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Louise K. Schaper
Curtin University of Technology, l.schaper@curtin.edu.au

Graham P. Pervan
Curtin University of Technology, graham.pervan@cbs.curtin.edu.au

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Louise K. Schaper
School of Information Systems
Curtin University of Technology
l.schaper@curtin.edu.au

Graham P. Pervan
School of Information Systems
Curtin University of Technology
graham.pervan@cbs.curtin.edu.au

Abstract

The research reported in this paper elucidates the development, empirical validation and preliminary analysis of a model of technology acceptance by Australian occupational therapists. The study described involved the collection of quantitative and qualitative data through a national survey and a longitudinal multi-method case study within a community-based healthcare organisation. The theoretical significance of this work is that it uses a thoroughly constructed research model, with potentially the largest sample size ever tested (2000+), to extend technology acceptance research into the health sector. Results provide support for the proposed model. This work reveals the complexity of the constructs and relationships that influence technology acceptance and highlights a need for reconceptualising current models. Results also demonstrate the importance of qualitative methodologies in information systems research. The significance and implications of the findings are discussed.

Keywords: Technology acceptance, UTAUT, health sector, structural equation modelling, partial least squares, qualitative methodology

1. Introduction

For decades, users' technology acceptance has been in the interests of both researchers and practitioners. Getting users to actually use information technology (IT) has appeared to be one of the most challenging IT implementation and management issues. Introduced by Davis (1986), the Technology Acceptance Model (TAM) is both widely tested and verified (Chau 1996, Davis 1986, Gefen & Keil 1998, Gefen & Straub 1997, Lu, et al. 2003, Mathieson 1991, Pavlou 2003, Venkatesh & Davis 2000) and is one of the most broadly used models for describing IT usage behaviours (Igbaria & Guimaraes & Davis 1995). TAM explains IT use by examining the meditating role of the perceived ease-of-use and the perceived usefulness in the relation between external variables and the actual use of IT, and it is considered to be a robust model that holds true across technologies, persons, settings and times (Straub & Keil & Brennan 1997). An extensive analysis of TAM studies can be found in Legris et al. (2003) showing the variety of technologies (e.g. e-mail, text-editor, telemedicine systems), settings (e.g. financial, medicine, IT companies) and users (e.g. students, sales assistants, physicians). However, the external variables tested as affecting technology acceptance have mostly been limited to user characteristics (e.g., previous experience Agarwal & Prasad 1997, Jackson & Chow & Leitch 1997, Venkatesh & Morris 2000) or system characteristics (e.g., output quality Davis & Bagozzi & Warshaw 1989, Venkatesh & Davis 1996), whereas the study of organisational characteristics has been limited. Rather than adding a new industry or professional group to this discussion, this study aims to explore further the effect of organisational variables by introducing the perspective of organisation culture. The purpose is

to explore whether organisation culture could be a common and concrete variable in explaining the differences in TAM studies, regardless of the systems, users and settings involved.

Even though it has been argued that IT is culturally neutral, IT use certainly is not (Davis 1989, Pacey 1983). The impact of culture on TAM has been previously studied by comparing technology acceptance in different countries. These studies expected the differences in technology acceptance to be due to cultural differences in the countries examined. McCoy, Everand and Jones (2005) studied the impact of culture on technology acceptance through sampling in both Uruguay and the US and comparing the results. The study found no significant differences between these two countries in relation to perceived usefulness and the intention to use. Straub et al. (1997) found TAM capable of explaining the use of e-mail in the USA and Switzerland but unable to explain it in Japan. Gefen and Straub (1997) explored the effect of gender on TAM, arguing gender to be a fundamental aspect of culture. They claimed the female culture focused on intimacy and solidarity, whereas men focus on hierarchy and independence.

Although these studies argue that culture has an impact on TAM, they are not able to specify their arguments because these studies do not attempt to measure culture. Assuming culture to be common to all the members of the sample (i.e. country, gender) and not validating these assumptions does not provide specific knowledge about the role of culture in the results. Since the existence of subcultures is a well-known phenomenon, it is not certain to obtain a sample that presents the "main culture" and its values. To overcome these obstacles, studies using a construct "culture" should clearly state the definition of culture that they are using and the ways in which they are measuring culture.

Within this paper, we, besides proposing that organisation culture will have a moderating effect on the relations between TAM, also discuss both the definitions and measurement of culture. First, we discuss the definition of organisation culture and how it is possible to measure it. We then present the Technology Acceptance Model, and based on previous studies, both in the field of information system (IS) and organisation culture, we draw our hypotheses. Next, a survey instrument is used to assess the research model and hypotheses. Finally, we present the results and discuss the practical implications of the findings.

