gefen et al. 2005). The logic with this type of study was that cultural similarities create trust, which, in turn, affects the behavior. For instance, trust was found to have a less important effect on e-commerce use in Italy than in the U.S. (Dinev et al. 2006).

3.6 Summary of the literature review

The literature review revealed culture to be a popular approach to examining IT acceptance and use. The mechanisms by which culture is expected to influence the various themes described were: cultural distance, national

borders, and organizational culture dimensions. Cultural distance studies explored how the cultural similarity affected different issues related to IT. The national borders explanation had the logic that people living in the same nation would have similarities in relation to IT acceptance. Finally, studies operating on an organizational level assumed differences in IT-related phenomena to be due to organizational characteristics or actions.

The distribution of the papers across journals showed that although the topic of cultural issues on IT acceptance and use is popular in speciality journals, not many have been recently published in mainstream journals. This can be due to the lack of theoretical rigor in forming the construct culture or in the measurements of culture. Since most of the articles did not explicitly conceptualize culture to a measurable unit, the theoretical advancement is difficult to obtain. In most of the studies, culture was not conceptualized explicitly but was expected to be a common value set for the whole nation (normally based on Hofstede (1980). It seems that studies concentrating on organization culture were more rigorous in their conceptualization of culture. Another difficulty showed by the review is that technologies are not comparable across studies. This makes the replication of the studies difficult.

4 CONCEPTUALIZING CULTURE

At its basic level, culture is often defined simply as *shared norms and values*. However, this tendency to simplify the concept with no further examination or definition often leads to a very vague understanding of culture and leaves the reader with no knowledge of what is concretely meant by the word *culture*. This chapter aims to describe and illustrate the concept of culture used in this thesis. First, the current problems with the conceptualizing of culture in IS research is discussed. Next, building on the work of Straub et al. (2002), the theoretical base for the conceptualizing (Social Identity Theory (Tajfel & Turner 1979)) is presented. Then, the layered structure of culture is introduced and suggestions for the important layers that could affect the technology acceptance are made. Finally, the relationship between organization and culture is discussed. The main purpose of this chapter is to define the concept of culture for use in the empirical assessment, but the discussion on the theory-based approach is also of importance.

4.1 Problems in conceptualizing culture in IS research

The concept of *national culture* has dominated the IS research literature (Leidner & Kayworth 2006; Myers & Tan 2002). It has been argued that exploring national differences is especially important for IS research because of the tight connections between globalization and IS (King & Sethi 1999). Since many organizations are doing business beyond national borders and global activities are often facilitated by IT, the topic of national culture has been seen as important to understand the effects of cultural differences on a national level (Ives & Järvenpää 1991).

However, the notion of national culture has been criticized for being over-simplified, especially in overlooking and generalizing the attributes of culture (Karahanna et al. 2005; Straub et al. 2002; Walsham 2002). The tendency to rely on Hofstede's (1980) previous work (see Chapter 3.1) on assuming that cultural differences based on national borders exist has been a source of criticism (see McCoy, Galletta & King 2005; Myers & Tan 2002). Although offering an easy and well-established solution, this approach has several shortcomings. For instance, Myers and Tan (2002) argue that national culture does not reflect the true cultural beliefs present within different nations and

ignores the possibility of subcultures. Moreover, Hofstede´s work has been argued to be invalid nowadays since the surveys were made in the 1970s and solely among employees from one large company (IBM) and with a sample consisting mostly of male employees (McCoy et al. 2005). A recent study testing Hofstede's cultural dimension found significant differences in the country scores compared with Hofstede's original work (1980), suggesting that these country scores might not be up to date or even working in today's global world (McCoy et al. 2005). Despite all the debate, Hofstede's work still dominates the culture-related studies in IS research (McCoy et al. 2005) and it has been argued to still have a place in the research field (Ford et al. 2003). In addition, the current conceptualizing of culture in IS studies has been criticized for assuming culture to be a static and unchanging element (Myers & Tan 2002). In IS culture research, culture is often studied from a fragmentary perspective (Gallivan & Srite 2005) and neglects the combinations of national and organizational cultures.

Several solutions have been suggested to overcome these problems in the current conceptualizing of culture in IS research. One solution is the use of individual level measures of culture (McCoy et al. 2005; Myers & Tan 2002; Straub et al. 2002). Measuring culture at an individual's level would help to avoid wide generalizations within groups (e.g. nation-states, races, etc.). According to Straub et al. (2002, 19), '*culture must be measured at an individual level even thought it is assumed that it is a group level phenomenon'*. Straub (2002, 19) argues that this is because culture can only manifest itself through the individual and it is not possible to access '*the collective unconscious of the entire culture '*instead, it is appropriate to use the individual unit of analysis when measuring culture. In the domain of healthcare, for instance, age, organization unit, gender and ethnic background were found to have an influence on organization culture perceptions (Helms & Stern 2001), suggesting that perceiving culture is an individual process.

Moreover, the use of theory-based measurement has been recommended in order to develop more rigorous ways of measuring culture (Straub et al. 2002). Previous cultural studies in the IS field have recommended Structuration Theory (Walsham 2002), value-based approach (Leidner & Kayworth 2006) and Social Identity Theory (Straub et al. 2002) as a suitable theoretical background for cultural studies.

4.2 Theoretical base for the concept of culture

This study uses the Social Identity Theory (SIT) (Tajfel & Turner 1979) to understand how subjective culture develops within an individual. According to

SIT, a person not only has one personal self but several selves that correspond to different group memberships. Changing social contexts triggers an individual to think, feel and behave on the basis of these levels of self. The basic idea of SIT is that social categories (e.g., nationality, sports team) provide a definition of who one is - in other words, what one's social identity is. The concept of *social identity* has been defined as '*the individual's knowledge that he belongs to certain social groups together with some emotional and value significance to him of this group membership'* (Tajfel, 1972, 292). People have several such category memberships they feel they belong to, and each of these categories represents a social identity in the individual's mind. These memberships produce *group behavior* - for instance, normative behavior, collective behavior, shared norms, and mutual influence (Hogg & Terry 2000).

The social identity mediates social contexts in the sense that social context triggers social identities into active use. This means that the category that best fits the context becomes salient in that context. For instance, in a working environment, professional identity and membership of the working group might be dominant and lead to a certain behavior (e.g. way of talking), while in a pub the behavior might be affected by membership of a group of football fans. This is due to structural fit (i.e. situationally relevant similarities among people) or normative fit (i.e. category specifications account for contest-specific behaviors). The identification process is explained in SIT based on an individual's self-enhancement and uncertainty reduction (Hogg & Terry 2000). It is beyond the scope of this study to take a stance on the formation of groups and the socio-psychological origins of SIT. Instead, the interest lies in the impact of such group memberships on how it affects the attitudes and behaviors.

Although SIT has developed within European social psychology, it is also articulated in organization and management science (Hogg & Terry 2000). Typically, an individual's in-group is membership of a pre-existing social group, such as gender and race (Bhattacharya, Rao & Glynn 1995) or vocation (Mehra, Kilduff & Brass 1998), but, to a certain extent, individuals also derive their identity from the organization or work groups they belong to. For many people, their professional or organizational identity can be even more pervasive than the identity based on gender or nationality (Hogg & Terry 2000).

Originally suggested by Straub, Loch et al. (2002), and later supported by Gallivan and Srite (2005) and Karahanna et al. (2005), SIT has been argued to be a suitable theoretical basis for culture studies in IS research and has been previously used in IS studies to explain IT adoption (Gefen & Ridings 2003). In this study SIT is used as a background theory to explain the mechanism

behind the empirical findings, and as a platform from which the conceptualizing of the culture is conducted. In other words, it is used as a theory for explaining (see Gregor 2006), rather than predicting, how and why some phenomena occur.

4.3 Layers of culture

Hofstede (1991) suggests that several layers of cultural programming shape one's behavior. These layers consist of national, regional, ethnic, religious, linguistic, gender, generation, social class and organizational culture. A recent article by Karahanna et al. (2005) further elaborated the layered notion of culture and created a hierarchy of cultural layers (Table 8). The uppermost (supranational) layer of culture pertains to a group of people sharing a region, ethnicity, religion or tongue. The second (national) layer consists of collective properties shared by citizens or countries. The third (professional) layer focuses on the employing organization and industry. The fourth (organizational) layer consists of shared social and normative values in organization. The final (group) layer consists of cultural differences within a single group on a level less than of the organization. These layers of culture overlap and it is suggested that an individual's culture is a product of these different levels of culture and, more precisely, their combination (Karahanna et al. 2005).

Table 8 Levels of culture (Karahanna et al. 2005, 5).

Level	***Definition***
Supranational	Any cultural differences that cross national boundaries or can be seen to exist in more than one nation. Can consist of: Regional - Pertaining to a group of people living in the same geographic area Ethnic - Pertaining to a group of people sharing common and distinctive characteristics Linguistic - Pertaining to a group of people speaking the same language
National	Collective properties that are ascribed to citizens of countries (Hofstede 1984)
Professional	Focus on the distinction between loyalty to the employing organization versus loyalty to the industry (Gouldner 1957)
Organizational	The social and normative glue that holds organizations together (Siehl & Martin 1990)
Group	Cultural differences that are contained within a single group, workgroup, or other collection of individuals at a level less than that of the organization

To illustrate the notion of interaction between the cultural layers, this study builds on the virtual onion metaphor (Figure 5). The virtual onion metaphor was first introduced by Straub et al. (2002) and is used in this study as a tool to scrutinize an individual's identity, which, in turn, is expected to shape IT behavior and attitudes. The virtual onion notion is based on SIT (Tajfel & Turner 1979) and suggests that each individual, like onions, consists of different layers. In the metaphor, these layers are different cultural identities. These layers are considered virtual in the sense that they can shift and change over time and circumstances. Drawing on the metaphor of a virtual onion, this study understands *culture,* rather than just one dimension, various layers of person's identity (Myers & Tan 2002).

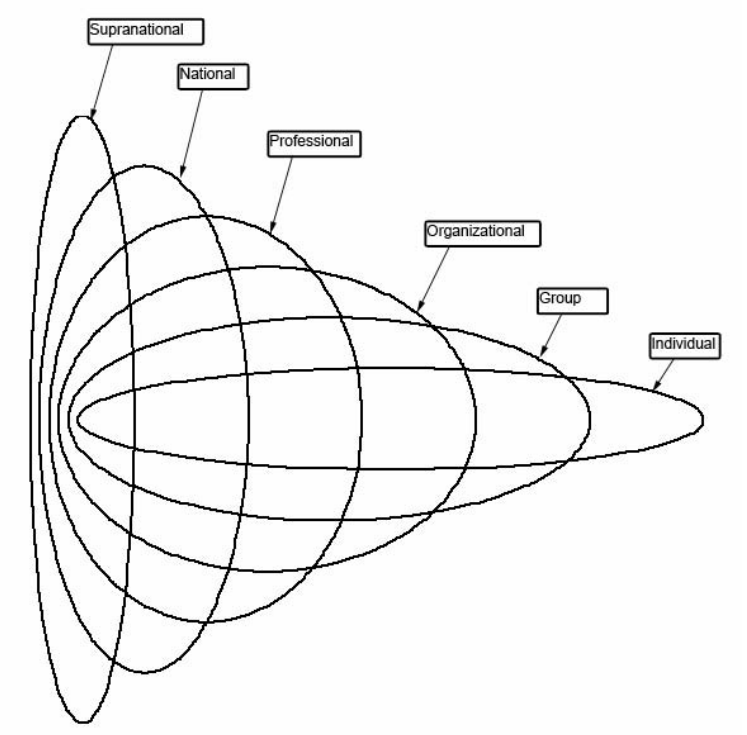

Figure 5 Interrelated layers of culture (Karahanna et al. 1998).

The layers of culture in Figure 5 are hierarchical and interactive. Each individual belongs to a specific national, professional, organizational, etc., culture. Some of these layers may be dominant and this dominance may depend on different situations. The individual's subjective culture is derived from the interaction between the layers, which eventually influences the individual's behavior. The *Individual* ellipse is not another layer of culture; instead, it illustrates how this individual culture is a combination of the different layers. It is also assumed that the layers nearest to the core are more important, but, besides interacting with each other, these layers can trade places (Straub et al. 2002). This means that for certain contexts and actions, the group layer could be dominant, while at some other national level - for example, for the action of buying new clothes - the group level culture might be dominant (being a female buying a red scarf) followed by the national level (being Finnish and preferring domestic wool).

4.4 Dynamic nature of culture

A further major question in the discussion of organization culture is that of the relationship between a culture and the organization. Here, three major approaches can be identified. According to the metaphor approach, culture is a metaphor of organizational reality (Burrell & Morgan 1979; Pondy & Mitroff 2003); culture is a variable that depends on the variable organization. The primary goal of this approach is to understand and explain the phenomenon of culture without taking an explicit, normative stance. By contrast, the variable approach has its origins in management theory and suggests that culture is a variable that can be regulated by the management (Beyer & Trice 1984; 1986; Deal & Kennedy 1983; Schein 1985). A normative stance is explicitly taken. Furthermore, this approach suggests that management is the main determinant of culture. Seeking to combine the two previous approaches, the dynamic construct approach suggests that culture is a dynamic construct (Hatch 1993; Sackmann 1992). This means that organization and culture are two interdependent constructs that can only be managed in an integrated manner. Whilst there is a relatively steady cultural core, all organizational changes have certain cultural implications and will show a long-term effect. Organizational changes can be conducted by the management, but they impact organization culture indirectly. As this dynamic perspective of culture is shared within this thesis, it is consequently assumed that if a certain organization culture is considered to be desirable within the context of technology acceptance, certain actions can be undertaken that potentially stimulate the desired cultural change. Although a discussion of such means is not provided, their general possibility is, however, a major motivation behind this study.

5 RESEARCH MODEL AND HYPOTHESES

The research model is established in this chapter, its constructs are defined and why these constructs and the relationship between the constructs are important is examined. First, the choices for technology acceptance model are presented. Then, the decisions on the layers of culture that will be included in the construct culture are made and their contents presented. After introducing the research model, the hypotheses are drawn based on previous studies. The hypotheses for technology acceptance are drawn up from the wide stream of research and, building on this steady ground, they are drawn up as directional. The hypotheses for the moderating effects of culture are drawn up using a different tactic: they are exploratory and no directional hypotheses are drawn up.

5.1 Research model

Based on the discussion in Chapter 2.6, the Technology Acceptance Model (TAM) was adapted for the demands of this study. Besides being widely tested and verified, TAM uses constructs that are parsimonious and flexible enough to be utilized in a heterogeneous research field such as the social and healthcare sector. Using TAM constructs does not require specifying the type of IT, user group or organization level of the respondents, and its concepts can also be used to explain subsequent usage. Moreover, TAM has been suggested to be a more appropriate model to explain the technology acceptance process in the healthcare sector than the competing theories (Chau & Hu 2002b). Although the extensions of TAM (Venkatesh & Davis 2000; Venkatesh et al. 2003) have reached more extensive explanation rates than the original TAM, they are more complex and variables such as gender and age that are included in UTAUT (Venkatesh et al. 2003) are already included in the cultural layers to be tested. Therefore, a very parsimonious version of TAM with the constructs PU and PEOU was chosen with the dependent variable of actual use. Support and training were added as external variables to measure the extent to which the respondents consider having enough training for their IT use and to what extent it is easy to get help for their IT use affects PU and PEOU. The research constructs and the hypothesized relationships between them for exploring the technology acceptance are presented in Figure 6.

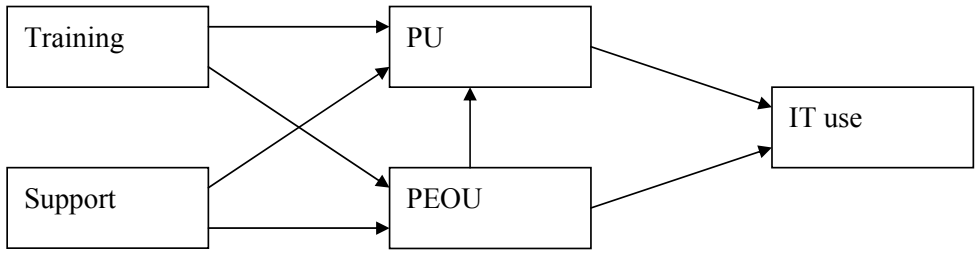

Figure 6 Research model for technology acceptance.

In the original TAM the intention to use a certain information system comes prior to actual use, and several studies have used intention to use rather than actual use when testing TAM (e.g. Horton, Buck, Waterson & Clegg 2001; Hu et al. 1999). Since in this study it was not possible to go into detail about the information technologies used and the duration of the use, the intention to use was omitted and effort was concentrated on the link between PEOU, PU and IT use. Considering the variety of systems used in the Finnish social and healthcare sector, and the heterogeneity of the sample, IT usage was derived from self-reported estimates. Although some studies suggest self-reported use is biased, Taylor & Todd (1995) argue that self-reported use correlates well with actual use. Unlike the original TAM (Davis 1989), this study does not use the construct *attitude* followed by the suggestions of Venkatesh and Morris (2000) due to its weak role as a mediator between the beliefs and behavioral intention. The constructs *training* and *support* were added as external variables in order to find out which organizational actions act as antecedents for PU and PEOU (Igbaria, Guimaraes & Davis 1995; Igbaria, Zinatelli, Cragg & Cavaye 1997; Venkatesh 1999; Venkatesh & Davis 1996), and although the relationships between PEOU and PU in TAM have been tested in numerous studies, there has been little empirical research on how these beliefs develop (see Gefen & Keil 1998; Karahanna & Straub 1999).