2. Organisation culture

Organisation culture has been a popular approach in both understanding and managing organisations since the late 1970´s (cf. for instance, Beyer & Trice 1984, Beyer & Trice 1986, Dandridge & Mitfor & Joyce 1980, Deal & Kennedy 1983, Keston 1992, Kets de Vries & Miller 1986, Kotter & Heskett 1992, Pettigrew 1979, Sackmann 1991, Sathe 1985, Schein 1985). It has also met response in the field of IS research (e.g., Couger 1986, Keil 2000, Olson 1982). Despite its popularity, the ubiquitous use of the construct has led to a multitude of different definitional approaches. Faure (1993), for instance, had already collected 160 definitions of organisation culture by 1993. In order to come to a basic understanding of organisation culture within this paper, we conducted an analysis of widely applied culture definitions by Deal & Kennedy (1982), Sathe (1985), and (1985). Within this paper, organisation culture is a mainly implicit construct which is based on shared basic assumptions, norms, and values and is represented in terms of language, behaviour, and attitude. Culture is a condensate of collectively experienced successful problem-solving and is thus relevant in situations where organisation members are confronted with new situations.

A further major question in the discussion of organisation culture is that of the relationship between a culture and the organisation. Here, three major approaches can be identified:

- According to the *metaphor approach*, culture is a metaphor of organisational reality. (Burrell & Morgan 1979, Morgan & Smircich 1980, Pondy & Mitroff 2003). Here, culture is a variable which depends on the variable organisation. The primary goal of this approach is to understand and to explain the phenomenon of culture, whilst an explicit, normative stance is not taken. Here, every organisation member is shaping and representing the organisation culture.
- Contrastingly, 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, Beyer & Trice 1986, Deal & Kennedy 1982, Deal & Kennedy 1983, Peters & Waterman 1982, Schein 1985). A normative stance is explicitly taken. Furthermore, this approach suggests that management is the main determinant to culture.
- Seeking to combine the two previous approaches, the *dynamic construct approach* suggests that culture is a dynamic construct (Hatch 1993, Heil & Stahl 2000, Sackmann 1989, Sackmann 1992). This means that organisation and culture are two interdependent constructs which can only be managed integrated manner. Whilst there is a relatively steady cultural core, all organisational changes have certain cultural implications and will show a long term effect. Organisational changes (on the artefact level) can be conducted by the management, but impact organisation culture indirectly. Here, all organisation members represent and shape the organisation culture.

Within this paper, we share the perspective of culture as a dynamic construct. Consequently, if a certain organisation culture (characteristic) is considered to be desirable within the context of technology acceptance, we assume that certain actions can be undertaken that potentially stimulate the desired cultural change. Although we will not provide a discussion of such means, their general possibility is, however, a major motivation behind this study.

Furthermore, the dynamic construct approach suggests that every organisation member represents and shapes their organisation culture; they are the smallest cultural units. At this juncture, literature provides arguments that organisation culture is not a monolithic construct, contrastingly, often strong subcultural diversities exist (Hofstede 1998, Hofstede, et al. 1990). Entire organisations, subgroups (such as departments) and also individuals have been suggested as operational units with which to measure culture (Beyer & Trice 1986, Hatch 1993, Hofstede 1998, Kets de Vries & Miller 1986, Schein 1985). Despite the problem of defining suitable units for *measuring* organisation culture (unit?→culture?), we can clearly state that all organisation members are, to some extent, affected by their organisation culture (culture→member). Furthermore, we can thus assume that the specific extent to which organisation culture affects an individual is also a matter of individual perception. In the domain of healthcare (Helms & Stern 2001), for instance, age, organisation unit, gender and ethnic background were found to have an influence on organisation culture perceptions, thus suggesting that perceiving culture is an individual process. Within our efforts to give evidence on how certain organisation culture differences might influence technology acceptance, a self-reported questionnaire can be applied to measure individually perceived organisation culture. To sum up, organisation culture affects individuals and the nature of this affect is a matter of individual perception. Here, individually perceived organisation culture will be analyzed against individual technology acceptance.