As the proposition is that an individual's cultural differences are due to different layers of culture that interact and shape the behavior (in this case technology acceptance), the next step in building the research model was to choose the cultural layers that were assumed to have an effect on technology acceptance. In a conceptual study about levels of culture, Karahanna et al. (2005) draw theoretical propositions that organizational and professional cultures may dominate in the behaviors with a strong task component (as opposed to a strong social component). Similarly, tasks involving competence values or practices (as opposed to terminal and moral values) are more dependent on organizational and professional culture. This would suggest that in the case of technology acceptance, organizational and professional layers of

culture would be the most suitable options. Moreover, as the upper level cultural layers (e.g. supranational, national) are conceptualized as being implicitly present in the lower layers, the emphasis is based on professional, organizational and group level cultures. Group level culture was chosen to be a part of the model to make it possible to exclude the possibility of group level differences actually causing the differences observed in the upper levels.

To measure the professional level culture, *occupation* and *hierarchical level* were chosen for the variables to be measured. Different occupational cultures have been found to lead to different mental models of technology, which can lead to conflicting evaluations of technological innovations (von Meier 1999). Following the social identity theory (SIT) (Tajfel & Turner 1979), it is assumed that individuals differentiate themselves according to their occupational group (e.g. nurses, office workers, physicians) and this membership of a particular occupational group is assumed to impact the behaviors and beliefs of the individual. Similar to the occupational group, the hierarchical level is assumed to have an impact on an individual's behavior and beliefs. It is assumed that individuals with supervisor tasks can form their beliefs and behaviors differently to those not having a supervisor position.

This study uses organization culture dimensions to measure organization level culture. Following the core idea of SIT, the assumption here is that individuals belonging to similar organizations share similar patterns of beliefs and behavior. However, solely testing the differences between different organizations in IT acceptance (e.g. two hospitals in different cities) would not provide information that would be useful unless there were a way to generalize the features of the organizations. Therefore, the level of organizational culture is measured with organization culture dimensions. The logic here is that individuals who are members of an organization with similar cultural dimensions (e.g. autonomy, effectiveness) share similar patterns of behavior and beliefs.

A relationship between organization culture and financial performance has been found in several studies (Flamholtz 2001; Flamholtz & Kannan-Narasimhan 2005; Lee & Yu 2004). Denison and Mishra (1995) argue that the high performance organizations are more aware of their goals and the current and future missions. These organizations have systems and structures to help them to adapt to new needs. In their study, adaptability was measured by whether the company was adaptive to customers' needs and also whether the organization was adaptive to change as a whole. In this study, technology acceptance is considered to be influenced by the performance culture of the organization - i.e. the values and principles that define the organization's way of performing its activities. Therefore, *adaptability*, *mission* and *functionality* are chosen as the cultural dimensions to be measured. In addition, it is

expected that technology acceptance is not only related to performance-related dimensions but is also dependent on social dimensions as well. Therefore, *autonomy* and *equality* are chosen as the cultural dimensions measuring the differences between individuals' organizational environments.

In an organizational setting, gender and age differences are becoming increasingly important in the management and implementation of IT (Morris, Venkatesh & Ackerman 2005). This importance, especially in the social and healthcare sector, is derived from the ageing and female dominant workforce. Gefen and Straub (1997) argued gender to be a fundamental aspect of culture. They claimed the female culture focused on intimacy and solidarity, whereas the male culture focuses on hierarchy and independence. For the group level culture therefore, the dimensions chosen are: *age*, *gender* and *education*. The education level, regardless of age and gender, has been found to be an important demographic variable in IT use (Agarwal & Prasad 1999; Burton-Jones & Hubona 2005). These variables are expected to have a similar group effect on an individual's culture as the other dimensions. They are assumed to shape an individual's behavior and beliefs through belonging to a certain group of people.

The layers of culture and their measurement ensuing from the discussion in Chapter 4 are presented in Table 9. The professional level of culture in this study consists of the occupation and hierarchical level in an organization. Organizational culture is assessed by the extent of adaptability, autonomy, equality, functionality and mission. Group level culture consists of the educational level, generation and gender. These layers with these contents are used as the construct *culture* in this study.

Table 9 Layers of culture.

Cultural layer	***Content***
Professional culture	Occupation Hierarchical level
Organizational culture	Adaptability Autonomy Equality Functionality Mission
Group culture	Age Education level Gender

By combining the layers of culture with the model of technology acceptance, a final research model for this study is presented in Figure 7. Culture is suggested to be a moderating variable and its impact will be tested for each of the relationships in the technology acceptance model. The black arrows represents direct effects and the dashed lines moderating effects.

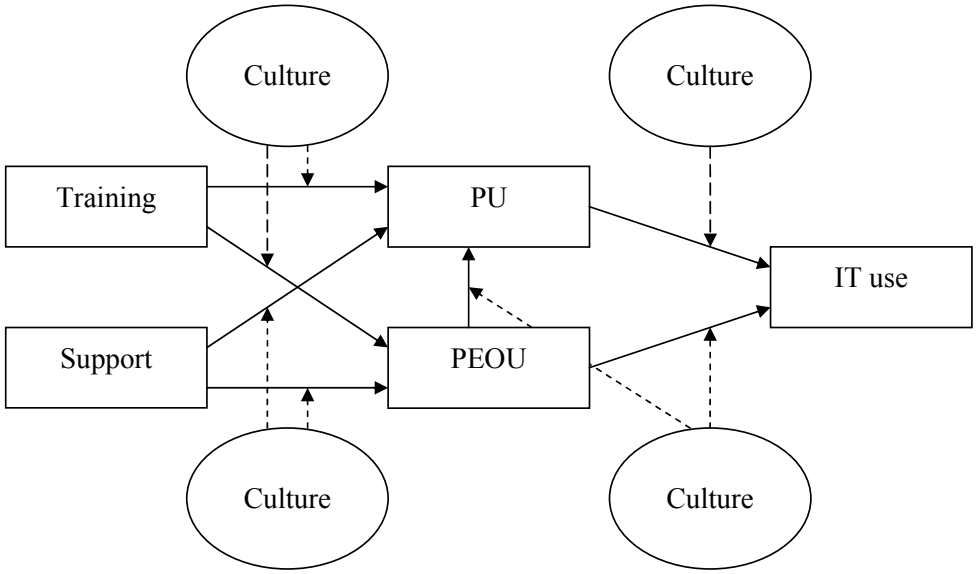

Figure **7** Research model.

It is expected that culture as such does not increase the amount of PEOU or PU. At least within this study, where the IT in question varies, the differencies between PEOU and PU could be mainly due to the system quality differences. Since within this study there is no control over the quality of the information systems the users are using, most of the differences between PEOU and PU are probably dependent on the differences in these systems. Cultural differences have been found to moderate the process of IT strategy and success (Lai & Wong 2003), as well as technology acceptance (Srite & Karahanna 2006). Therefore, rather than understanding culture as having a straight impact on the constructs, it is assumed that culture has an effect as an environment in which the acceptance process is taking place and the interest lays on how the culture affects the processes that form technology acceptance. The definitions of the research constructs of the model are provided in Table 10.

Table 10 The definitions of the constructs.

Construct	***Definition***
Independent variables	
Support	the extent to which the respondents feel they easily get support for their IT use
Training	the extent to which the respondents feel they have had enough training for their IT use
Mediating variables	
PEOU	the extent to which the respondents feel IT to be easy and effortless to use in their work
PU	the extent to which the respondents regard the use of IT as being useful for their work
Moderating variables (culture)	
Hierarchical level	the level at which the employee is in a superior position in the organization
Occupation	the occupation the employee currently has
Adaptability	the extent to which the employees consider their organisation is continuously seeking improvements
Autonomy	the extent to which the respondents perceive their organization gives them the autonomy to influence their own work
Equality	the extent to which the employees feel everybody is treated equally in the organization
Functionality	the extent to which the respondents perceive their organisation to be effective in its functions
Mission	the extent to which the goals of the organisation are clear to the employees
Educational level	the highest educational level attained by the respondent
Gender	the gender of the respondent
Generation	the age of the respondent
Dependent variable	
Actual IT use	the hours the respondents use on IT per week

Although the concepts of training and support are, at least in practice, overlapping, the difference here is based on the time scale. Support is something that is currently taking place if needed, while training refers to an action that has taken place in the past. Based on the definitions, the respondents are expected to use at least some IT in their work, although it is likely that this is not the case. The research model constructs are not suitable for respondents who had not used IT in their work at all.

5.2 Hypotheses

As TAM has been widely tested in previous studies and a large body of evidence about the relationships has been found, this study builds the hypotheses for two different purposes. First, the relationships adopted from the technology acceptance literature are tested using directional hypotheses (i.e. how the antecedents affect the variables is assumed). This approach is thus explanatory. Second, the exploratory testing of how culture acts as a moderator on the technology acceptance model is conducted using non-directional hypotheses (i.e. it is assumed that the different layers of culture have a moderating effect but the direction of the effect is not assessed).

Several studies have found the provision of support for IT use to be a factor influencing users' IT satisfaction (Bowman, Grupe and Moore, 1993; Mirani and King, 1999; Rainer and Carr, 1999; Schaw, Niederman and DeLone, 2002), also in the healthcare setting (Cox & Dawe 2002). Support is especially needed when users are facing problems, but it can be seen to affect the overall beliefs about a system. IT can be seen as easier to use when sufficient support is available. This has been noted in a TAM study where support has been found to have a positive direct effect on PEOU (Igbaria et al. 1997). Therefore, it is expected that:

*Hypothesis 1: The relationship between **Support** and **PEOU** will be positive, such that when the respondents perceive having more IT Support, the perceived PEOU is higher.*

Support is expected to promote more favorable beliefs about the system among the users (Igbaria et al. 1995). Therefore, it can be assumed that it would not only have an effect on the ease of use but also on other beliefs about the IT. Moreover, support has been found to have a direct positive effect on PU (Igbaria et al. 1997). It is thus expected that:

*Hypothesis 2: The relationship between **Support** and **PU** will be positive, such that when the respondents perceive having more IT support, the perceived PU is higher.*

Besides support, empirical research has found training to be a key factor influencing the effective use of IT (Thompson, Higgins and Howell, 1991). Training is a means of providing users with the knowledge necessary for the technology use. Logically, when users get more training for the IT use, they are assumed to perceive it to be easier to use than without training. Although Venkatesh (1999) found training to lead to a change of only 10% in the

behaviour of trainees in their jobs, the impact of training on PEOU has been found to be strong (Igbaria et al. 1997; Venkatesh 1999; Venkatesh & Davis 1996). Some controversial results have been obtained however: training did not have an effect on PEOU or PU (Wu et al. 2006). Similarly, in a study by Agarwal and Prasead (1999), training was not found to have an effect on PEOU. However, it is suggested that, especially in an early stage of use, PEOU is significantly affected by training (Venkatesh & Davis 1996). Thus it is assumed that:

*Hypothesis 3: The relationship between **Training** and **PEOU** will be positive, such that when the respondents perceive having more IT training, the perceived PEOU is higher.*

Similar to PEOU, training has also been found to have an effect on PU (Agarwal & Prasad 1999; Venkatesh 1999; Venkatesh & Davis 1996). Training can increase the understanding of how a certain system could increase the effectiveness of the work and, therefore, increase the PU. Thus it is proposed:

*Hypothesis 4: The relationship between **Training** and **PU** will be positive, such that when the respondents perceive having more IT training, the perceived PU is higher.*

Research has consistently found that the degree of PEOU positively influences the degree of PU (e.g. Agarwal & Prasad 1999; Burton-Jones & Hubona 2005). Lee et al. (2003), in an extensive literature review of TAM, summarized that of 82 studies testing this relationship, the relationship was reported to be significant in 69, strongly suggesting that:

*Hypothesis 5: The relationship between **PEOU** and **PU** will be positive, such that when the respondents perceive higher PEOU, the perceived PU is higher.*

Studies have found controversial results when testing the direct effect of PEOU on IT use. For instance, a relationship was found between PEOU and IT use but not between PU and IT use when testing a word processor, but the opposite when testing with e-mail (Burton-Jones & Hubona 2005). However, of 82 studies reviewed by Lee et al. (2003), this relationship was found not be significant in 58, suggesting that PEOU is also a direct determinant of IT use. Therefore, it is posited that:

*Hypothesis 6: The relationship between **PEOU** and **IT use** will be positive, such that when the respondents perceive higher PEOU, the amount of IT use is higher.*

PU is repeatedly found to be a significant predictor of use. Lee et al. (2003) reported that of 84 studies testing this relationship, 74 found it to be significant. Studies using actual use as a dependent variable have also found PU and IT use to have a positive relationship (Agarwal & Prasad 1999; Davis et al. 1989). PU has been suggested to be the most important antecedent of IT use, especially in the healthcare sector (Chau & Hu 2002b). Based on these results, it is assumed that:

*Hypothesis 7: The relationship between **PU** and **IT use** will be positive, such that when the respondents perceive higher PU, the amount of IT use is higher.*

The hypotheses of the technology acceptance model and their supporting references are summarized in Table 11.

Table 11 Summary of technology acceptance hypotheses.

Hypothesis	***Supporting references***
H 1: The relationship between **Support** and **PEOU** will be positive, such that when the respondents perceive having more IT support, the perceived PEOU is higher.	(Igbaria et al. 1997)
H 2: The relationship between **Support** and **PU** will be positive, such that when the respondents perceive having more IT support, the perceived PU is higher.	(Igbaria et al. 1997)
H 3: The relationship between **Training** and **PEOU** will be positive, such that when the respondents perceive having more IT training, the perceived PEOU is higher.	(Igbaria et al. 1997; Venkatesh 1999; Venkatesh & Davis 1996)
H 4: The relationship between **Training** and **PU** will be positive, such that when the respondents perceive having more IT training, the perceived PU is higher.	(Agarwal & Prasad 1999; Igbaria et al. 1997; Venkatesh 1999; Venkatesh & Davis 1996)
H 5: The relationship between **PEOU** and **PU** will be positive, such that when the respondents perceive higher PEOU, the perceived PU is higher.	(Agarwal & Prasad 1999; Igbaria et al. 1997)
H 6: The relationship between **PEOU** and **IT use** will be positive, such that when the respondents perceive higher PEOU, the amount of use is higher.	(Davis et al. 1989; Igbaria et al. 1997; Muthitacharoen, Palvia, Brooks, Krishnan, Otondo & Retzlaff-Robert 2006)
H 7: The relationship between **PU** and **IT use** will be positive, such that when the respondents perceive higher PU, the amount of use is higher.	(Agarwal & Prasad 1999; Burton-Jones & Hubona 2005; Davis et al. 1989; Igbaria et al. 1997; Muthitacharoen et al. 2006)

When testing the culture's moderation effect on technology acceptance, a different approach was used. Since this part of the study is exploratory, no directional hypotheses are drawn. The purpose within this section is to form possible hypotheses based on theory and previous studies, but since most of the hypotheses suggested here have not been tested as such previously, their directional influence is not assumed. Moreover, no specific relationship to which the moderating layers would have an effect is drawn. All the items constituting *culture* in this study are tested with each of the relationships in the technology acceptance model.

The professional layer constructs of culture (occupation and hierarchical level) are expected to have an influence on the technology acceptance process based on an assumption that individuals who are members of the same 'occupation group' (e.g. nurses, office workers) would share values, beliefs or patterns of behavior that would affect their IT acceptance. In other words, this

can be called professional identity, which refers to '*the extent to which one defines he or herself in terms of the work he or she does and the prototypical characteristics ascribed to individuals who do that work*' (Mael & Ashforth 1992, 106). Chau & Hu (2002a) have suggested that the impact of PU is stronger in professional groups that are more 'practical' if the benefits attained with IT are more practical than strategic in nature. Moreover, testing TAM among physicians (Chau & Hu 2001; Hu et al. 1999) has provided results that TAM explains around 40% of physicians' intention to use. A study using TAM constructs in a regression analysis found that PU explained 53% of nurses' and hospital administrators' use of a database system (Jayasuriya 1998). These results, although not totally comparable, provide evidence that the occupation has an impact on technology acceptance. Since it is very difficult to arrange occupations in such an order that it would make sense to measure directional impacts (i.e. more practical vs. more strategic occupations), this study simply concentrates on testing whether occupation has an effect on IT acceptance relations or not. Therefore, it is posited that:

Hypothesis 8: Occupation is a part of culture that moderates the technology acceptance relations.

The hierarchical level is also assumed to create groups that would affect the individual's culture perception. For instance, it is expected that superiors would be in a position to show an example and, as a result, might share different beliefs and behaviors in their technology acceptance. Most of the TAM studies have concentrated on supervisors' IT acceptance (Legris et al. 2003). But if, applying the same logic as with occupation, 'practical' level employees could perceive things differently to 'strategic' level employees (e.g. supervisors), it is assumed that:

Hypothesis 9: The hierarchical level is a part of culture that moderates the technology acceptance relations.

Organizational layer cultural differences are expected to influence the technology acceptance process by providing a certain environment (group) that will have an influence on the employees' beliefs and behaviors. If an organization is perceived as adaptive and is constantly seeking improvement, it can create a positive attitude towards using IT to improve their activities. Furthermore, this kind of culture is expected to reduce the level of resistance to change, and, therefore, to offer the possibility for users to base their decision to use the system on their technology acceptance in organizations where old structures and ways are preferred to new ones. The individuals who

are members of an adaptable organization are thus expected to form their IT acceptance beliefs and behaviors differently to the individuals in an organization that is not adaptable. Therefore, it is concluded that:

Hypothesis 10: The organization's adaptability is a part of culture that moderates the technology acceptance relations.

In organizations that do not give the employees any initiative, it can also be expected that the use of IT is more mandatory - i.e. the employees are not given the opportunity to freely decide whether to use IT or not. When the use of IT is mandatory, PU and PEOU are not expected to have as important an influence on use as in the case of employees who are encouraged to manage their own work. Therefore, it is argued that:

Hypothesis 11: Autonomy is a part of culture that moderates the technology acceptance relations.

Social environment has an important role in technology acceptance. Thorpe and Brosnan (2007) argue that the fear of technology is a social fear - i.e. people are more afraid of making fools of themselves through not knowing how to use IT, rather than being afraid of the technology itself. Based on the assumption that technology use is affected by the social environment, it is argued that if the user perceives IT to be useful and easy to use, and the social environment does not put pressure on the user, there are no obstacles in the way of an increased amount of use. Based on these arguments, it is posited that:

Hypothesis 12: Equality in an organization is a part of culture that moderates the technology acceptance relationships.

If the culture of the organization prefers effectiveness and functionality, this is also expected to have an influence on the use of IT: when PU and PEOU are high, and the organization values effectiveness, the use of IT is expected to be higher. Also if the use is not easy and not perceived as useful, the effective culture would increase the extent to which employees reject the use of IT. Therefore, it is expected that:

Hypothesis 13: The organization's functionality is a part of culture that moderates the technology acceptance relations.

Giving clear goals to aim at can also help in accepting IT. In this case the culture of explicating the goals of the organization can help the employees to understand why it is important to use IT and how it assists achieving the goals of the organization. Based on these assumptions, it is posited that:

Hypothesis 14: The organization's clear mission is a part of culture that moderates the technology acceptance relations.

The group layer constructs of culture used in this study (education, gender, generation) have been a widely explored area in technology acceptance studies. The education level has been found to be negatively related to attitudes toward computers (Igbaria & Parasuraman 1989). The level of education has been found to be positively related to PU but not to PEOU in the case of e-mail, but no relationships to either in the case of word processing (Burton-Jones & Hubona 2005). In contrast, the level of education has also been found to impact on PEOU but not directly on PU or intention to use (Agarwal & Prasad 1999). Although being partly mixed, the results suggest that the educational level could be a possible moderator in the technology acceptance process. Based on the theoretical foundation of SIT, this study argues that the education level can create in-groups and out-groups that the employees feel they belong to and this affects their IT beliefs and behaviors. Individuals with more education are assumed to behave similarly when basing their technology acceptance beliefs and behavior than individuals with less education. Hence:

Hypothesis 15: The education level is a part of culture that moderates the technology acceptance relationships.

Traditionally, studies have used gender's influence on behavioral or attitudinal issues, neglecting the decision process issues. Men's decisions have been found to be more strongly influenced by their attitude toward using the new IT, while women have been found to be more strongly influenced by subjective norms and perceived behavioral control (Venkatesh et al. 2000). Morris and Venkatesh (2000) found that men's decisions to adopt a technology were more strongly influenced by its perceived usefulness, whereas women were influenced by the technology's ease of use. This finding was confirmed in a case of e-learning by Ong and Lai (2006). Gefen and Straub (1997) found gender to have a impact on PEOU and PU but not directly on e-mail usage. Women perceived a higher level of usefulness of e-mail compared with men, but scored the PEOU lower than men. Based on the results above, it is assumed that:

Hypothesis 16: Gender is a part of culture that moderates the technology acceptance relations.

Similarly to gender, age can be seen as a source of in-group favoritism. People of the same age are expected to behave or form their beliefs in a similar way in the case of technology acceptance. In a study conducted in a telecommunications organization, age was found to negatively correlate with computer usage (Zeffane and Cheek 1993). Burton-Jones and Hubona (2005) found older respondents have a lower level of PEOU but not a significantly lower PU. Older workers have been reported to weigh the importance of the ease of use greater than younger workers in their technology acceptance decision. Although the results are partly controversial, it is posited that:

Hypothesis 17: Age is a part of culture that moderates the technology acceptance relationships.

The hypotheses of the moderating effect of culture have been collected in Table 12.

Table 12 Hypotheses about the moderating effect of culture.

Hypotheses	
H8	Occupation moderates the technology acceptance relationships.
H9	The hierarchical level moderates the technology acceptance relationships.
H10	The organization's adaptability moderates the technology acceptance relationships.
H11	Autonomy moderates the technology acceptance relationships.
H12	Equality in organizations moderates the technology acceptance relationships.
H13	The organization's functionality moderates the technology acceptance relationships.
H14	The organization's clear mission moderates the technology acceptance relationships.
H15	The education level moderates the technology acceptance relationships.
H16	Gender moderates the technology acceptance relationships.
H17	Age moderates the technology acceptance relationships.

The relationships that these moderating variables are assumed to have an impact on are not specified in the technology acceptance model. However, the technology acceptance model will first be tested in order to find the

relationships that are important and statistically significant. The moderating effect of cultural variables will then be tested for those relationships.

6 RESEARCH METHODOLOGY

This chapter presents the methodological choices for the study at hand. First, it discusses the philosophical background assumptions, such as the ontological engagements and paradigm differences. It then introduces the research method and the arguments for why this approach was considered to be the most appropriate to answer the research questions. Then the research design issues, such as the units of analysis, are presented. The measurements from the survey instrument are listed, followed by a discussion on the validation issues. Finally, the data analysis methods are presented. This chapter aims at explicating the methodological and research design choices made and arguing why these particular choices were made. Moreover, the advantages and disadvantages of the choices are discussed.

6.1 Philosophical engagements

IS research is a field of diverse research methods, research paradigms and research approaches (Chen & Hirschheim 2004). Added to this, a differention is made between behavioral science and design science research (e.g. Hevner, March, Park & Sudha 2004). This multitude of research options has made it difficult, but, at the same time, vastly important to understand the basic assumptions behind the methodological alternatives. Traditionally, the distinction between research methodologies is made between epistemological paradigms. In the IS research field these paradigm battles have mostly been between positivism and interpretivism (Mingers 2004a; Weber 2004), although criticism has also been suggested to be one of the IS research paradigms (see McGrath 2005). Moreover, more recent work has introduced even more paradigms, such as critical relativism (Mingers 2004; Smith 2006).

The dominant dichotomy between positivism and interpretivism has also created criticism. For instance, Weber (2004) claims that the differences assumed between these two streams of research are, at least partly, based on rhetoric, not real separations. Weber (2004) argues that although ontological backgrounds in positivistic and interpretativistic research are different (reality exists beyond our perceptions vs. reality only exists through a person) it does not make any difference to the fundamental goals for research. Similarly, Smith (2006) sums up that in practice, research arguably relies on a realist

ontology and this, according to him, is the crux of the inconsistencies in IS research.

However, despite the flux in the paradigm discussion in the IS field, it is not necessary to take a stance on whether ontological assumptions really are unnecessary or whether critical realism should or should not be the dominant paradigm in IS research. These issues are to be solved in the debate within the IS field. However, a researcher should explicate and understand the research paradigm. In order to anchor the research into the current stream of IS, the researcher should understand the differences between various paradigms. This is necessary in order to increase the rigor in the field of IS and to build stronger paradigms to develop the field of IS research. Moreover, it helps the reader and the researcher to understand the methodological choices and possibilities, and provides certain guidelines on how to conduct the research.

This study builds on the positivistic tradition. This means that although nowadays a strong positivist stance is arguably disappearing (Weber 2004), the basic assumptions, such as the human notion of causality and hypothetico-deductive model of scientific explanation (Smith 2006), are the basic background assumptions of this study.

6.2 Research method

The empirical part of this study is conducted using the survey research method. As distinct from a survey, which can refer to several data collection and measurement processes, such as marketing surveys or political polls, survey research is conducted to advance scientific knowledge (Pinsonneault & Kraemer 1993). In general, survey research is a method of going from observations to theory validation. Traditionally, the objective for survey research in behavioral IS research has been to verify the relationship between selected constructs in order to explain behavior involving IS. Survey research has been a dominant research methodology in the IS discipline, although other methods have increased in popularity in recent years (Palvia, Mao, Salam & Soliman 2003). Since other methods are widely accepted in IS research, the choices for the most appropriate one to answer the research questions are many. Survey research has been stated to be most appropriate when:

- The central questions of interest in the phenomena are ‘what is happening?’ and ‘how and why is it happening?’ Survey research is especially well suited to answering questions about what, how much and how many, and, to a greater extent than is commonly understood, questions about how and why.

- Control of the independent and dependent variables is not possible or not desirable.
- The phenomena of interest must be studied in their natural setting.
- The phenomena of interest occur in current time or the recent past (Pinsonneault & Kraemer 1993).
- Adequate secondary data is not available.
- There is a desire to generalize findings from a small subpopulation to a larger population.
- The target respondent population is accessible.
- The data to be obtained is of a personal, self-reported nature (Rea & Parker 2005).

As this study aims at exploring the impact of culture on IT acceptance and, moreover, to compare the impact of these relationships, survey research is seen as an appropriate research method. By collecting numeric data and analyzing it with statistical methods it is possible to test the relationships of the research model. Besides, a quantitative comparison of the impacts of different cultural layers is possible. As the constructs of this study are mainly attitudinal, controlling the independent and dependent variables is not of interest. Similarly, due to the attitudinal nature of the phenomena of interest, it can be seen to occur in the current time or in the recent past. Moreover, adequate secondary data is not available, the target population is accessible and there is interest in generalizing the findings. The data to be obtained is very personal and is considered to be self-reported (e.g. own attitudes and amount of use).

Culture has previously been studied in IS research using a varying set of methodologies and data collection methods, such as ethnography (Trauth 1999) or document analysis and observation (Hasan & Ditsa 1999). Some researchers consider culture to be a topic that should be studied with mainly qualitative methods (Myers & Tan 2002). On the contrary, suggestions about testing different layers of culture with large surveys have also been stated (Gallivan & Srite 2005; Karahanna et al. 2005; Straub et al. 2002). In sum, basing the arguments on the general guidelines for choosing an appropriate research method and the previous suggestions from the field of IS-culture research, the survey research method is seen as the strongest option to successfully conduct this research.

Survey research can have different purposes: to explore, to describe or to explain (Pinsonneault & Kraemer 1993). Exploration survey research aims at becoming more familiar with the topic and finding preliminary concepts about it. In contrast, the purpose of descriptive survey research is to find situations, attitudes, or opinions that take place in a population. The third type of survey research, and currently the most important, is explanatory research. This

research is interested in the causal relationships between variables that, based on theory, are expected to relate. In explanatory research hypotheses are normally drawn before the actual testing, and they should be theoretically based. The hypotheses could be basic (i.e., relationships exist) or directional (i.e., positive or negative). Overall, the purpose of explanation survey research is to test theory and causal relationships.

The purpose of this study is mainly explanation, since the construct of technology acceptance is already widely tested and the hypotheses to be tested are based on theory and previous empirical findings. However, the phenomenon of culture and its measurement and impact on IS is also partly exploratory. Although these hypotheses are also based on theory (SIT), these measurements of culture are not well established. Since the phenomena of interest in this study (i.e. technology acceptance and culture) are relatively widely tested and, by no means, no new phenomena of interest, no need to conduct only an exploratory study was found. Moreover, when aiming at a theoretical contribution, descriptive survey research is not a suitable option. As this research aims at contributing to the existing research stream, it is conducted as explanation research. Explanation research is stated to be most important type of survey research and the trend towards conducting such research in the IS discipline is increasing.

The survey research method has limitations, which should be noted when evaluating this research. Firstly, a survey is just a snapshot of one place and time, in this case the year 2005 in the Finnish social and healthcare sector. Although the results of this study might be generalized to the population of Finnish social and healthcare professionals, it should be borne in mind that this generalization could only be valid at that point in time and only among that population. As the social and healthcare sector and IS are both constantly leapfrogging, some consideration should be used when implementing the results in practice at a later point in time or with a different population. Secondly, compared with other research methods such as experiment, survey does not provide as strong evidence of causality since the test situation is not manipulated and no control group is used to validate the results. In this study, for instance, the use of a control group could have provided stronger evidence of how cultural differences impact on IT acceptance. Similarly, using a case study method could have provided a deeper understanding of the phenomenon, but, on the other hand, this approach would not have been suitable for tracing causalities or covering such a wide research field as the Finnish social and healthcare sector. Other criticisms that have been stated against the survey research method in the IS field research comes from Kraemer and Dutton (1991), who stated that survey research is unable to yield cumulative

knowledge, is atheoretical and ill-suited to addressing the subtleties of IT in a complex setting.

In the extremely heterogeneous research environment of IS, the context, not to mention the technologies, under examination are constantly developing and changing. Besides that, the use of theories is vague and these theories have been adopted from other fields of research (e.g. sociology, psychology, organizational sciences). However, this study aims at overcoming these charges against survey research by building on the extensive stream of TAM studies, basing its conceptualizing on a well-established theory (SIT) and trying to simplify the complex setting of IT in the social and healthcare sector into easily measured items.

Based on the discussion in this chapter, this study is labeled positivistic survey research. To conduct this research in practice, guidelines on the development and use of a survey instrument by Grover (1997) are the following:

- Determination of the unit of analysis (e.g., the individual, group, or organization)
- Creation and use of multi-item scales
- Pre-testing and use of pilot data
- Assessment of both construct and content validity
- Assessment of reliability
- Random sampling from a defined sample frame
- Determination of an appropriate response rate and evaluation of non-response bias
- Assessment of whether significant correlations imply real causal relations
- Determination of statistical power of the final analysis.

The following chapters aim at following and reporting the steps mentioned in the list. To report the ideal survey based research, guidelines for MIS research include (Grover, Lee & Durand 1993):

- Report the approach used to randomize or select samples
- Report a profile of the sample frame
- Report the characteristics of the respondents
- Use a combination of personal, telephone and mail data collection
- Append the whole or part of the questionnaire
- Adopt a validated instrument or perform a validity or reliability analysis
- Perform an instrument pretest
- Report on response rate
- Perform a statistical test to justify the loss of data from non-respondents.

Following these guidelines, this study aims at logically reporting the study.

6.3 Research design

Research design refers to the strategy for answering the research questions or hypotheses. This research was conducted as cross-sectional, as distinct from longitudinal, research. Since the aim was to test the relationships of variables at one point in time, the cross-sectional design was considered the most appropriate. By contrast, longitudinal designs are appropriate for studying phenomenon that change or the sources and consequences of a phenomenon. Cross-sectional design limits the causal inferences and because of its one point conduction the temporal priority is difficult to establish (Pinsonneault & Kraemer 1993). However, the relationships of the constructs in this study are mainly attitudinal and the temporal order is not of great importance. Attitudes are normally constituted in complex processes, where tracing the temporal order of causalities is not necessarily possible or valuable.

The second important research design issue is to determine the units of analysis. A unit of analysis is the level on which the responses are collected. In other words, all questions in the instrument should be collecting information in a consistent unit of analysis, whether it is the individual, work group, project, function, organization or the whole industry. This study uses the individual as the unit of analysis. This choice was obviously related to the research interest in the relationship of an individual's perceived culture and individual level IT acceptance.

The third research design issue is deciding on the respondents in the survey research. In this study the respondents are employees of the Finnish social and healthcare sector. This choice was made from practical and historical standpoints. Firstly, the researcher has previously been doing research in this field. Therefore, the research interest and previous knowledge is in the social and healthcare sector. Secondly, co-operation with the Finnish Institute of Occupational Health made it possible to include a survey instrument in their nationwide questionnaire in the particular sector. Since the research design issues are mainly due to the practicalities, it must be noted that these decisions have an impact on the research questions and measures. In other words, the research design limits certain choices but also enables certain others.

6.4 Sampling and data collection procedures

The sample frame was the registered employees of the Finnish social and healthcare sector. The survey sample was compiled from the Finnish Statistics Board's records on social and healthcare employees for the year 2004. The samples were based on the fields of activities that the respondents were

currently working in. The sampling was made as a two-stage sampling, where the first phase was stratified and second phase random. In stratified sampling the population is separated into mutually exclusive groups (i.e. strata); random sampling is then used from each stratum (Rea & Parker 2005). The purpose of stratified sampling is to make certain that each stratum has an adequate sample size and it is most suitable for situations where the stratum will be analyzed both separately and combined. Altogether, 10 strata were chosen in such a way that even the smaller sectors were present with a 200-person sample. Representation was guaranteed by random sampling after the stratification within each of the field of activities. This sampling strategy was chosen to make it possible to also make analyses within one professional group or field of activities. Since within this study the data set is analyzed as such and no sub-groups are separated, a weighting procedure was employed to analyze the data with regard to the total population. This was made in order to be able to generalize the results to the whole population.

A pilot study of the survey instrument was conducted prior to the initial data collection phase. The pilot study is further discussed in Chapter 6.6 on instrument validation. After the pilot study phase a mail survey was used to gather data for this study. Questionnaires were mailed to the sample and two reminders were sent to bolster the response rate. Of the 5,000 surveys distributed, 2,870 were completed, returned and accepted, representing a response rate of 67%, which can be considered to be a good rate (Baruch 1999). The measures used in this study were included in a job satisfaction survey conducted every fifth year by the Finnish Institute for Occupational Health. The sampling and data collection choices, as well as the research design issues, are summarized in Table 13.

Table 13 Summary of research method.

Research design	
Survey type:	cross-sectional
Unit of analysis:	individual
Respondent:	social and healthcare employee
Sampling procedures	
Sample frame:	employees of Finnish social and healthcare sector
Representation of the sample probability:	2 stage sampling stratified/random
Sample size:	5,000
Data collection	
Data collection strategy:	mail questionnaire
Pretest:	among the sample
Response rate	67%

Mail survey questionnaires are considered to be especially good for factual data and not so good for more complex and sensitive information (Pinsonneault & Kraemer 1993). The information that was gathered within this study mainly consisted of opinions and attitudes, and could, therefore, be considered sensitive information. To overcome any problems, the questionnaires were returned straight to the researchers, not to a supervisor, and no identification information was asked for. That is likely to reduce the risk of biased answers. The questions were also made as simple as possible to reduce the risk of biased answers due to too complex questions. Since the questions were related to IT, which is not necessarily a familiar topic for employees in the social and healthcare sector, this was considered necessary to avoid both biased answers and neglecting to complete the questionnaires.