Consequently, the question arises of what actually are the perceived organisational dimensions which might have an impact on technology acceptance. Several dimensions of culture have been suggested, for instance: cultural strength (Kotter & Heskett 1992), pathology (Kets de Vries & Miller 1984), risk attitude (Deal & Kennedy 1983), innovativeness, decisiveness, or future orientation (Ansoff 1979). However, the studies

showed evidence that the dimensions of organisation culture are subject to the study objective and to the domain which is being analyzed (for instance, in public administrations Schedler & Proeller 2003).

A relationship between organisation culture and financial performance has been found in several studies (Flamholtz 2001, Flamholtz & Kannan-Narasimhan 2005, Lee & Yu 2004). These results suggest that certain organisation's cultural dimensions would lead to a higher level of performance. Denison and Mishra (1995) argue that the high performance organisations are more aware of their goals and the current and future missions. These organisations have systems and structures to help them to adapt to new needs. Adaptability, in this study, was measured if the company was adaptive to customers needs but also if the organisation was adaptive to changes as a whole. In our study, technology acceptance is considered to be influenced by the performance culture of the organisation e.g. the values and principles that define the organisation's way of performing its activities. Therefore, based on the previous results of high performing organisations, Adaptability, Mission and Functionality are chosen as cultural dimensions to be analyzed. Mission measures the extent by which the goals of the organisation are clear to the employees. Functionality is defined as the extent to which respondents perceive their organisation to be effective in its functions. Adaptability is defined as the extent to which the employees consider their organisation is continuously seeking improvements.

Technology acceptance is not only related to performance related dimensions but here is expected to be dependent on individual level dimensions. Therefore, Autonomy and Equality are chosen as cultural dimensions measuring the differences between individuals' work. Autonomy measures to what extent the respondents perceive their organisation gives them the autonomy to influence their own work. Equality is defined as a level at which employees feel everybody is treated equally in the organisation. Hereby, the chosen organisation culture dimensions are expected to map the organisation culture from versatile aspects.

3. Technology acceptance model

TAM was chosen as the basis of the study because as well as being widely tested and verified, it uses constructs that are flexible enough to be utilised in a heterogeneous research field, such as the social and healthcare sector. Using TAM constructs (Fig. 1) does not require specifying the type of IT used, the user group or the organisation level of the respondents. TAM is an intention based model which was formed especially to explain user acceptance of computer technology. The theoretical foundation for TAM is found in the theory of reasoned action (TRA) by Fishbein and Ajzen (1975). According to TRA, an individual's belief influences attitude, which in turn shapes behavioural intention. In other words, an individual's subjective probability of consequence concerning a particular behaviour generates positive and negative feelings about a particular behaviour. Davis (1989) further adapted the causal chain to predict the user acceptance of IT. TAM explains this acceptance by positing that perceived usefulness and the perceived ease-of-use are two of the primary determinants of IT acceptance.
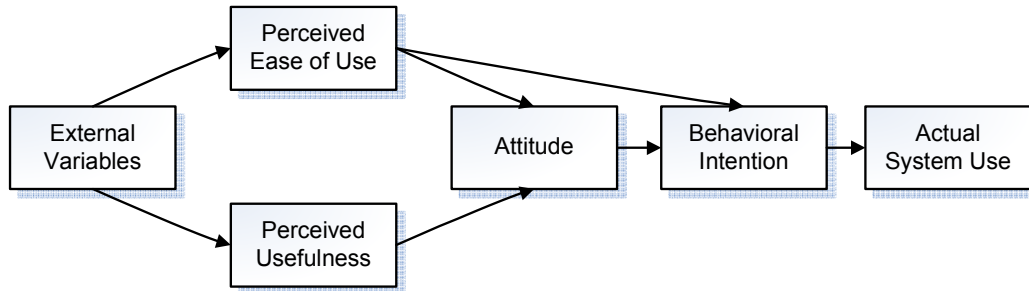
Figure 1:   *Original TAM (cf. Davis, 1989).*

Perceived usefulness (PU) is defined as the degree to which a person believes that using a particular system would enhance his or her job performance and the perceived ease-of-use (PEOU) is defined as the degree to which using the technology will be free of effort (Davis, 1989). PEOU and PU are expected to influence attitude, which refers to the degree of affect that an individual associates with using a system (Davis, 1989). Behavioural intention to use the system is a construct describing the intention, but not as yet, the actual use of a certain system, whereas the actual system use in TAM`s main dependent variable is typically the self-reported measure of time or the frequency of system use.