6.5 Measurements

Since most of the constructs used in this study are latent (i.e. not directly observable or measurable), an operational definition and measurement items with numeric values was assigned to each of the constructs. The questionnaire consisted of statements that the respondents rated on a five-point Likert scale anchored at Strongly Agree and Strongly Disagree. Constructs that only consisted of one item, and already defined in Chapter 5.1, were: Support (the extent to which respondents feel they get easily support for their IT use) and Training (the extent to which respondents feel they have had enough training for their IT use). The actual use of IT was measured by asking how many hours/week the respondents use IT in their work. The operationalizing of the

constructs consisting of more than one item is presented in Table 14. Items for the constructs PU and PEOU were adopted from Davis (1989) and the constructs Adaptability, Autonomy, Equality, Functionality and Mission were used from the questionnaire developed by Laine et al. (2006). The Finnish questionnaire is attached in Appendix 1.

Table 14 The operationalizing of the constructs.

Construct	***Number of items***	***Items measured***
PEOU (Davis, 1989)	3	The extent to which the respondents consider that: 1. it is easy to get the IT to work as wanted 2. the use of IT is flexible 3. the use of IT is easy
PU (Davis, 1989)	3	The extent to which the respondents consider the use of IT: 1. quickens the completion of their work tasks 2. improves the quality of the tasks 3. eases the work
Adaptability (Laine et al., 2006)	3	The extent to which the respondents consider their work organization is: 1. supportive in trying out new things 2. making improvements to its activities 3. collecting feedback and improvement ideas.
Autonomy (Laine et al., 2006)	5	The extent to which the respondents can affect: 1. the diversity and variety of their work. 2. the quality of work 3. the work distribution 4. the amount of work 5. the working tempo
Equality (Laine et al., 2006)	5	The extent to which the people are treated equally, regardless of their: 1. age 2. gender 3. race 4. organization level 5. length of employment contract.
Functionality (Laine et al., 2006)	4	The extent to which the respondents consider their work organization to be: 1. flexible 2. effective 3. good in cooperation 4. successful in work distribution
Mission (Laine et al., 2006)	3	The extent to which the respondents are aware of the goals of: 1. the whole organization 2. their work unit 3. their own work

In addition, the hierarchical level was sought from the supervisor position the respondents have (options: not at all, supervision tasks, supervision position). The highest education level attained was sought using the Finnish classification for the education system (university, vocational high school, college level, vocational school, vocational training, no education after elementary school). Occupation was sought by presenting a list including the most common occupation groups in the Finnish social and healthcare sector to choose from (see Laine et al. 2006). Moreover, the respondents were asked for their age and gender.

6.6 Instrument validation

The purpose of the instrument validation is to try to ensure that the instrument used for data collection is measuring the constructs it was designed to measure. Put simply: '*a valid measure is one that accurately measures what it is supposed to measure*' (Belson 1986, 9). In order to rigorously validate the quantitative research instrument, this study used recommendations from Straub (1989), Bourdreau, Gefen et al. (2002), Straub, Bourdeau et al. (2004), and Lewis et al. (2005). These guidelines include:

- piloting the instrument,
- evaluating the content validity,
- evaluating the construct validity, and
- evaluating the construct reliability.

Piloting the instrument refers to a preliminary test aiming to avoid unanticipated problems occurring. Pilot studies are normally conducted in a small sample, preferably of the target group. As Straub (1989) and Bordeau et al. (2002) suggest, the pilots should be taken more seriously by the IS research community. Piloting the research instrument provides an opportunity to exclude or include questions, change the expressions in the questionnaire, and make final adjustments in order not to face problems that could otherwise occur in the research process. In this study a pilot study was conducted before the actual survey distribution. Firstly, the questions about IT attached to the questionnaire were made and tested with colleagues to find unintentional misunderstandings and difficulties on a general level, such as the wording of the questions or difficulties in understanding the definitions in the study. These questions were then added to the questionnaire and distributed to employees of the social and healthcare sector by the Finnish Institute of Occupational Health. In this piloting the respondents were asked to fill in the questionnaire and comment on the questions if faced with difficulties in understanding or if they had other ideas about the questionnaire. Altogether,

21 questionnaires were returned. All the questions in the questionnaire concerning IT were completed and only a few comments were added, mostly explanations of the respondent's answers. No statistical analysis for construct validity was conducted at this point but the answers to the planned constructs were noticed to co-vary. Therefore, no changes were made to the questions after the piloting.

Although the actual piloting was conducted among the actual sample, the discussions on the questions in this study conducted with colleagues could have been conducted among the real sample. This would have increased the probability that the respondents, regardless of the piloting answers, did not understand the questions correctly. Coming from outside the sample population, there might have been aspects that colleagues coming from the same discipline understood differently. Furthermore, for the challenging measure of IT use, more options could have been piloted to find an easier and more reliable way of measuring the actual use of IT. Overall, the piloting, for its part, provided evidence that the questions were relatively well understood and that this phase increased the validity of the research instrument.

Content validity refers to the degree to which an instrument covers the variety of meanings associated with a construct. It is the degree to which items in an instrument reflect the content to which the instrument should be generalized (Cronbach 1971). For instance, if the construct *perceived usefulness* involves both increased quality of the work and increased efficacy of the work, an instrument surveying this construct would have content validity if both of these aspects were addressed. Content validity is generally established through literature reviews or expert panels (Boudreau et al. 2002). The constructs used in this instrument were partly based on a strong literature base (*perceived usefulness/perceived ease of use*); on the other hand, the constructs used for measuring organizational culture (*adaptability*, *autonomy*, *equality*, *functionality*, *mission*) are not established constructs in the discipline of IS, but their constructs are measured with five questions, which should increase the content validity. Finally, some constructs in the instrument are based on just one item (training/support/IT use). Here, the risk of low content validity is the highest. When evaluating this study and its results, it should be noted that these constructs risk not having a high content validity because they are not based on previous literature, they are measuring the construct with only one item yet they are still trying to reach the essentials of the complex contents (such as sufficient training and support).

Construct validity is based on how results from an instrument relate to other measures in the theoretical environment under study. In other words, how the items ´move´ together in such a way that they can be considered one construct (Boudreau et al. 2002). Since most of the constructs in this study are latent,

testing the construct validity is very important. The components of construct validity are: convergent, discriminant, and nomological validation (Lewis et al. 2005). These validations can be assessed using statistical analysis methods, such as factor analysis. The convergent validity for the measurements was assessed using a principal components factor analysis. Seven factors were extracted from the data, each containing items of one construct. The loading values used Varimax rotation with Kaiser normalization.

'Construct reliability' refers to the internal consistency of the constructs (Straub et al. 2004). Cronbach alpha values were calculated to test the construct reliability. Table 15 presents a summary of the number of items in each construct as well as the Cronbach alpha values for the constructs that were constituted from more than one item. In addition, the factor loadings for each of the construct are presented.

Table 15 Loadings and Cronbach alphas for the constructs.

Construct	***Item***	***Loading***	***Cronbach alpha***
Autonomy	Aut1	0.733	0.768
	Aut2	0.537	
	Aut3	0.651	
	Aut4	0.858	
	Aut5	0.835	
Functionality	Func1	0.777	0.850
	Func2	0.756	
	Func3	0.799	
	Func4	0.746	
Adaptability	Ad1	0.752	0.812
	Ad2	0.788	
	Ad3	0.749	
Equality	Eq1	0.669	0.809
	Eq2	0.621	
	Eq3	0.692	
	Eq4	0.767	
	Eq5	0.778	
Mission	Mis1	0.808	0.834
	Mis2	0.874	
	Mis3	0.810	
Perceived usefulness	PU1	0.857	0.905
	PU2	0.839	
	PU3	0.849	
Perceived ease of use	PEOU1	0.879	0.880
	PEOU2	0.706	
	PEOU3	0.887	

All the constructs had Cronbach's alpha values at least very close to the limit of 0.80 suggested as a desirable alpha statistic (Nunnally 1978). Therefore, it can be concluded that these constructs are reliable to use in the data analysis as one construct and no items had to be removed.

6.7 Data analysis methods

AMOS version 6 was used to test the technology acceptance model (Figure 6). AMOS is a so-called second-generation data analysis technique and its advantage is that it can analyze relationships among multiple independent and dependent constructs simultaneously (Gefen, Straub & Boudreau 2000). For testing a whole model with several variables, the use of AMOS is beneficial for traditional regression analysis in the fullness of information about the extent to which the model is supported by the data this method tests for statistical conclusion validity (Gefen et al. 2000). AMOS uses so-called structural equation modeling (SEM), which is a collection of statistical techniques enabling the testing of a set of relationships (Tabachnick & Fidell 2001).

SEM is a confirmatory technique and therefore suitable for testing a theory (Tabachnick & Fidell 2001). However, it is not recommended for use with exploratory analysis. Therefore, SPSS version 14 was used to test the moderating effects of culture. Examining the moderating effects is an increasingly popular statistical approach in IS studies, but, at the same time, errors frequently occur (Carte & Russell 2003). There are several definitions of moderation (see Carte & Russell 2003) but in this study it is understood as Schhmitt and Klimoski (1991, 18) define it: *'a moderator variable affects the nature of the relationship between two other variables'*. Stepwise regression analysis was chosen as a way of counting any possible moderating effect of cultural layers on different relationships in technology acceptance. In stepwise regression analysis one variable is added at time and the researcher has no control over which variables are entered. Stepwise regression analysis will compute many models for the variables as many variables change the R square at a statistically significant level (de Vaus 2002).

7 RESULTS

This chapter presents the results of the statistical analyses. First, in order to get an understanding of the current state of IT use in the Finnish social and healthcare sector, descriptive information on the amount of IT use and perceptions of IT is presented. Then the sample that will be used in the analyses is introduced and the demographics are compared with the original sample in order to make the generalizations in a later part of the thesis. Second, the technology acceptance model is tested using the structural equation model technique. The model fit measurements are presented and the goodness of fit is evaluated based on the thresholds. Then the hypotheses about the technology acceptance are tested. Third, the moderating effect of occupation is tested using the same structural equation model among physicians, nurses and office workers, and the statistical significance of these differences is analyzed. Fourth, the moderating effects on culture are tested within all the relationships in the technology acceptance model that were found to be statistically significant. The results of the stepwise regression analyses for the moderators are presented and, finally, conclusions on the hypotheses are drawn. The purpose of this chapter is to present the statistical results testing the research model and the hypotheses that were constructed in Chapter 6.

7.1 Sample quality

Since the analysis of the model with AMOS requires that no missing values are included, respondents with missing values were excluded. This was done as a listwise deletion (see Arbuckle 2005), where all the cases with some missing value data were eliminated. This method for dealing with incomplete data has the problem that all the other information that the respondent gave is discarded (Arbuckle 2005). Moreover, this method reduces the sample size. Although there is a risk of a biased sample when using this method for handling missing data, it was considered to be the most suitable alternative since most of the respondents that missed out the question of the amount of IT use per week had missed out several other questions about IT use as well. Therefore, the use of other standard methods, such as pairwise deletion or data imputation (see Arbuckle 2005), was not considered appropriate. In addition,

since the amount of IT use was counted as a proportional figure for each professional group, the respondents belonging to the *other* group were excluded. This decision was made as the respondents in this group did not share similar work patterns or tasks and this could have led to biased proportional figures. This listwise deletion, together with the elimination of the unidentified professional group, reduced the size of the data to 1,915, which is 33% less than the original data (N=2,870). However, the pattern of missing data is more essential than the amount that is missing; randomly scattered missing values in the data are a less serious problem than non-randomly scattered missing values since they can affect the generalizability of the results (Tabachnick & Fidell 2001). In order to evaluate the risk of biasing the sample by eliminating respondents, the original sample demographics are presented together with the new sample in Table 16.

Table 16 Descriptive information on the sample.

Category		***Frequency***	***Valid percentage in the current sample***	***Valid percentage in the original sample***
Gender	female male	1,816 238	88 12	90 10
Age	<30 years 31-40 years 41-50 years 51-60 years > 61 years	225 476 734 578 41	11 23 36 28 2 Average: 44	10 21 34 32 3 Average 45
Working experience	< 2 years 3-10 years 11-20 years 21-30 years > 31 years	106 561 573 547 231	5 27 29 27 12 Average: 18	5 27 30 27 11 Average: 17
Highest educational level attained	none: vocational training: vocational school: college level: vocational high school: university:	33 95 467 867 226 337	2 5 23 42 11 17	3 9 27 38 9 14

The majority of the respondents were female (88%). The average age was 44 and the average working experience 18 years. The educational level varied from ‘no education’ to ‘university level’ – the largest groups being those who finished at college level or vocational school; 17% of the respondents had a university level education.

Since it is important when generalizing the results to know how the elimination of the respondents who had not answered all the IT-related questions changed the structure of the sample, the sample demographics are compared with the original data set demographics. The original sample consisted of slightly more females than the current sample. While 90% of the respondents in the original sample were female, the new percentage in the sample is 88%. The average age changed from 45 to 44 years and the average working experience from 17 years to 18 years. It is also noteworthy that the educational level is higher in the new sample. In short, the elimination of the respondents that had not answered the IT-related questions (and who are likely not to use IT in their work) led to minor changes in the sample demographics.

To prepare the variables for structural equation modeling, the gender and hierarchical level were transformed to dummy variables and latent variables consisting of several questions were computed to factors (for the validity and reliability tests of these variables see Chapter 6.6). Other variables were included as such. As the work tasks across the professional groups vary, and the amount of IT use as well, the amount of IT use was calculated as a relative measure for each of the professional groups. This means that an average amount of IT use was calculated for each of the professional groups and this average was then deducted from the actual reported amounts of IT.

7.2 Descriptive statistics

In order to give an overview of the current state of IT use in the Finnish social and healthcare sector, descriptive statistics on the amount of IT use are provided. The amount of IT use is then compared between male and female respondents, different age groups, hierarchical levels and educational levels. The purpose is to provide information on who is currently using IT in the sector and how much. In addition, perceptions of IT are also described. The extent to which the respondents consider IT to be easy to use and, on the other hand, how useful they consider it to be for their work are also presented. Similar to the amount of IT use, the distribution of these perceptions is compared in different demographic groups. Information is also provided on the extent to which the employees in the Finnish social and healthcare sector consider having had enough training and support for their IT use.

7.2.1 Amount of IT use

The respondents were asked a Likert-scale question of how much they use IT in their work. The response scale anchored from *not at all* to *a lot*. Although being subjective rather than providing any specific information on the amount of use, the results do provide evidence of how much the employees perceive using IT in their work. The figures were distributed quite evenly among different estimates of use. One-fifth of the respondents who had answered this question perceived using IT a lot in their work, half of the respondents perceived using IT in their work estimated with values of 4 or 3, and thirteen per cent perceived using IT a little in their work. Of the respondents who had answered this question, 15% did not use IT in their work at all. The respondents were also asked how many hours they use IT in their work on average. The classified results of IT use in hours/week are presented in Table 17.

Table 17 IT use hours/week.

Hours of IT use/week	***Valid percentage***
0	1
1-4	34
5-19	40
20-29	12
30-39	12
40+	1

When looking at these results, it should be noted that 724 respondents did not answer this question. While, 425 respondents answered that they were not using IT at all in their work, the frequency of respondents answering they are using 0 hours of IT per week was only 22. Presumably, respondents who are not using IT in their work did not answer this question. Of the respondents who did answer this question, 34% used IT for less than one hour a day on average. The second biggest class, with 40% of the respondents, was those using IT from one to three hours a day on average. The groups that were using IT for four to six hours per day or six to eight hours per day both represented 12% of the respondents who answered this question. Moreover, 1% of the respondents answered that they use IT their work for eight or more than eight hours per day.

When viewing the amount of IT use between male and female employees, some differences can be spotted. While the same percentage of both male and

female respondents reported that they do not use IT in their work at all, a higher percentage of female respondents than male respondents reported that they use IT for 1 to 4 hours per week. Respectively, a higher percentage of male respondents reported using IT for 5 to 19 hours per week. The percentages for the classes of more frequent use were quite evenly distributed. The percentages in both gender groups are cross-tabulated in Table 18. The mode value is marked with bold font.

Table 18 Cross-tabulation: IT use and gender.

	0	***1-4 h/week***	***5-19 h/week***	***20-29 h/week***	***30-39 h/week***	***>40 h/week***
Female	1%	35%	**39%**	12%	12%	1%
Male	1%	28%	**46%**	10%	13%	3%

The Chi-Square test showed a contingency coefficient of 0.073 with a p-value of 0.044, which indicates that there is a statistically significant, although not strong, relationship between IT use and gender when using a p-value limit of 0.05

The differences in amount of IT use between different age groups were also examined. When viewing the percentages it seems that the older employees are using more IT in their work. However, the frequencies, especially in the last age group (over 60 years old), are very small and the percentages are very sensitive to large percentage changes. The percentages of each age group in each IT usage group are shown in Table 19 with bold mode values.

Table 19 Amount of IT use by age.

	0	1-4 h/week	5-19 h/week	20-29 h/week	30-39 h/week	>40 h/week
<30 years	1%	40%	**43%**	9%	7%	0%
31-40 years	1%	35%	**42%**	10%	11%	0%
41-50 years	1%	35%	**36%**	11%	16%	2%
51-60 years	1%	32%	**41%**	14%	11%	2%
>60 years	4%	**34%**	30%	16%	12%	4%

The Chi-Square test showed a contingency coefficient 0.148 with a p-value of less than 0.001, suggesting that age and amount of IT use are related at a statistically significant level. The amount of IT use at work seemed to be

lowest among the youngest employees. For the respondents 30 years old or below, 7% reported using IT in their work for more than 30 hours a week, while in the other age groups the percentages were from 11% to 18%. The most common class for IT use in each of the age groups was from 5 to 19 hours a week, which is one to three hours per day in average.

When viewing the hierarchical level and IT use together, the cross-tabulation shows that the employees with a supervisor position or supervisor tasks are using IT more than those who do not have supervisor duties. However, the differences are not very extensive. Table 20 presents the percentages of IT use in the groups of supervisors and non-supervisors. The mode class is in bold.

Table 20 Cross-tabulation of IT use and hierarchical level.

	0	1-4 h/week	5-19 h/week	20-29 h/week	30-39 h/week	>40 h/week
Not supervisor	1%	**39%**	36%	10%	12%	1%
Supervisor	1%	34%	**39%**	12%	13%	2%

The Chi-Square test showed a contingency coefficient of 0.197 with a p-value of less than 0.001, indicating a statistically significant relationship between hierarchical level and amount of IT use.

While the amount of IT use from one to four hours per week is more common among those employees with no supervision tasks or position, the other classes with more extensive IT use are more common among employees with supervisor tasks or position. For those with no supervisor duties, the most common amount of usage was from one to four hours a week, while for those with supervisor duties the most common amount of IT use is from five to 19 hours a week.

The amount of IT use seems to vary across different educational levels as well. The percentages of IT use at each educational level are presented in Table 21 and the mode values are in bold.

Table 21 Cross-tabulation of IT use and education.

	0	1-4 h/week	5-19 h/week	20-29 h/week	30-39 h/week	>40 h/week
None:	5%	**38%**	14%	24%	19%	0%
Vocational training:	3%	**55%**	19%	8%	19%	0%
Vocational school:	2%	**56%**	29%	5%	8%	1%
College level:	1%	28%	**44%**	13%	!4%	1%
Vocational high school:	0%	23%	**49%**	14%	12%	1%
University:	0%	34%	**40%**	12%	14%	4%

The Chi-Square test showed a contingency coefficient of 0.323 with a p-value smaller than 0.001, suggesting that the amount of IT use and education have a statistically significant relationship. Employees with no education after the preliminary school were most commonly using IT in their work for one to four hours per week. However, almost a fifth of the respondents with no education used IT for 30 to 39 hours per week. The situation was the same with the employees with vocational training; for the employees with vocational school education, the most common amount of IT use was one to four hours. For the other educational level employees, the most common IT use level was five to 19 hours per week. This suggests that the employees with higher level education use more IT in their work.

7.2.2 Perceived ease of use

To measure the perceived ease of use (PEOU) the respondents were asked three questions with a five-point Likert scale (see Table 14). A factor was calculated and a categorization was made. Responses from 3 (totally agree with ease of use dimensions) to 6 are in the class ‘easy’, numbers 7 to 11 were classified as ‘relatively easy’ and numbers 12 to 15 as ‘not easy’. Over a third of the respondents who answered this question considered IT use to be easy. Almost half of these respondents considered it to be relatively easy, while almost one-fifth considered IT use to be hard.

The perceived ease of use varied slightly by gender. A cross-tabulation provided evidence that male employees could consider IT to be easier to use than the female employees. The results of the cross-tabulation are presented in Table 22. The mode class is in bold.

Table 22 Cross-tabulation: PEOU and gender.

	Easy	***Middle***	***Hard***
Female	778	1060	423
	35%	**47%**	18%
Male	110	129	23
	42%	**49%**	9%

A Chi-Square test was conducted to calculate if these differences are statistically significant. The results showed a contingency value of 0.081 with a p-value smaller than 0.001 and, therefore, a statistically significant, although very weak, difference in PEOU between male and female respondents. In particular, there were a higher percentage of female employees who perceived IT as not easy to use.

The amount of PEOU also differed across the age classes. A remarkably higher percentage of employees under 30 years of age considered IT to be easy to use than in the older age groups. Accordingly, the percentage of respondents who considered IT not easy to use grew with age. Almost a third of the employees over 60 years perceived IT as not easy to use. The cross-tabulation between PEOU and age is presented in Table 23, with the mode value marked with bold font.

Table 23 Cross-tabulation: PEOU and age.

	Easy	***Middle***	***Hard***
<30 years	159	91	11
	61%	35%	4%
31-40 years	244	250	67
	44%	**45%**	12%
41-50 years	298	433	155
	34%	**49%**	18%
51-60 years	183	386	193
	24%	**51%**	25%
>60 years	14	29	20
	22%	**46%**	32%

A Chi-Square test showed a contingency coefficient of 0.252 with a p-value of less than 0.001. This implies that there is a statistically significant relationship between age and PEOU, although it is, nevertheless, quite weak. The most common perception was that IT use is not easy, but not hard either.

However, especially in the three eldest age groups, there were many employees that considered IT use to be hard.

When viewing how the perceived ease of use was distributed across different hierarchical levels, the employees with supervisor tasks or position perceived IT as easy to use more often than the employees with no supervisor tasks. Similarly, more employees with no supervision tasks perceived IT as not easy to use than other employees. Table 24 shows the results from the cross-tabulation.

Table 24 Cross-tabulation: PEOU and hierarchical level.

	Easy	***Middle***	***Hard***
Not supervisor	649	884	371
	34%	**46%**	20%
Supervisor	241	277	67
	41%	**47%**	12%

The results of the Chi-Square tests showed a contingency coefficient of 0.095 with a p-value of less than 0.001. The most common perception in both of the respondent groups was that IT is medium to easy to use. One-fifth of the respondents with no supervision duties perceived IT as hard to use, while the respective figure in the group of supervisors was 12%.

The amount of use differed across respondents with different education levels. The cross-tabulation results show that the perceptions of easiness are higher among the more highly educated employees. The percentages of each educational level are presented in Table 25, with mode classes marked with bold font.

Table 25 Cross-tabulation: PEOU and education.

	Easy	***Middle***	***Hard***
None:	28%	**35%**	37%
Vocational training:	19%	**45%**	36%
Vocational school:	24%	**50%**	26%
College level:	38%	**48%**	14%
Vocational high school:	**58%**	37%	5%
University:	41%	**49%**	10%

The Chi-Square test results also confirmed that PEOU is related to educational level at a statistically significant rate with a contingency coefficient of 0.270 (p-value <0.001). All other educational groups considered IT to be middle to easy to use - except those with vocational high school education, who had the mode class *easy*. The differences are remarkable when looking at the percentages in the *hard* class. In the less educated classes the percentage of respondents who perceived IT as hard to use was from 26 to 37%, while the figures in the more educated respondent classes were from 5 to 14%.

7.2.3 Perceived usefulness

Similar to the hierarchical level, the perceived usefulness (PU) was measured on a five-point Likert scale with three questions (see Table 14). PU was also computed to a factor and was classified similarly to PEOU.

The majority of the respondents considered IT to be useful or relatively useful in their work, while about a fifth of the respondents who answered this question did not consider it to be useful. Perceived usefulness varied slightly by gender. A cross-tabulation provided evidence that male employees consider IT to be more useful for their work than the female employees. The results of the cross-tabulation are presented in Table 26.

Table 26 Cross-tabulation: PU and gender.

	Useful	***Middle***	***Not useful***
Female	**40%**	38%	23%
Male	**55%**	33%	12%

A Chi-Square test was conducted to calculate if these differences are statistically significant. The results showed a contingency coefficient of 0.104 with a p-value smaller than 0.001 and, therefore, a statistically significant difference in PU between male and female respondents.

Over half of the male respondents perceived IT as being useful in their work while the percentage among female respondents was 40%. Almost as large a percentage of female respondents perceived IT as being useful or medium useful in their work. IT was perceived as not useful by 23% of female and 12% of male respondents.

The amount of PU also differed across the age groups. The most common class was *useful,* except for the age group from 51 to 60 years, where it was

medium useful. Around 20% of the respondents perceived IT as not useful in their work, except in the youngest age group, where 14% of the respondents consider IT not to be useful. The cross-tabulation, with the mode classes in bold, is presented in Table 27.

Table 27 Cross-tabulation: PU and age.

	Useful	***Middle***	***Not useful***
<30 years	**45%**	42%	14%
31-40 years	**43%**	38%	20%
41-50 years	**44%**	34%	22%
51-60 years	35%	**39%**	25%
>60 years	**41%**	37%	22%

A Chi-Square test showed a contingency coefficient of 0.107 with a p-value of less than 0.001. This suggests that there is a statistically significant relationship between age and PU.

PU also varied across hierarchical levels. Of the respondents who had supervisor tasks or position, 56% considered IT to be useful in their work and 11% not useful. The respective percentages for the respondents with no supervisor tasks or positions were 37% and 25%. The results of the cross-tabulation are presented in Table 28 with mode values in bold.

Table 28 Cross-tabulation: PU and hierarchical level.

	Useful	***Middle***	***Not useful***
Not supervisor	37%	**38%**	25%
Supervisor	**56%**	33%	11%

A Chi-Square test showed a contingency coefficient of 0.176 with a p-value of less than 0.001, suggesting that hierarchical level and PU have a statistically significant, but weak, relationship.

The amount of use differed across respondents with different education levels. The cross-tabulation results show that the perceptions of easiness are higher among the more highly educated employees. The percentages of each educational level are presented in Table 29. The mode values are in bold.

Table 29 Cross-tabulation: PU and education.

	Useful	*Middle*	*Not useful*
None:	38%	18%	**44%**
Vocational training:	20%	39%	**40%**
Vocational school:	26%	**39%**	35%
College level:	**47%**	37%	16%
Vocational high school:	**55%**	35%	10%
University:	**52%**	38%	10%

A Chi-Square test showed a contingency coefficient of 0.292 with a p-value of less than 0.001, implying that there is a statistically significant relationship between PU and educational level. For the employees with no education or vocational training background, the most common perception was that IT is not useful for their work. For the respondents with vocational school education, the most common perception was in the middle, while for the other educational level employees the most common perception was that IT was useful for their work.

7.2.4 IT training and support

The questionnaire contained a question about the extent to which the respondents thought they had enough training for their IT use. This was measured with a five-point Likert scale. These options were coded into three classes: responses one and two were coded to *sufficient*, the middle alternative was *middle,* and alternatives four and five were coded as *not sufficient.* About 30% of all the respondents reported the amount of IT training as sufficient. Almost half of the respondents thought it was not sufficient.

The respondents were also asked how easy they perceived it to be to get help with their IT use. This was also measured with a five-point Likert scale and the recoding was made in a similar way to *training.* Responses one and two were classified into *easy,* number three was *middle* and responses four and five were classified as *not easy*. Half of the respondents perceived it was easy to get support for their IT use and 23% of all respondents perceived it not to be easy. The rest, 17%, perceived it to be neither easy nor not easy.

7.3 Model testing results

The research model was tested using structural equation modeling with AMOS. In total, 1,915 respondents were included in the analysis. The fit measures were calculated to evaluate the fit of the model (Figure 6) to the data. These reported fit measures are the most widely used overall model fit indices in IS research (Gefen et al. 2000), and they are: Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Normed Fit Index (NFI), the Root Mean Residual (RMR) and the Root Mean Square Error of Approximation (RMSEA). GFI measures the absolute fit to the data, whereas AGFI adjusts the value to the degrees of freedom in the model. RMR assesses the residual variance of the observed variables and how the variance of one variable correlates with the residual variances for other items (Gefen et al. 2000). NFI evaluates the estimated model by comparing the Chi-square value of the model to the Chi-square value of the independence model (Tabachnick & Fidell 2001). Finally, the RMSEA value estimates the lack of fit in a model compared to a perfect model. The fit measures of the tested model are summarized in Table 30 together with the rule of thumb thresholds.

Table 30 Fit measurements for the research model.

Fit Measure	***Research model characteristics***	***Rule of thumb recomendations***
Discrepancy	0.201	
Degrees of freedom	2	
p-value	0.904	>0.05 (Gefen et al. 2000)
Discrepancy/df	0.101	<2 (Tabachnick & Fidell 2001)
GFI	1.000	>0.95 (Gefen et al. 2000)
NFI	1.000	>0.95 (Tabachnick & Fidell 2001)
AGFI	1.000	>0.95 (Gefen et al. 2000)
RMR	0.024	<0.08 (Tabachnick & Fidell 2001)
RMSEA	0.000	<0.06 (Tabachnick & Fidell 2001)

The goodness-of-fit measures for the hypothesized model were: Chi-square = 0.201 and degrees of freedom 2, with a Chi-square/df ratio (0.101) that is

lower than the suggested 2 (Tabachnick & Fidell 2001). The p-value was lower than 0.05, which is technically the limit for an insignificant p-value and therefore a good model fit (Gefen et al. 2000). GFI, AGFI and NFI all exceeded the recommendations of >0.95 (Gefen et al. 2000). RMR was also lower than 0.05, which suggested the model to be an extremely good fit, as did a small RMSEA value. As a conclusion, the tested model showed an extremely good fit to the data.

Regression weights for the relationships in the model were calculated in order to test the hypotheses. These regression estimates, together with the significance level, are presented in Table 31.

Table 31 Regression weights for technology acceptance model.

	Estimate	***S.E.***	***C.R.***	***P***
Training-PEOU	1.329	0.046	29.208	***
Support-PEOU	0.353	0.051	6.943	***
Training-PU	-0.124	0.067	-1.844	0.065
Support-PU	0.046	0.064	0.722	0.470
PEOU-PU	0.715	0.027	26.050	***
PEOU-IT use	0.215	0.083	-2.589	0.010
PU-IT use	0.535	0.071	-7.573	***

*** $p<0.001$

All the other relationships were found to be statistically significant (at the <0.05 level) except for the Training-PU and Support-PU relationships. The impact of Training and Support on PEOU were positive, as hypothesized, which indicates that the higher the respondents estimated having had enough training for their IT use, the higher they evaluated the easiness of IT use. Similarly, the easier the respondents considered IT support to be available for their IT use, the higher they estimated the easiness of use. Surprisingly, the impact of Training on PU was found to be negative. However, this relationship was very weak and not statistically significant. Therefore, no conclusions about the direction should be drawn. The relationship between Support and PU was also found to be not statistically significant. PEOU had a positive impact on PU, implying that the easier the respondents perceived their IT use to be, the higher they evaluated its usefulness. The relationships between PU and PEOU in IT use were positive, suggesting that the easier and the more useful the respondents perceived their IT use to be, the more they were using it. The standardized regression weights for the relationships are presented in Figure 8 as are the squared multiple correlations for the dependent variables.

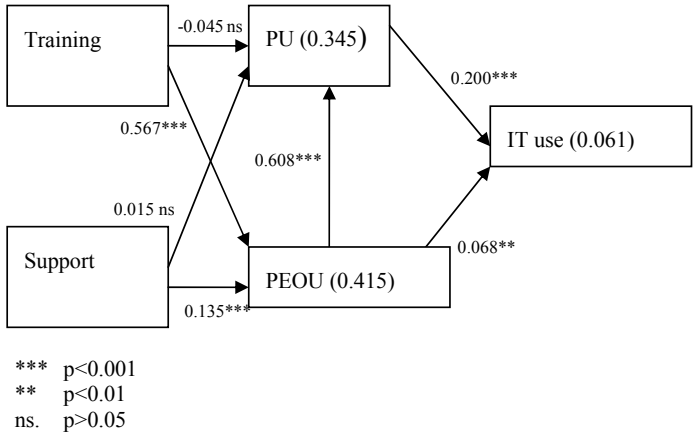

Figure 8 Standardized regression weights of the model.

Training had a weak negative impact on PU, which was not statistically significant, whereas the impact of training on PEOU was relatively strong. Support did not have a statistically significant effect on PU but did have a weak effect on PEOU. PEOU had a relatively strong impact on PU and a very weak impact on IT use. PU had a moderate effect on IT use. Training, support and PEOU together explained about 35% of the total variance in PU, whereas training and support explained about 42% of the variance of PEOU. PU and PEOU together explained only 6 % of the variance of the amount of IT use. A summary of the hypothesis testing and some additional remarks are presented in Table 32.

Table 32 Summarized results of hypothesis testing.

Hypothesis	*Result*	*Remarks*
H 1: The relationship between **Support** and **PEOU** will be positive, such that when the respondents perceive having more IT support, the perceived PEOU is higher.	Supported	This relationship was weak.
H 2: The relationship between **Support** and **PU** will be positive, such that when the respondents perceive having more IT support, the perceived PU is higher.	Not supported	This relationship was not statistically significant
H 3: The relationship between **Training** and **PEOU** will be positive, such that when the respondents perceive having more IT training, the perceived PEOU is higher.	Supported	This relationship was relatively strong
H 4: The relationship between **Training** and **PU** will be positive, such that when the respondents perceive having more IT training, the perceived PU is higher.	Not supported	This relationship was negative and not statistically significant
H 5: The relationship between **PEOU** and **PU** will be positive, such that when the respondents perceive higher PEOU, the perceived PU is higher.	Supported	This relationship was strong
H 6: The relationship between **PEOU** and **Use** will be positive, such that when the respondents perceive higher PEOU, the amount of use is higher.	Supported	This relationship was weak
H 7: The relationship between **PU** and **Use** will be positive, such that when the respondents perceive higher PU, the amount of use is higher.	Supported	This relationship was very weak

Based on the results, hypothesis 2 and 4 are rejected and the other hypotheses are supported. The results suggest that PU is not affected by the previous IT training and support but is solely dependent on the PEOU. Conversely, training and support have an impact on PEOU. IT use is statistically dependent on PU and PEOU, but these relationships are not strong; the impact of PEOU in particular is, although being statistically significant, very weak. These findings are further discussed in Chapter 8.

7.4 Moderating effect of occupation

In order to test the moderating effect of occupation on technology acceptance, three professional groups were selected for the analyses: physicians, nurses and office workers. Since the data consisted of respondents from over 90 different professional areas, the most commonly known professional groups with the most respondents were selected for further examination. A total of 349 nurses, 146 office workers and 110 physicians were used for the analyses.