4. The possible effects of organisation culture differences on technology acceptance

As the core mechanism of TAM is that an individual's belief's influence attitude and through that, influences behaviour, we hereby build our hypotheses on the assumption that different perceptions of organisation culture demonstrate their affect through attitudes and values towards IT use. If an organisation is perceived as adaptive and is constantly seeking for improvement, it can create a positive attitude towards using IT to improve their activities. Furthermore, this kind of culture is expected to decrease the level of resistance to change, and therefore, offer the possibility for users to base their decision to use the system on the perceived usefulness and perceived ease-of-use rather than in organisations where old structures and ways are preferred to new ones. Therefore, we conclude:

> *Hypothesis 1: The relationship between PU and Use and PEOU and Use will be moderated by Adaptability such that when the respondents perceive the organisation to be more adaptive, their relations to PU-Use and PEOU-Use are stronger.*

In organisations that do not give any initiative to employees, it can also be expected that the use of IT is more mandatory, i.e. 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, we argue:

> *Hypothesis 2: The relationship between PU and Use and PEOU and Use will be moderated by Autonomy such that when the respondents perceive themselves to have higher autonomy in their work, their relations to PU-Use and PEOU-Use are stronger.*

Social environment has an important role in technology acceptance. Thorpe and Brosnan (2005) argue that the fear of technology is a social fear i.e. people are more afraid, for instance, to make fools of themselves, by 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, we argue 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, we therefore posit:

Hypothesis 3: The relationship between PU and Use and PEOU and Use will be moderated by Equality such that when the respondents perceive the organisation to be more equal, their relations to PU-Use and PEOU-Use are stronger.

If the culture of the organisation prefers effectiveness and functionality, this is expected to have an influence also on the use of IT: when PU and PEOU are high, and the organisation 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:

Hypothesis 4: The relationship between PU and Use and PEOU and Use will be moderated by Functionality such that when the respondents perceive the organisation to be more functional, their relations to PU-Use and PEOU-Use are stronger.

Giving clear goals where to aim can also help in accepting IT. In this case, the culture of explicating the goals of the organisation can help the employees to understand why it is important to use IT and how it assists in achieving the goals of the organisation. Based on the assumptions, we therefore posit:

Hypothesis 5: The relationships between PU and Use and PEOU and Use will be moderated by Mission such that when the respondents perceive the goals of the organisation to be clearer, their relations to PU-Use and PEOU-Use are stronger.

This study proposes that the organisation culture dimensions will have a moderating effect on IT use. Organisation culture is expected to affect the relationship between perceived usefulness and actual use and perceived ease-of-use and actual use as presented in Figure 2.
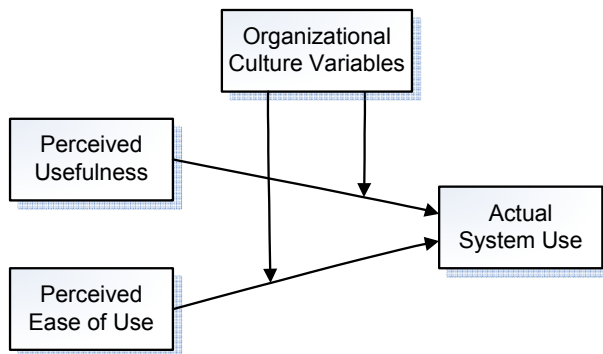

Figure 2:   Research model.

In the original, the TAM intention to use comes prior to actual use and several studies have used intention to use rather than actual use when testing TAM (Davis & Bagozzi & Warshaw 1989, Horton, et al. 2001, Hu, et al. 1999). Considering the variety of systems used in the Finnish healthcare sector and the heterogeneity of the sample, self-reported actual use was chosen for this study. Though some studies suggest self-reported use to be biased, Taylor & Todd (1995) argue that self-reported use correlates well with actual use. Unlike the original TAM (Davis 1986, Davis 1989) this study does not use the construct Attitude followed by the suggestions of Venkatesh & Davis (2000) and also because this particular study is not

interested in this mediating variable. Neither is this study interested in the relationship between PU and PEOU.

5. Methodology

Measures

To test the posited hypotheses, this study used a survey method. The survey consisted of statements that the respondents rated on a five-point Likert scale anchored at Strongly Agree and Strongly Disagree. Items used to operationalise PU and PEOU were adopted from Davis (1989). The perceived ease-of-use and perceived usefulness were each measured by three items. Perceived usefulness describes to what extent the respondents regarded the use of IT to be useful for their work. Perceived ease-of-use refers to the level the respondents feel IT to be easy and effortless to use at their work. Use was assessed by asking how many hours a week the respondents use IT at their work.