Using the same research model as with the whole data, the goodness of fit measure was calculated with AMOS for all the subgroups. A summary of these figures is presented in Table 33.

Table 33 Goodness of fit measurements for different professionals.

Professional group	***Discrepancy***	***Degree of freedom***	***p-value***	***Discrepancy/df***	***GFI***	***NFI***	***RMR***	***RMESE***
Nurses	2.628	2	0.269	1.314	0.997	0.993	0.162	0.030
Physicians	1.699	2	0.428	0.849	0.994	0.987	0.339	0.000
Office workers	0.843	2	0.656	0.422	0.998	0.995	0.227	0.000

The results suggest that the model fitted the data within each of the subgroups. All the measures of fit exceeded the suggested threshold (see Table 30) except for the RMR. All the samples had RMR values over the recommended 0.08 (Tabachnick & Fidell 2001). There did not seem to be significant differences in the model fit. To further examine the possible differences in technology acceptance across professional subgroups, regression weights were calculated for each of the relation of the research model. The regression weights and their significance rates for the sample of nurses (n= 349) is presented in Table 34.

Table 34 Regression weights: nurses.

	Estimate	***S.E.***	***C.R.***	***P***
Training-PEOU	0.946	0.115	8.236	***
Support-PEOU	0.698	0.132	5.292	***
Training-PU	-0.139	0.150	-0.927	0.354
Support-PU	-0.158	0.163	-0.968	0.333
PEOU-PU	0.634	0.064	9.929	***
PEOU-IT use	-0.166	0.206	-0.803	0.422
PU-IT use	-0.509	0.182	-2.792	0.005

*** $p<0.001$

The relationships between Training-PEOU, Support-PEOU, PEOU-PU and PU-IT use were found to be statistically significant ($p<0.05$) while the relationships between Training-PU, Support-PU and PEOU-IT use were not. The PEOU-PU relationship was the strongest, followed by the relatively

strong Training-PEOU relationship. The relationships between Support and PEOU, and PU and IT use were weak. For the sample of nurses, training and support explained 33.5% of the total variance of PEOU. Training, support and PEOU explained 26.4% of the total variance of PU, and PEOU and PU explained 4% of the variance of IT use.

For the sample of physicians (n=110), the Training-PEOU and PU-PEOU relationships were found to be statistically significant, while the Support-PEOU, Training-PU, Support-PU, PEOU-IT use and PU-IT use relationships were not statistically significant. The regression weights and their p-values are presented in Table 35.

Table 35 Regression weights: physicians.

	Estimate	***S.E.***	***C.R.***	***P***
Training-PEOU	1.201	0.228	5.264	***
Support-PEOU	0.147	0.256	0.574	0.566
Training-PU	0.306	0.271	1.125	0.260
Support-PU	0.018	0.272	0.064	0.949
PEOU-PU	0.649	0.102	6.383	***
PEOU-IT use	-0.068	0.600	-0.113	0.910
PU-IT use	-0.224	0.520	-0.432	0.666

*** $p<0.001$

The relationships between Training and PEOU, and PU and PEOU were both relatively strong in the sample of physicians, while the other relationships were weak. Training and support together explained 29.1% of the total variance of PEOU. Training, support and PEOU explained 39.9% of the variance of PU. PEOU and PU explained 0.4% of the variance of IT use.

As in the sample of physicians, the Training-PEOU and PEOU-PU relationships were found to be the only statistically significant relationships for the sample of office workers (n=146). The regression weights for the office workers sample are presented in Table 36.

Table 36 Regression weights: office workers.

	Estimate	***S.E.***	***C.R.***	***P***
Training-PEOU	1.180	0.138	8.524	***
Support-PEOU	0.158	0.161	0.985	0.325
Training-PU	-0.035	0.140	-0.251	0.802
Support-PU	0.216	0.133	1.623	0.105
PEOU-PU	0.501	0.069	7.310	***
PEOU-IT use	-0.527	0.445	-1.183	0.237
PU-IT use	-0.945	0.535	-1.765	0.078

*** p<0.001

The Training-PEOU and PEOU-PU relationships were strong, while the other relationships in the model were found to be weak. For the office workers, training and support explained 38.9% of the total variance of PEOU. Training, support and PEOU explained 39.8% of the total variance of PU. PU and PEOU explained 7.4% of the total variance of IT use.

The standardized regression weights for the technology acceptance model for each of the professional group samples are collected in Figure 9 (N=Nurses, P=Physicians, O=Office workers).

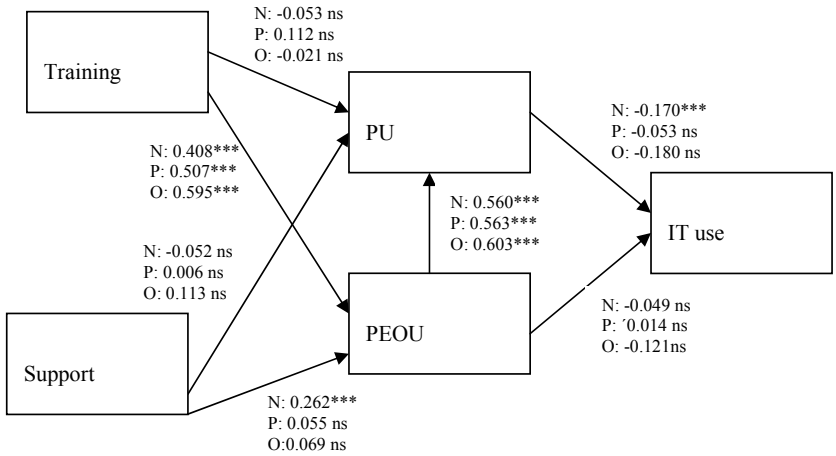

Figure 9 Regression weights for different professional groups.

Similarities across the professional groups can be traced to the Training-PEOU and PEOU-PU relationships. These two relationships were statistically significant in each of the samples and, moreover, relatively strong. Relationships that were not statistically significant in any of the samples were Training-PU and PEOU-IT use. These relationships scored very low

regression weights and were not statistically significant. The sample of nurses differed from the samples of office workers and physicians in the Support-PEOU and PU-IT use relationships. These relationships were not statistically significant for the office workers and physicians, but they were for the nurses. Moreover, there were differences in the total variance in dependent variables. The squared multiple correlations for each professional group are summarized in Table 37.

Table 37 Squared multiple correlations for different professional groups.

	PEOU	***PU***	***IT use***
Nurses	0.335	0.264	0.040
Office workers	0.389	0.398	0.074
Physicians	0.291	0.399	0.004

The antecedents of PEOU (training and support) explained most of the total variance in the sample of office workers, while the figure was the lowest in the sample of physicians. For the office workers and physicians, the antecedents of PU (training, support, PEOU) explained the same amount of the total variance, but with the nurses the total variance was over 10% lower. For the physicians, the antecedents of IT use (PU and PEOU) only had an extremely marginal impact on the total variance, while for the office workers the total variance was about 7% and for the nurses 4%.

To test the path coefficient, the differences between the different professional groups were calculated with multi-group analysis through the Chi-square test. In this test, one path coefficient between two constructs of a model is constrained to have the value of one in the corresponding construct for the other model. This constrained model's Chi-square is then compared to the other model's Chi-square, where the correlation between the two constructs was estimated freely. When the degree of freedom between the two models is 1, a difference between the Chi-squares that is greater than 3.84 suggests that the two constructs are significant at the 0.05 level. This is considered to be evidence for the moderating effect of occupation. Since there were three professional groups, this test was conducted in pairs. The results of this comparison are presented in Table 38.

Table 38 Chi-square test for occupation's moderating effect.

Nurses vs. Physicians		
Relationship	***Chi-square change***	***Significance***
Training-PU	6.387	<0.05
Training-PEOU	0.778	ns
Support-PU	12.366	<0.05
Support-PEOU	10.640	<0.05
PEOU-PU	11.325	<0.05
PU-IT use	3.133	ns.
PEOU-IT use	5.435	<0.05
Physicians vs. Office workers		
Relationship	***Chi-square change***	***Significance***
Training-PU	6.365	<0.05
Training-PEOU	0.776	<0.05
Support-PU	10.603	<0.05
Support-PEOU	12.323	<0.05
PEOU-PU	11.286	<0.05
PU-IT use	5.416	<0.05
PEOU-IT use	3.123	ns.
Office workers vs. Nurses		
Relationship	***Chi-square change***	***Significance***
Training-PU	53.555	<0.05
Training-PEOU	0.217	ns.
Support-PU	5.182	<0.05
Support-PEOU	46.924	<0.05
PEOU-PU	31.454	<0.05
PU-IT use	62.501	<0.05
PEOU-IT use	30.557	<0.05

The results show that the occupation was found to moderate several relationships in the research model. The Training-PU relationship was found to differ across professional groups. Similarly, the Support-PU, Support-PEOU and PEOU-PU relationships were found to differ between each professional group. In contrast, the Training-PEOU relationship was found to differ between nurses and physicians as well as between nurses and office workers, while the results suggest that this relationship does not differ between office workers and physicians. The PU-IT use differs between physicians and office workers and between office workers and nurses but does not differ between nurses and physicians. Finally, the relation PEOU-IT use relationship was found to differ between physicians and nurses as well as between office workers and nurses, but not between physicians and office workers.

7.5 Moderating effect of culture

The adjusted model that only includes the significant relationships was used to test the moderating effect of cultural variables. In practice this means that the relationships between training and support with PU were excluded since these relationships did not show a statistical significance and the regression weights were very weak (see Figure 8). In order to avoid misinterpreting the results, the correlations between the assumed moderating variables were calculated. If some of the variables have strong correlations, they are likely to affect the regression analyses. The correlations between the cultural variables are presented in Table 39.

Table 39 Correlations of the cultural variables.

	Hierarchical level	Education	Age	Gender	Adaptability	Autonomy	Equality	Functionality
Education	0.264***							
Age	0.155***	-0.088***						
Gender	0.163***	0.191***	ns.					
Adapta-bility	0.157***	0.111***	ns.	ns.				
Autonomy	0.269***	0.157***	ns.	0.146***	0.411***			
Equality	0.140***	0.095***	ns.	0.069**	0.419***	0.331***		
Functionality	-0.055*	ns.	ns.	-ns.	-0.529***	-0.302***	-0.499***	
Mission	-0.223***	-0.129***	-0.047*	-0.047*	-0.366***	-0.330***	-0.302***	0.341***

The correlations between demographic variables were weak, not exceeding 0.3. However, the organizational culture variables were more strongly correlated. These variables were correlated with each other in a range of 0.3 to over 0.5, suggesting that some considerations have to be given when looking at the regression analysis results.

In order to test the moderating effect of cultural variables, a stepwise regression analysis was used. The dependent and independent variables were analyzed together with all the cultural variables. The significance level for the R^2 change was set at 0.05.

7.5.1 Moderating effects between Training and PEOU

The relationship between Training and PEOU was moderated by age and hierarchical level. The results of the stepwise regression analysis are shown in Table 40. A separate row is provided for each step in building the regression model. This means that each step is labeled as *model* and that many models are presented as many variables added changes to the R square at a statistically significant level ($p<0.05$). The added variable presented in the first column indicates that this particular variable was added to the previous model and the R^2 change is the change caused by adding the particular variable to the existing variables.

Table 40 Regression analysis of Training-PEOU.

Model	***R***	***R Square***	***Adjusted R Square***	***R Square Change***	***Sig. F Change***
Training	0.625	0.391	0.390	0.391	0.000
Training, Age	0.642	0.421	0.411	0.021	0.000
Training, Age, Hierarchical level	0.647	0.419	0.418	0.007	0.000

The adjusted R^2 change was from 0.390 to 0.418 and age was found to be a more powerful moderator than hierarchical level. In order to find the directions of the moderators, the coefficients are listed in Table 41.

Table 41 Coefficients of the Training-PEOU.

Dependent Variable: PEOU	Non-standardized Coefficients		Standardized Coefficients	t	Sig.	VIF
Variable	B	Std. Error	Beta			
(Constant)	1.444	0.280		5.157	0.000	
Training	1.393	0.048	0.592	29.325	0.000	1.041
Age	0.048	0.006	0.163	7.942	0.000	1.067
Hierarchical level	-0.575	0.134	-0.086	-4.292	0.000	1.031

Age had a positive coefficient with PEOU, suggesting that older employees are statistically less likely to have a stronger impact on training to PEOU than the younger employees. Hierarchical level had a negative coefficient with PEOU. This implies that the employees with supervision tasks are more likely to have a stronger relationship with Training to PEOU than the employees with no supervision tasks. The VIF value, indicating collinearity, was below the suggested value of 2 (Tabachnick & Fidell 2001); therefore, no problems concerning collinearity are anticipated.

7.5.2 Moderating effects between Support and PEOU

The relationship between Support and PEOU was moderated by age, hierarchical level and education. The results from a stepwise regression analysis are presented in Table 42.

Table 42 Regression analysis of Support and PEOU.

Model	***R***	***R Square***	***Adjusted R Square***	***R Square Change***	***Sig. F Change***
Support	0.412	0.170	0.169	0.170	0.000
Support, Age	0.476	0.225	0.225	0.056	0.000
Support, Age, Hierarchical level	0.487	0.236	0.236	0.011	0.000
Support, Age, Hierarchical level, Education	0.493	0.241	0.241	0.006	0.001

The adjusted R^2 change was from 0.169 to 0.241 and age was found to be the strongest moderator followed by the hierarchical level and educational level. In order to find the directions of the moderators, the coefficients are listed in Table 43.

Table 43 Coefficients of Support-PEOU.

Dependent Variable: PEOU	Non-standardized Coefficients		Standardized Coefficients	t	Sig.	VIF
Variable	B	Std. Error	Beta			
(Constant)	2.989	0.431		6.932	0.000	
Support	1.029	0.059	0.393	17.328	0.000	1.006
Age	0.073	0.007	0.246	10.644	0.000	1.047
Hierarchical level	-0.561	0.160	-0.084	-3.507	0.000	1.129
Education	-0.201	0.061	-0.78	-3.279	0.001	1.104

Age had a positive coefficient with PEOU, suggesting that older employees are statistically less likely to have a stronger impact on Support to PEOU than the younger employees. Hierarchical level had a negative coefficient with PEOU. This suggests that the employees with supervision tasks are more likely to have a stronger relationship with Support to PEOU than the employees with no supervision tasks. Similarly, the negative coefficient between education and PEOU implies that less educated employees are statistically less likely to have a stronger relationship with Support to PEOU than the more educated employees.

7.5.3 Moderating effects between PEOU and PU

For the relationship between PEOU and PU hierarchical level, age, education and autonomy were found to have a statistically significant moderating effect. The results are shown in Table 44.

Table 44 Regression analysis of PEOU-PU.

Model	***R***	***R Square***	***Adjusted R Square***	***R Square Change***	***Sig. F Change***
PEOU	0.586	0.343	0.343	0.343	0.000
PEOU, Hierarchical level	0.597	0.356	0.355	0.013	0.000
PEOU, Hierarchical level, Age	0.599	0.359	0.358	0.003	0.006
PEOU, Hierarchical level, Age, Education	0.602	0.363	0.361	0.004	0.004
PEOU, Hierarchical level, Age, Education, Autonomy	0.604	0.365	0.363	0.003	0.015

The total R^2 change was from 0.343 to 0.363. Hierarchical level was found to be the strongest moderator for this relationship. Age, education and autonomy had practically the same effect on R^2 change. The coefficients for these moderators are listed in Table 45.

Table 45 Coefficients of PEOU-PU.

Dependent Variable: PU	Non-standardized Coefficients		Standardized Coefficients	t	Sig.	VIF
Variable	B	Std. Error	Beta			
(Constant)	4.745	0.540		8.787	0.000	
PEOU	0.686	0.026	0.584	26.822	0.000	1.107
Hierarchical level	-0.554	0.178	-0.071	-3.110	0.000	1.201
Age	-0.023	0.008	-0.067	-3.035	0.002	1.123
Education	-0.181	0.066	-0.060	-2.736	0.006	1.120
Autonomy	-0.045	0.019	-0.053	-2.427	0.015	1.094

Hierarchical level had a negative correlation with PU, implying that the employees with supervisor tasks are statistically more likely to have a stronger relationship with PEOU and PU than the employees with no supervision tasks. Age was found to have a positive coefficient, suggesting that older employees

are statistically less likely to have a stronger relationship with PEOU and PU than the younger employees. Similarly, educational level affects this relationship in such a way that the less educated employees are statistically less likely to have a stronger relationship with PEOU to PU than more educated employees. The organization's autonomy had a negative moderating impact, implying that where the autonomy given by the organization is higher, the impact of PEOU on PU is stronger.

7.5.4 Moderating effects between PEOU and IT use

The relationship between PEOU and IT use was solely moderated by age. The results from a stepwise regression analysis are presented in Table 46.

Table 46 Regression analysis of PEOU-IT use.

Model	***R***	***R Square***	***Adjusted R Square***	***R Square Change***	***Sig. F Change***
PEOU	0.180	0.032	0.032	0.032	0.000
PEOU, Age	0.195	0.038	0.032	0.006	0.003

Age increased the adjusted R^2 from 0.032 to 0.038. The coefficients are listed in Table 47.

Table 47 Coefficients of PEOU-IT use.

Dependent Variable: IT use	Non-standardized Coefficients		Standardized Coefficients	t	Sig.	VIF
Variable	B	Std. Error	Beta			
(Constant)	1.890	1.068		1.770	0.077	
PEOU	-0.600	0.079	-0.200	-7.583	0.000	1.072
Age	0.069	0.023	0.078	2.970	0.003	1.072

Age had a positive coefficient with IT use, suggesting that older employees are statistically more likely to have a stronger impact on PEOU-IT use than the younger employees.

7.5.5 Moderating effects between PU and IT use

No moderating effects were found for the relationship between PU and IT use. The results of the regression analysis and coefficients are presented in Table 48 and Table 49 respectively.

Table 48 Regression analysis of PU-IT use.

Model	***R***	***R Square***	***Adjusted R Square***	***R Square Change***	***Sig. F Change***
PU	0.222	0.049	0.049	0.049	0.000

Table 49 Coefficients of PU-IT use.

Dependent Variable: IT use	Non-standardized Coefficients		Standardized Coefficients	t	Sig.	VIF
Variable	B	Std. Error	Beta			
(Constant)	4.492	0.530		8.478	0.000	
PU	-0.568	0.065	-0.222	-8.781	0.000	1.000

7.6 Summary of the moderating effect of culture

To sum up the results on the moderating effect of culture on technology acceptance, Table 50 presents the cultural variables that were found to be statistically significant moderators (the significant relationships are marked with x).

Table 50 Summary of the moderators of technology acceptance.

Moderating variables	***Training-PEOU***	***Support-PEOU***	***PEOU-PU***	***PEOU-IT use***	***PU-IT use***
Hierarchical level	x	x	x		
Adaptability					
Autonomy			x		
Equality					
Functionality					
Mission					
Education		x	x		
Gender					
Age	x	x	x	x	

Hierarchical level was found to moderate three relationships: Training-PEOU, Support-PEOU and PEOU- PU. The organization's adaptability was not found to have an effect on any of the relationships. Autonomy, however, was found to have a moderating effect on the relationship between PEOU and PU. The organization's equality, functionality or mission did not have a moderating effect. Educational level was found to have an effect on Support-PEOU and PEOU-PU. Age was found to be the most common moderator, moderating all the other relationships except PU-IT use. Gender was not found to have a moderating effect.

Since none of the cultural variables had an effect on all of the relationships, none of the hypotheses was accepted as such but several were partially supported. A summary of the hypothesis testing results is provided in Table 51.

Table 51 Summary of the moderating effect of culture.

Hypotheses	
H8 Occupation is a part of culture that moderates the technology acceptance relationships.	Supported
H9 Hierarchical level is a part of culture that moderates the technology acceptance relationships.	Partly supported
H10 The organization's adaptability is a part of culture that moderates the technology acceptance relationships.	Not supported
H11 Autonomy is a part of culture that moderates the technology acceptance relationships.	Partly supported
H12 Equality in organizations is a part of culture that moderates the technology acceptance relationships.	Not supported
H13 The organization's functionality is a part of culture that moderates the technology acceptance relationships.	Not supported
H14 The organization's clear mission is a part of culture that moderates the technology acceptance relationships.	Partly supported
H15 Education level is a part of culture that moderates the technology acceptance relationships.	Partly supported
H16 Gender is a part of culture that moderates the technology acceptance relationships.	Not supported
H17 Age is a part of culture that moderates the technology acceptance relationships.	Partly supported

In general, the professional and individual level cultural variables seem to have more impact on the technology acceptance process than the organizational level variables. These findings are further discussed in Chapter 8.

8 DISCUSSION OF THE RESULTS

The results of the statistical analyses are further discussed in this chapter. First, the results of testing the technology acceptance model are discussed, both with the individual relationships and their regression weights, and the goodness of fit measures of the whole model in general. Then the moderating effects of culture are discussed, concentrating on one relationship at a time. The purpose of this chapter is to further discuss the results obtained, and the possible explanations, limitations and comparisons with previous results.

8.1 Technology acceptance model in social and healthcare sector

The technology acceptance model (TAM) was found to fit very well with the data. All the goodness of fit measurements implied an extremely good fit. However, some of the relationships in the model were not as expected. For instance, instead of the hypothesized positive effect, training had a weak negative impact on PU. This relationship was, however, found to be very weak and not statistically significant. This was also the case with the relationship between support and PU. Unlike previous studies (Agarwal & Prasad 1999; Igbaria et al. 1997; Venkatesh 1999; Venkatesh & Davis 1996), here training only impacted on PU through its impact on PEOU. Similarly, again differing from previous studies (Igbaria et al. 1997), support did not have an impact on PU. Therefore, the usefulness of an information system in the social and healthcare sector seems to be affected by variables other than support and training.

The impact of training on PEOU was found to be relatively strong. This is a logical result considering that training was reported as a subjective measure about the extent to which the respondents considered having had enough training. Obviously, this does not give the degree of actual training provided but more how the respondents perceived the amount of training. In other words, it would be logical that employees who consider IT to be easy to use would also consider having had enough training for the IT use. Therefore, it can be said to be a little surprising that this relationship was not found to be stronger. Support had a similar effect on PEOU, but this effect was much weaker than the impact of training. These results were consistent with the

results from previous studies (Igbaria et al. 1997; Venkatesh 1999; Venkatesh & Davis 1996).

As expected, and found in most of the TAM studies (see Lee et al. 2003), PEOU had a strong impact on PU. This indicates that the easier the employees perceive IT to be, the more useful they perceive it to be. PU had a stronger impact on IT use than PEOU. This result has also been found in previous studies in the healthcare sector (Chau & Hu 2001; 2002a), except in the case of mobile computing, where PEOU was found to be a stronger nominator (Wu et al. 2006).

In previous studies in the healthcare sector TAM has explained the variance of intention to use from 40 to 44% (Chau & Hu 2001; 2002; Hu et al. 1999). These figures did not actualize in this study. TAM did explain the amount of use within this sample, but only for 6%. This can be due to the study design differences and different measurements. For instance, it should be noticed that IT acceptance studies in healthcare have mainly focused on behavioral intention to use, not on actual use (e.g. Chau & Hu 2001; 2002a; 2002b; Gagnon et al. 2005; Hu et al. 1999; Wu et al. 2006; Yi et al. 2006). Moreover, the amount of use may not be an appropriate measurement when evaluating the acceptance of IT in the healthcare sector. It has also been stated that TAM has not been tested in a heterogeneous environment with several different groups of subjects and different IT (Lee et al. 2003). The results of this study suggest that perhaps TAM is not suitable for such research environments but is more appropriate for explaining intention to use in homogenous samples. When the diversity of people and IT increases, the number of other intervening variables increases as well, and this might have led to the model not fitting the data. For instance, social factors have been found to influence technology acceptance (Cheung, Chang & Lai 2000), but these factors were not included in the research model. In the social and healthcare sector, which has been characterized as institutionalized in terms of professional roles and dual administrative hierarchy (Chiasson & Davidson 2004), the environment can be even more impacted by social and hierarchical factors.

Another potential explanation for the low rate of IT use could be the failure in setting the measurement for actual IT use. It might have been too difficult for the respondents to estimate the time spent working with IT. This might have led to vague estimates that did not show the existing relationships. The measurement of voluntariness of use, as suggested by Venkatesh et al. (2003), could have better explained the actual use.

8.2 Role of professional culture in technology acceptance process

Some differences were found across professional groups. In the samples of physicians and office workers the relationships between Training and PEOU, and PEOU and PU were found to be statistically significant, while the other relationships were not. For the nurses, the statistically significant relations were Training-PEOU, Support-PEOU, PEOU-PU and PU-IT, while the relationships between Training-PU, Support-PU and PEOU-IT use were not. However, this could be due to the differences in sample sizes.

The biggest difference in the regression weights was found in the relationship between Support and PEOU. The impact of support was much stronger in the sample of nurses than in the samples of physicians and office workers. It seems that the nurses could benefit more from the IT support than the other professional groups. Conversely, nurses did not have as strong relationship between Training and PEOU as did the other samples.

When comparing the squared multiple correlations across different professionals, the antecedents (training, support) explained most of the variance of PEOU in the sample of office workers, followed by the sample of nurses. The variance was the lowest among the physicians. This suggests that for the office workers these organizational actions would be the most beneficial when aiming at an increased amount of PEOU. The antecedents of PU (training, support, PEOU) explained most of the variance of PU among the physicians and office workers. This figure was not as high among the nurses.

Actual IT use was not widely explained in any of the professional groups. For the office workers, the total variance in IT use was explained by the antecedents for 7%, while for nurses it was 4% and for physicians 0.4%. Following the discussion above about the total fit of the TAM, the professional group comparisons also suggest that IT use is not well explained by the TAM variables; among the physicians in particular, the impact of the antecedents on the actual IT use was practically non-existent, strongly suggesting that factors other those of TAM affect the amount of IT use. Therefore, the results of this study did not repeat the results from previous studies where TAM had an explanation rate of 40% among physicians (Chau & Hu 2001; Hu et al. 1999) and 53% among nurses and hospital administrators (Jayasuriya 1998).

8.3 Role of culture in technology acceptance process

The most dominant cultural variables affecting the technology acceptance model were the hierarchical level and age of the respondents. Age was found

to be a moderator between all the other relationships except for PU-IT use. For the relationship between Training and PEOU, age was the strongest moderating variable and the direction of the relationship was positive, suggesting that the older the employees are the less important antecedent training would be for the PEOU. This implies that younger employees could benefit more from IT training than the older age groups. Similarly, age was the strongest moderating variable between Support and PEOU, suggesting that the younger employees could benefit more from IT support. Age also affected the relationship between PEOU and PU, implying that younger employees would have a stronger impact on PEOU-PU. Age was the only moderating variable for the relationship between PEOU and IT use. Based on the results, the older employees are assumed to have stronger relationships between PEOU and IT use than the younger employees. In short, age seems to moderate the process of forming the opinions about PEOU and PU in such a way that younger employees are more affected by training, support and PEOU than older employees. However, the actual IT use seems to be more affected by PEOU among older employees than younger. These results are consistent with previous studies; older workers have been reported to weigh the importance of ease of use higher than younger workers in their technology acceptance decision (Burton-Jones & Hubona 2005).

Hierarchical level was found to moderate the relationships between Training-PEOU, Support-PEOU and PEOU-PU. The results suggested that all of these relationships were stronger for employees with supervision tasks. As suggested by social identity theory, having supervision tasks could differentiate employees from each other. Employees with supervision tasks could have a more positive view of organizational actions such as training and support, and, therefore, the impact of these variables on technology acceptance could also be stronger than among employees that do not have supervision tasks or position.

Education level was found to moderate the relationships between Support-PEOU and PEOU-PU. The results implied that the more educated employees had stronger relationships between Support and PEOU as well as PEOU and PU than the less educated employees. These results were consistent with previous results that had found level of education to impact on PEOU but not directly on PU or intention to use (Agarwal & Prasad 1999). It is however, a little surprising that the educational level did not have an effect on the relationship between Training and PEOU.

The final variable that did have a moderating effect on technology acceptance was the organization's autonomy. This was the only organizational variable that was found to have a statistically significant moderating effect on technology acceptance. According to the results, PEOU had a stronger effect

on PU in the organizations that give their employees greater autonomy. This implies that the organizational culture could also have an important role in facilitating IT acceptance.

To sum up the results from the cultural variables, the moderating effects were low in general and only affected the dependent variable to a modest extent. However, the results suggest that for technology acceptance, the cultural levels that could be the most important were the professional culture and group level culture. Moreover, unlike several previous studies, gender was not found to affect the process of technology acceptance.

9 CONCLUSIONS

The implications arising from the results are presented in the discussion that follows. First, the implications for IS culture research are discussed, followed by the implications for technology acceptance research and, more specifically, for health-IT research. Finally, the lessons learned are summarized and the limitations of this study are evaluated and the generalization of the results is discussed. Moreover, suggestions are made for future research. The purpose of this chapter is to summarize what was achieved in this study and who could benefit from the results. In addition, the purpose is to evaluate the research and to discuss how the limitations of this study could be avoided in future studies.

9.1 Implications for IS culture research

This study empirically operationalized and measured the layered construct of culture suggested by several authors (McCoy et al. 2005; Myers & Tan 2002; Straub et al. 2002). In this study the construct of culture followed the suggestions, was based on theory (Straub et al. 2002), was holistic in the sense of combining different levels of culture (Gallivan & Srite 2005) and considered the dynamic view of culture (Myers & Tan 2002). Firstly, the theory-based culture used in this study (based on SIT) was found to be a well operationalized and holistic approach to measuring culture. By using SIT as a background theory it is possible to include suitable levels of culture to be tested. As this study was conducted solely in a Finnish context, the national layer was excluded. However, it can easily be adopted in the construct.

The empirical results provided evidence that the professional level variables have an impact on technology acceptance while the organizational level impact was almost non-existent. Group level variables also had an impact. However, gender did not seem to be a part of an individual's culture when forming the IT acceptance decisions, unlike previously suggested (Gefen & Straub 1997).

The conceptualizing of culture is dependent on the research question at hand. It should not be used as an easy way to conclude differences between different groups. Even though a solid measurement for something as abstract as culture is not possible, or even necessary, more rigor should be used when using this construct. The conceptualizing of the culture should, moreover,

depend on the level at which the analyses are made. Especially when using quantitative measures or trying to find relationships between culture and some other factor, the conceptualizing of culture should also follow the line. In other words, if the dependent variable is on an individual level (i.e. individual acceptance of IT), the measurement of culture should also be made on that level (i.e. individually perceived culture).

9.2 Implications for technology acceptance research

Although the technology acceptance model was found to fit the data obtained from the heterogeneous social and healthcare sector, the model was not able to explain the actual amount of use to any great extent. As many other TAM studies have reported an explanation rate of 40% (Lee et al. 2003), the rate in this study was modest at 6%, strongly suggesting that PU and PEOU are not the dominant antecedents of IT use in all sectors. As TAM has been criticized for only being tested in very homogenous environments (Lee et al. 2003), this study provided evidence that TAM might not be a suitable model for testing technology acceptance in heterogeneous environments.

There are many limitations to this study, which have already been discussed in Chapter 8.1 and will be further discussed in Chapter 9.5, but the problems in the measurement of IT use should be especially noted. The self-reported measurement of actual IT use might be too biased to get accurate results for the analysis. Different data collection methods should be used in order to increase the validity of this measurement.

9.3 Implications for health IT research

This study provided interesting insights into the acceptance of IT in the social and healthcare sector. Opposite to many other sectors, IT use was not explained to such a large extent in the social and healthcare sector. As what affects an individual professional's acceptance of IT has been unclear, especially among healthcare professionals (Chau & Hu 2001; 2002a; 2002b; Gagnon et al. 2003; Gagnon et al. 2005; Yi et al. 2006), this study provided evidence that perceived usefulness is the most important antecedent explaining actual use of IT. However, the actual IT use was only explained for about 6% of the whole sector. This suggests that there are many other factors in the healthcare sector that affect the actual use, and traditional TAM is not the most suitable model when trying to explain the variance in IT usage. Sufficient

training seems to be an important factor in explaining perceived ease of use and, through that, the perceived usefulness.

Secondly, as the technology acceptance research has not been conducted in a wider range of social and healthcare professionals but has mostly been limited to physicians' acceptance of telemedicine (Menon et al. 2000; Yi et al. 2006), this study provided evidence from a very heterogeneous environment consisting of several different professional groups and IT in use. However, comparing different professional groups did not seem to have such an important effect on IT acceptance behavior as expected. Between the different professional groups tested in the analyses, TAM explained from 0.04% to 7% of the total variance in actual IT use. In short, the results showed that the amount of the use in the healthcare sector is dependent on several different aspects, and PU and PEOU only represent a small proportion of that.

9.4 Implications for practice

IT managers in the social and healthcare sector could use the results of this thesis when planning to implement new IT or when aiming at increasing the use of existing IT. As is general in the sector, the perceived usefulness of IT is a quite important denominator of IT use, and it should, besides implementing IT that is useful, promote the usefulness to the employees. The benefits of a new information system often actualize in a later part of the information chain. The person who is filling in patient information may not need to use it him/herself, but this information might be very important and save time for someone else. Therefore, explaining the benefits of the system for the whole organization could increase the acceptance of IT.

As training and support are important denominators of perceived ease of use, and ease of use affects the perceived usefulness, these results can be used when organizing IT services for the employees of the social and healthcare sector. The results of this study suggest that it is not appropriate to apply the same strategy to promote acceptance of IT to all the sub-cultures within an organization. Providing training and support services could be targeted more specifically to certain professional groups. For instance, as the nurses seem to benefit most from IT support, this service could be targeted to them. In addition, it seems that younger employees are more receptive to training and support, and special training groups could be created for older employees that could take into consideration their special needs. It can be that older employees do not have even basic knowledge of information systems and the present training could be too difficult and fast. The same applies to support

services; it can be hard to ask for help if you don't even know what are you asking for help with.

Finally, this thesis suggests that culture can be harnessed to encourage the adoption of IT. According to the dynamic construct approach (see Chapter 4.4.), the organization and culture are understood as two interdependent constructs that can be managed in an integrated way. While a relatively steady cultural core exists, all organizational changes have certain cultural implications and will affect the long-term culture. Organizational changes mostly take place on the artefact level - for instance, changing the hierarchical structure, business processes, or communication guidelines - but they can have an indirect impact on the organizational culture. This means that it is possible to develop the organization culture to be more open towards information technology. Based on the results of this study, organizations that give more autonomy to their employees could accept IT more easily. Therefore, trying to change the organization to give more initiative to the employees could, for its part, encourage IT acceptance.

9.5 Limitations

The practical and research implications should be interpreted in light of the limitations of this study. The main limitation of this study is the heterogeneity of the sample, especially when it comes to the variety of IT used. As the kind of IT the respondents were using or for how long the respondents have been using it could not be specified, it should be noted that the results are more on the attitudinal level. Limiting the IT to electronic patient records or to mobile devices could have made it possible to get a more detailed picture of the usage. Asking the time of using IT would also have helped to specify the results. Since different phases of IT use have been found to be affected by different factors (Karahanna et al. 1999; Zhu & Kraemer 2005), it would have been useful to get this information from the respondents.