The organisation culture dimension was also measured by a five-point scale. Autonomy was measured using five items asking how much employees can affect the diversity and variety of their work, quality of work, work distribution, amount of work and working tempo. Autonomy was measured using four questions asking to what extent the respondents consider their working environment to be flexible, effective, having good cooperation and successful work distribution. Adaptability was measured by three statements asking to what extent the organisation is supporting trying out new things, making improvements for its activities and collecting feedback and improvement ideas. Equality was measured using five items asking how well people are treated equally, regardless of their age, gender, race, organisation level and the length of their employment contract. Mission was measured by three items: how well respondents were aware of the goals of the whole organisation, their work unit and their own work.

Sample

The survey sample was compiled from the Finnish Statistics Board's records of social and healthcare employees. Samples were based on the fields of activities that the respondents were currently working in. Altogether 10 sample sectors were chosen in such a way that even the smaller sectors were present with a 200 person's sample. Records do not show the current situation as such, since, for example, employees with under two years in the sector were not, as yet, included in the records. Therefore the survey had poor coverage of young and new employees.

Procedures

A pilot study of the survey instrument was conducted prior to the initial data collection phase. Altogether 21 respondents from the health and social sector employees were returned. The pilot study did not show any inconvenience in the measures. After the pilot study phase, a mail survey was used to gather data for this study. Questionnaires were mailed to the sample groups and two reminders were sent to bolster the response rate. Of the 5000 surveys distributed, 2870 were completed, returned and accepted, representing a response rate of 67%. The measures used in this study were included in a job satisfaction survey, conducted every fifth year by the Finnish Institute for Occupational Health.

6. Data analysis results

Demographics of the sample

The demographic data of the sample were collected by asking the respondents their gender, age, education level, organisation level and their amount of work experience in the field. The average age of the respondents was 45 years old, with the standard deviation of 10. Respondents` age varied from 19 to 68 years. Male respondents made up 10% of the sample and 90% were female, as is characteristic of the social and health sector. Followed by the Finnish education system, the highest educational level attained was, 14% university, 9% vocational high school, 38% college level, 27% vocational school and 9% vocational training. 3% of the respondents did not have any education after elementary school. 78% of the respondents had no supervisory tasks or position in the organisation, 13% had supervisory tasks but no official supervisory status, 9% of respondents had a supervisor level position. The average work experience was 17 years, with a standard deviation of 10 ranging from 1 to 47 years.

Construct reliability and validity

To test the construct reliability Cronbach alpha values were calculated. Table 1 presents the number of items of each construct as well as the Cronbach alpha values all of which exceeded the limit 0.80 suggested as a reasonable level for an exploratory study.

Table 1: Test of reliability.

Name of the construct	Cronbach Alpha	Number of items
Autonomy	0.811	5
Functionality	0.860	4
Adaptability	0.816	3
Equality	0.829	5
Mission	0.844	3
PU	0.922	3
PEOU	0.895	3

The convergent validity for the measures was assessed using 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 normalisation ranged for Autonomy from 0.533 to 0.852; for Functionality from 0.754 to 0.799; for Adaptability from 0.761 to 0.798; for Equality from 0.655 to 0.772, for Mission from 0.871 to 0.806; for Perceived usefulness from 0.865 to 0.0.869 and for Perceived ease-of-use from 0.724 to 0.858. Discriminant validity was assessed with a correlation matrix (Table 2).

Table 2: Correlation matrix. (sig. <0.01)

	Autonomy	Functionality	Adaptability	Equality	Mission	PU
Autonomy	1,000					
Functionality	,265	1,000				
Adaptability	,385	,444	1,000			
Equality	,252	,448	,390	1,000		
Mission	,285	,334	,349	,279	1,000	
PU	,139	,040	,120	,071	,102	1,000
PEOU	,113	,078	,125	,123	,139	,626

A high correlation between PU and PEOU is reported in several studies and it must be considered when evaluating the results. Otherwise, the results of the validity analyses suggest that the reliability and the validity of the data lies within acceptable limits. To be able to use the amount of use as a reliable construct, we calculated the average of each professional group, decreased it from the actual amount of use and therefore obtained a professional specific amount of use.

Regression analysis results

To test whether a relationship between TAM constructs changes across the extent of perceived culture dimensions we used a stepwise multiple regression analysis with SPSS 12.1. A regression analysis with and without moderating variables was made and an f-test was conducted to measure the significance of the change between R^2s with and without moderating variables. The results of the analyses are shown in Table 3.

Table 3: Regression analysis results.

Moderating relationship PU-USE			
Variable	R^2change	Sig of R^2 change	β
Autonomy	0.005	0.001	0.069
Adaptability	0.002	0.027	0.044
Equality	-	0.213	0.026
Functionality	-	0.104	0.032
Mission	-	0.174	0.027
Moderating relationship PEOU-USE			
Variable	R^2change	Sig of R^2change	β
Autonomy	0.002	0.038	0.044
Adaptability	-	0.373	0.019
Equality	-	0.143	0.033
Functionality	-	0.130	0.032
Mission	-	0.261	0.024

Using a significance level of 0.05 in the f-test, the results suggest that autonomy has a moderating effect on the relationship between PU and Use as well as PEOU and Use. Adaptability of the organisation moderated the relationship PU-Use but not PEOU-Use. Other variables did not have a statistically significant effect on TAM. Since the impact of autonomy and adaptability can be considered as being very low, even trivial considering the large size of the sample, there is a risk of neglecting zero hypotheses too easily. However, the influence of the organisation culture was not expected to be strong, but based on the assumption of a moderating role, rather modest.

Considering the exploratory nature of the study, strong coefficients are not required. Therefore, hypotheses 2 is supported, and hypotheses 1 is partly (the relationship PU-Use) supported. All other hypotheses are not supported.

7. Conclusions

The results provide us with evidence that the adaptability of the organisation and the autonomy given to employees could positively moderate the process of technology acceptance. Concretely, this means that the influence of PU and PEOU regarding actual use, based on the analysis, is stronger when employees perceive themselves to have wider autonomy concerning their own work and also that the influence of PU on actual use is stronger when employees perceive their organisation to be adaptive to new things. Autonomy and adaptability could therefore be considered as organisation culture dimensions fostering technology acceptance within organisations. It should be noted, however, that these results do not take any particular stance regarding the formation of perceptions about PU and PEOU. These variables are considered mainly to be dependent on both the technology and user.

Practical implications

According to the dynamic construct approach (see Section 2 and Hatch 1993, Heil & Stahl 2000, Sackmann 1989, Sackmann 1992) we understand the organisation and culture as two interdependent constructs which can be managed in an integrated manner. Whilst a relatively steady cultural core exists, all organisational changes have certain cultural implications and will affect the culture in the long term. Organisational changes take place mostly at an artefact level, for instance, changing the hierarchical structure, business processes, or communication guidelines, but they can have an indirect impact on organisation culture. This means that it is possible to develop the organisation culture to be more open towards information technology. Given a certain PU and PEOU among employees, measures could be undertaken to change organisation culture (and the employees' perceptions of it) towards stronger employee autonomy (see hypothesis 2) or towards stronger adaptiveness (hypothesis 1). Practical instruments, for instance, could be those of reducing the hierarchy or increasing the delegation of tasks and responsibility (autonomy) or involving employee representatives as multiplicators in organisation strategy workshops (the perception of adaptiveness). On the other hand, given certain organisation culture dimensions (here, adaptiveness and autonomy), applying change to the employees perception of IT usefulness (PU) and ease-of-use (PEOU) is of the greatest importance for technology acceptance. This means that within an organisation culture that is oriented towards adaptiveness and autonomy, the PU and PEOU have a strong impact on the actual use of IT. In practice, this can mean that within these particular organisation cultures socio-technical design approaches, for instance, which enact the employees' participation within the software development process can stimulate PU and PEOU and, thus, have an impact on actual IT use.

Limitations and suggestions for further studies

This study was conducted within the Finnish social and healthcare sector. As stated by i.e. Hofstede (1980), different countries have different general values and "national cultures". Given this framework, the results of this study can also be affected by the "national culture" of Finland. In addition, the chosen sector most probably has its own specific cultural dimension compared to, for example, business organisations. The social and healthcare sector can be characterised as being a knowledge-intensive skill-based sector, where the division of labour and the hierarchical structures are different from other industrial sectors. It cannot be

guaranteed that these results are not due to the existing cultural frameworks in the sample used in this study and that these results may not occur under different circumstances. However, if we assume that organisation culture is perceived differently at an individual level, this study provides some concrete constructs to use in further studies in different settings.

Further studies should be conducted to validate the moderating effect of organisation culture and more sophisticated and wider ranging measures should be created to overcome the limitations of this study, which were only being able to argue its results on the basis of single organisation culture dimension variables. These results provide, however, an interesting perspective for organisation culture discussion in the field of IT acceptance studies.

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