Another limitation of this study is that the measurements were subjective. Although the attitudinal measurements, such as perceived usefulness and ease of use, are, by nature, very subjective and should stay like that, measurements such as training, support and amount of IT use could have been measured more objectively. If the study sample had been smaller, the actual information from objective sources (such as documents) could have been collected in order to get a realistic picture of the actual stance of the training or support provided. Moreover, instead of a self-reported estimate, the amount of IT use could have been measured by observation.

A third limitation of this study is the exploratory nature of the culture testing. Since the moderating testing was conducted as an exploratory study and no directional hypotheses were tested, the moderating effects have to be estimated as preliminary results. Testing with stepwise regression analysis is not as comprehensive a testing method as structural equation model techniques; hence the results are preliminary and suggest the direction future studies should aim at.

9.6 Generalization

Statistical generalization means generalizing from a sample to a population and it relies on probability theory to estimate how likely the patterns in the sample are to reflect the patterns in the population (de Vaus 2002). As the sample in this study was made to be a probability sample, it is possible to generalize to the population, which, in this case, is the Finnish social and healthcare sector. However, as discussed in Chapter 7.1, the stratified sample and the exclusion of the missing values resulted in a demographic structure that was slightly different to the actual population. However, these differences were not large and it is quite safe to consider these results as being a generalization of the Finnish social and healthcare sector.

When considering generalizing the results of this study to other social and healthcare sectors in other countries, it should be noted that the Finnish system is mostly public and, moreover, unlike the American healthcare system for instance, publicly financed. The different organization and financing of the social and healthcare systems in different countries may limit the generalizing of the results. For instance, the logic of implementing new IT in a private healthcare unit may be much more guided by the savings and profit expectations that it may be in the public sector. Therefore, care should be exercised when utilizing these results outside the Finnish social and healthcare system. However, the tasks and professional roles are the same to a rather large extent, independent of the national borders. The demographic data provided in Chapter 7.1 can be used when comparing different healthcare sectors.

It is hard to generalize the results outside the social and healthcare sector. The healthcare sector is a complex mixture of profit and non-profit motives, and private government enterprises with national differences due to the regulatory and market structures (Chiasson & Davidson 2004). Therefore, the same suggestions as with generalizing to a different country are given: compare the structure of the sector and the demographics in order to evaluate whether the results could be transferable to other sectors as well.

To sum up, the results can be generalized to the Finnish social and healthcare sector. Care should be exercised and some comparisons between the Finnish and the system at hand should be made when using the results outside of Finland. Since the professional level and group level variables were particularly found to affect the technology acceptance, the sample should be quite the same with regard to age, education and gender distribution. When utilizing these results outside of the healthcare sector, the differences in sector structures should also be borne in mind. Because of the quite unique characteristics of the social and healthcare sector, generalization to other sectors can be problematic.

9.7 Future research

Future research could move towards more extensive testing of cultural layers. For instance, comparisons between different nations could be made. Similarly, the layered structure of culture could be tested across different sectors. This could provide more evidence of cultural layers that could impact the technology acceptance. Moreover, the organizational dimensions measured here should be re-evaluated and new dimensions should be tested since the dimensions tested within this study did not provide strong results.

The technology acceptance model did not show good explanation rates for actual IT use. Based on the results of this study, the question of whether the actual amount of IT use is a useful dependent variable for measuring IT acceptance should be reconsidered. Furthermore, some additional variables should be added to the model in order to better explain IT acceptance. These variables could be social norm, task-technology fit and computer enjoyment (Wu et al. 2007). In addition, the voluntariness of use would be an important variable to include in the model (see Venkatesh et al. 2003).

Different research methods could also be used. Combining interviews or observations of the cultural atmosphere in an organization could provide a more detailed and in-depth picture of the organizational culture in which the IT use is taking place. This material could then be combined to analyze the survey results.

Ultimately, as suggested by Leidner and Kayworth (2006), a value-based approach should be adopted in order to advance beyond the group level in cultural studies. This approach would allow going beyond the groups as the source of cultural differences. The mechanism here would be that different values cause different attitudes and behaviors. This values perspective would make it possible to look at the contradictions across national, organizational, and group level cultures (Leidner & Kayworth 2006).

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APPENDIX 1 QUESTIONNAIRE IN FINNISH[4]

1. Sukupuoli?
Mies..... 1
Nainen..... 2

2. Ikä? _____ vuotta

5. Ammatillinen koulutus?
Ei ammatillista koulutusta..... 1
Ammatillinen kurssi 2
Ammattikoulu/keskiasteen koulutasoinen tutkinto 3
Keskiasteen opistotasoinen tutkinto 4
Ammattikorkeakoulun tutkinto..... 5
Korkeakoulututkinto..... 6

6. Kuinka kauan olet toiminut sosiaali- ja terveysalalla? _____ vuotta _____ kuukautta

12. Toimitko esimiestehtävissä?
En..... 1
En toimi virallisena esimiehenä, mutta minulla on kuitenkin työnjohdollisia tehtäviä 2
Toimin virallisissa esimiestehtävissä 3

15. Kuinka paljon voit vaikuttaa seuraaviin asioihin työssäsi?

a) työn monipuolisuuteen ja vaihtelevuuteen	1	2	3	4	5
b) tekemäsi työn laatuun	1	2	3	4	5
c) työtehtävien jakoon työyhteisössä.....	1	2	3	4	5
d) työmäärääsi	1	2	3	4	5
e) työtahtiisi	1	2	3	4	5

27. Missä määrin kukin väite vastaa sinun käsitystäsi työyhteisöstä (esim. päiväkoti, sairaalan osasto, kotipalvelu), jossa työskentelet?

a) työyhteisömme toimii joustavasti.....	1	2	3	4	5
b) työyhteisömme toimii tehokkaasti	1	2	3	4	5
c) työyhteisömme jäsenten yhteistyö on hyvä.....	1	2	3	4	5
d) työyhteisömme työnjako on onnistunut	1	2	3	4	5

28. Kuinka usein seuraavat asiat pitävät paikkansa työyhteisössäsi?
Työyhteisössämme:Ei koskaan=1, Harvoin=2, Joskus=3, Melko usein=4, Erittäin usein=5

a) kannustetaan kokeilemaan uusia asioita	1	2	3	4	5
b) tehdään jatkuvasti parannuksia toimintaan.....	1	2	3	4	5

[4] Only the questions that were used in this thesis are presented here. For the whole questionnaire see Laine et al. 2006.

c) hankitaan palautetta ja parannusideoita muista
yksiköistä tai asiakkailta / potilailta..... 1 2 3 4 5

30. Kuinka hyvin seuraavat asiat pitävät paikkansa työyhteisössäsi?

a) eri ikäisten työntekijöiden välinen tasa-arvo toteutuu... 1 2 3 4 5
b) eri ammattikuntien välinen tasa-arvo toteutuu 1 2 3 4 5
c) vakinaisten ja ei-vakinaisten välinen tasa-arvo
toteutuu 1 2 3 4 5
d) sukupuolten välinen tasa-arvo toteutuu 1 2 3 4 5
e) eri kansallisuutta, kulttuuria, uskontoa tms.
edustavien työntekijöiden välinen tasa-arvo toteutuu .. 1 2 3 4 5

31. Miten hyvin olet selvillä:

a) koko työpaikkasi tai organisaatiosi tavoitteista? 1 2 3 4 5
b) oman työyksikkösi tavoitteista?..... 1 2 3 4 5
c) oman työsi tavoitteista?.....1 2 3 4 5

47. Kuinka monta tuntia keskimäärin käytät tietotekniikkaa työssäsi viikossa?

_____ tuntia viikossa

49. Miten seuraavat tietotekniikkaa koskevat väittämät soveltuvat kohdallesi?

a) Tietotekniikan käyttö nopeuttaa työtehtävieni
suorittamista..... 1 2 3 4 5
b) Tietotekniikan käyttö parantaa työsuoritukseni
laatua..... 1 2 3 4 5
c) Tietotekniikka helpottaa työtäni..... 1 2 3 4 5
d) Minulle on helppoa saada tietotekniikka toimimaan
kuten haluan..... 1 2 3 4 5
e) Tietotekniikan käyttö on mielestäni joustavaa..... 1 2 3 4 5
f) Tietotekniikan käyttö on minulle helppoa. 1 2 3 4 5
g) Olen saanut riittävästi koulutusta tietotekniikan
käyttöön..... 1 2 3 4 5
h) Saan tarvittaessa helposti apua tietotekniikan
käyttöön..... 1 2 3 4 5
i) Käytän mielelläni tietotekniikkaa työssäni. 1 2 3 4 5
j) Koen tietotekniikan käytön työssäni stressaavaksi. ... 1 2 3 4 5

APPENDIX 2 EMPIRICAL STUDIES: CULTURE-IT ACCEPTANCE AND USE

Citation	*The purpose of the study*	*Level of culture*	*Conceptualizing culture*	*Countries*	*Target system*	*The measurement of culture*	*Method*	*Main findings (empirical, culture related)*
(Al-Busaidi & Olfman 2005)	To investigate the determinants of a successful knowledge management system deployment	Organizational	Organization's shared values and operationalization of its process	Oman	Knowledge management system	Knowledge-culture Vision clarity	Survey	Vision clarity and knowledge-culture had a correlation with knowledge management system success (objective estimation of IT managers)
(Bagchi et al. 2004)	To explore the role of national culture on the adoption of information technologies	National	Hofstede's definition	31 different nations[5]	PC, telephone, cell phone, fax, Internet, fax	Not explicitly measured, based on Hofstede	Archival data analysis	After controlling for national economic and social differences, *power distance* was found to affect the adoption of PC and cell phone, *uncertainty* avoidance the adoption of pager and *masculinity* the adoption of cell phone and telephone.
(Choudrie & Lee 2004)	To explore and present the factors contributing to the	National	Not explicit	Korea	Broadband	n/a	Multi-method	Korean educational and technical culture affected the adoption of broadband.

	rapid broadband development							
(Cyr et al. 2005)	To examine cultural preferences for design elements of a local vs. a foreign website and subsequent perceptions of trust, satisfaction and e-loyalty	National	Several definitions of culture	Canada, U.S., Germany, Japan	e-business	Not explicitly measured, based on Hofstede	Survey	No statistically significant differences were found to indicate that local websites were more trusted than foreign sites. Americans were more loyal to a local website than to a foreign site.
(Dinev et al. 2006)	To examine cross-cultural differences related to e-commerce use	National	Not explicit	Italy, U.S.	e-commerce	Not explicitly measured, based on Hofstede	Survey	Relationships between institutional trust, privacy concerns, and perceived risk in e-commerce use were weaker for Italy than for the U.S.
(Elbeltagi et al. 2005)	To study the use of decision support systems	Organiza-tional	Not explicit	Egypt	Decision support system	Individualism, Masculinity, The cultural gap among decision makers and DSS staff, Uncertainty avoidance	Survey	Cultural characteristics had a positive significant influence on system usage
(Gefen et al. 2005)	To investigate the role of trust in IT adoption	National	Not explicit	U.S., The Republic of South	e-voting	Gender, education, race	Survey	Socio-cultural similarity had a greater effect on trust in the RSA, while trust had a greater effect on PU in the USA.

				Africa				
(Harrington & Guimaraes 2005)	To examine the type of corporate culture that influences absorptive capacity and, through that, the IT implementation success	Organizational	Culture reflects the values and norms held by the organization	n/a	Expert system	Developmental, group, rational, hierarchical cultures	Survey	Strong developmental and rational cultures and weaker hierarchical culture significantly related to absorptive capacity.
(Huang et al. 2003)	To explore the adoption of development method and the impact of sub-cultures	Organizational	That which is shared and dependent on different organizational groups	n/a	Component-based development	Not measured	Interpretative case study	Differences were found in adoption between different organizational subgroups in different phases of implementation
(Hwang 2005)	To investigate how informal controls affect ERP adoption	Organizational	Not explicit	n/a	Enterprise Resource Planning (ERP)	Uncertainty Avoidance	Survey	Uncertainty avoidance has an effect on Perceived ease of use of an ERP
(Kim et al. 2005)	To conduct an exploratory analysis of the processes in web-based shopping systems use in different national contexts	National	Not explicit	UK, Korea	Web-based shopping systems (WBSS)	Not measured	Survey	Cultural characteristics and contexts seem to play a significant role in WBSS use, e.g. product delivery and payment method
(Lai & Wong 2003)	To evaluate the moderating effects of local culture on	National	Not explicit	Canada, Japan, U.K.,	Global information system	Not explicitly measured, based on	Survey	The relationship between IS strategy and IS success was moderated by local culture

	global information systems			U.S.		Hofstede		
(Lim 2004)	To explore how power distance moderates the relationship between the availability of explanation facility and utilizing software agents	National	Hofstede's definition	Singapore, Mauritius	Software agents	Power distance, measured explicitly	Laboratory experiment	People from high power-distance cultures were more influenced by the explanation incorporated into the system and obtained higher performance
(Liu et al. 2004)	To compare perceptions concerning online privacy and how it relates to the level of trust with a company's website	National	Several definitions	U.S., Taiwan	e-commerce	Not explicitly measured, based on Hofstede	Laboratory experiment	No significant differences were found between the US and Taiwan samples
(Loch, Straub & Kamel 2003)	To explore the extent to which the technology culture and social norms affect the acceptance of the Internet	National	Culture is demonstrated through social actions and becomes crystallized in social institutions via the creation of social	Egypt, Kuwait, Lebanon, Saudi Arabia	Internet	National IT policies, Technological culture, Culture-specific beliefs and values	Survey	Social norms along with technological culture explained 47% of the variance of the system usage.

			norms					
(Mao et al. 2005)	To explore the cultural differences in IT acceptance	National	Not explicit	U.S., Turkey	Mobile phone services	Not explicitly measured, based on Hofstede	Survey	PEOU did not have an influence in the US sample but did have an influence in the Turkish sample. PU had an influence on IT use in both samples.
(S. McCoy et al. 2005)	To examine the TAM, focusing on the moderating effect of culture	National	Several definitions	U.S., Uruguay	e-mail	Not explicitly measured, based on Hofstede	Survey	Relation PU-IU was not moderated by culture. Perceived behavioral control-IU was stronger in the Uruguay sample than in the U.S. sample.
(Middleton & Cukier 2006)	To study the contradictions in the use of mobile e-mail	Organiza-tional	Not explicit	Canada	Mobile e-mail	Not measured	Interpretative case study	Organizational culture can reinforce the functional perspective of mobile e-mail adoption.
(Okunoye & Karsten 2002)	To understand the local context in which knowledge management occurs	National and organiza-tional	How things are done in a particular setting	Nigeria, Gambia	Knowledge management	Organizational and national culture factors were analyzed from the interviews	Interpretative case study	The organizational culture, such as trust and reward, affected knowledge management. Local culture affected training certifications and high unemployment led to resistance to share knowledge.
(Parboteeah & Parboteeah 2005)	To examine how social institutions and national culture are related to PU	National	Hofstedes definition	24 different nations[6]	n/a	Not explicitly measured, based on Hofstede	Archival data analysis	Social inequality, uncertainty avoidance, and masculinity affect the degree of PU
(Png et al.	To explore the	National	Not explicit	24	Frame relay	Not measured,	Survey	Businesses from higher

2001)	impact of dimensions of national culture on the adoption of a type of IT infrastructure			nations[7]		based on Hofstede (uncertainty avoidance, power distance)		uncertainty avoidance countries were less likely to adopt frame relay, Power distance did not have an effect on the adoption.
(Rose et al. 2003)	To examine the differences in frustration with download times across cultures	National	Not explicit, based on dichotomy mono-poly-chronism	U.S., Finland, Egypt, Peru	e-commerce	Not measured	Laboratory experiment	Subjects from polychromic cultures were less concerned with download delays than subjects in monochromic cultures
(Sagi et al. 2004)	To explore how national culture and gender affect the attitude toward e-commerce	National	Not explicit	U.S., England, Greece	e-commerce	Not explicitly measured	Survey	Cultural groups were found to differ in e-commerce attitudes but gender was not found to be a significant denominator
(Shore 2001)	To build and test a framework to classify the stages of information sharing within a supply chain	National and organiza-tional	Several definitions and mechanism	U.S., China, Hong Kong, Canada	Knowledge sharing	National culture dimensions adopted from Hofstede, Corporate IT culture	Case studies	Both national and corporate IT culture affected the supply chain strategy
(Srite & Karahanna 2006)	To explore how individuals espoused national cultural values (masculinity/feminin	National	Hofstede's definition	U.S./ sample of students from 30	PC and PDA	National culture dimensions adopted from Hofstede	Survey	Social norms are stronger determinants of intended behavior for individuals who espouse feminine and high uncertainty avoidance cultural

	ity, individualism/collectivism, power distance, and uncertainty avoidance) in moderate technology acceptance.			countries				values. Espoused masculinity/femininity did not moderate the relation between PU and behavioral intention but did moderate the relationship between PEOU and behavioral intention.
(Walsham 2002)	To develop a theoretical basis using structuration theory and to illustrate it with two case studies	National	Shared symbols, norms, and values in a social collectivity such as country	Jamaica, India, U.S.	IS development, Geographic information system	Interview material analyzed and contradictions in behavior that were noticed to be systematic were collected	Structuration analysis	The structurational analysis provides a deeper examination of cross-cultural working and IS than is found in the current literature.
(Yap et al. 2006)	To study the impact of cultural and socio-economic factors on the global diffusion of e-commerce	National	Not explicit	69 different nations	e-commerce	Not explicittely measured. Based on Hofstede	Archival data analysis	Uncertainty avoidance and masculinity negatively affects network readiness, while individualism positively influences network readiness. Power distance is not a significant determinant.

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