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Cultural Factors in a Mobile Phone Adoption and Usage Model

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Abstract: In human-computer interaction and computing, mobile phone usage is mostly addressed from a feature-driven perspective, i.e. which features do a certain user group use, and/or a usability perspective, i.e. how do they interact with these features. Although the feature driven and usability focus carry value, it is not the full picture. There is also an alternative or wider perspective: mobile phone use is influenced by demographic, social, cultural, and contextual factors that complicate the understanding of mobile phone usage. Drawing on concepts and models from sociology, computer-supported cooperative work, human-computer interaction and marketing, we researched the influence of culture on mobile phone adoption using interviews and two surveys. The contribution of this research is a model that includes culture as one of the factors that influence mobile phone adoption and usage. The proposed model represents the influence of mediating factors and determining factors on actual mobile phone use. The proposed model has been evaluated from both a qualitative and quantitative perspective.

Keywords: mobile phone usage, mediating factors, determining factors, usage intensity, usage variety and usage breath, sociology, computer-supported cooperative work, human-computer interaction and marketing
Categories: H.1.2, J.4

1 Introduction

Mobile communications, including mobile phones, is a complex and rapidly changing industry consisting of hardware, software, network and business aspects. Mobile phone usage involves the mobile phone, the telecommunications system, the mobile phone users, the adoption, and the use of the system. People have adopted mobile phone technology with almost unprecedented enthusiasm [Keshav 2005] to the effect that the status of a mobile phone has changed from an unknown device to an essential device in the span of less than ten years. This raises questions about the factors that underlie the rampant adoption and use. Past research has focused on researching mobile phone adoption and usage from a variety of divergent perspectives. For example, in sociology the user has been researched as a social entity and in marketing the focus has been on the user as an economic entity. In human-computer interaction (HCI) mobile phone usage is mostly addressed from a feature-driven perspective, i.e. which features do a certain user group use, and/or a usability perspective, i.e. how do

they interact with these features. One of the aims of the field of HCI is to add value to the user interaction. Although the feature driven and usability focuses carry value, it is not the full picture. There is also an alternative, or wider, perspective: mobile phone users are influenced by demographic, social, cultural, and contextual factors that complicate the understanding of mobile phone usage.

This paper is our response to taking a wider perspective on modelling mobile phone usage, while paying special attention to the cultural perspective. The research question, namely 'What are the cultural factors in a mobile phone adoption and usage model?' can be decomposed into two sub-questions: Firstly, 'Does culture influence mobile phone adoption and use?' and secondly, 'How can the influence of culture be included in a model on mobile phone adoption and usage?'. The contribution of this paper is a set of cultural dimensions that were found to influence mobile phone usage and a model for mobile phone adoption and usage. This paper should be of interest to a wide audience since it aims to integrate the views on mobile adoption from social, cultural and marketing perspectives.

1.1 Investigative Stance

The aim of our research is to understand the factors that influence mobile phone adoption and usage and therefore the epistemology is mainly interpretivistic. However, since the theoretical framework provides some existing models for technology adoption and use, there is the objective of finding whether these models apply to mobile phone adoption and use and this leads to positivist outcomes as well. The study evolved from an interpretivist, qualitative study aimed at understanding the factors that influence mobile phone adoption and usage to a positivist, quantitative study where specific questions about mobile phone adoption and usage were investigated. The findings were then triangulated with the qualitative data to propose an answer to the original question on the factors that influence mobile phone adoption and usage.

1.2 The Scope and Approach of this Research

The scope of this paper is limited to addressing mobile phone adoption and usage from a cultural perspective using cultural dimensions as a starting point. Our research involved structured interviews and three surveys (a pilot survey, a data gathering survey and a verification survey). Although our interviews focused on a variety of age groups, our surveys mainly yielded data about mobile phone usage of university students under the age of 30 in South Africa. The proposed model was evaluated qualitatively with different age groups.

We analysed the research literature for concepts, theories and models that could help to understand the factors that influence mobile phone adoption and usage. Since we were specifically interested in looking at the cultural aspect of mobile phone adoption and usage, we also considered literature on the culturalisation of computer technology.

1.3 Organisation of this Paper

This paper is organised as follows. [Section 2] summarises the research design that is structured around two questions, where the answer to the first question leads to the

second question. The first question asks if culture influences mobile phone adoption and usage. [Section 3] provides the theoretical background for this question and describes the interviews, the pilot survey and the data gathering survey conducted to investigate this question. The analysis of the results and the response to the first question is also dealt with. Having established that culture influences mobile phone adoption and usage, [section 4] addresses the second research question in considering how this finding can be represented in the bigger picture of technology adoption and usage. The section starts with a theoretical foundation for technology adoption models, and then integrates this knowledge on existing models with the findings of our research to propose a new model for representing the factors that influence mobile phone technology adoption models. The section concludes by discussing the evaluation of the proposed model. [Section 5] reflects on our findings and also notes some of the factors that influenced our research. [Section 6] concludes with the notion that since mobile phones, are the ultimate, personalised, personal computer, mobile phone adoption and usage seem to differ from other technology adoption and use in ways we are only beginning to understand.

2 Research Design

The research reported on in this paper focuses on two sub-questions:

- Does culture influence mobile phone adoption and usage?
- How do cultural factors fit into the bigger picture of mobile phone technology adoption and usage?

The research design consisted of four phases. The first phase was explorative and consisted of literature reviews and questionnaire based interviews with participants from different ethnic and age groups. The aim was to gain some understanding of the factors that influence mobile phone adoption and usage and the focus was on gathering qualitative data. The output of this phase was a basic understanding of the issues involved in mobile phone adoption and usage and a refined questionnaire. The second phase was a pilot survey where the main aim was to test the questionnaire and gather data in order to refine the questionnaire. The results of the pilot survey was analysed against research findings from literature in order to finalise a survey questionnaire aimed at capturing the cultural dimensions that influence mobile phone adoption and usage. The third phase involved the data gathering survey that was conducted to capture quantitative data on mobile phone adoption and usage for statistical analysis. The findings of the survey were combined with research literature on technology adoption and usage to propose a model for mobile phone adoption and usage. The fourth phase was the evaluation of the model which included both a qualitative and a quantitative evaluation. These four phases will now be discussed in more detail in the sections to follow. [Section 3] primarily focuses on the first research question and [section 4] on the second.

3 Culture and Mobile Phones

This section deals with the question: does culture influence mobile phone adoption? [Section 3.1] provides the theoretical foundation by reviewing existing research on

culture and the influence on interactive systems, and specifically mobile phone usage and adoption. [Section 3.2] discusses the research we conducted to find out what aspects of culture, if any, affect mobile phone adoption and usage. It included a discussion on the structured interviews conducted to form an understanding of the factors that influence mobile adoption and usage, the pilot survey to test the questionnaire that was based on the outcomes of the structured interviews, the data gathering survey and the findings from this survey on whether or not cultural factors influence mobile phone adoption and usage.

3.1 Theoretical Foundation

The mobile device market has widened to a global scale and consequently mobile devices are distributed throughout the world [Kim and Lee 2005]. As the use of mobile phones pervades the world, the globalization of mobile device user interface design is becoming more crucial to business success and building a loyal customer base. Communications technologies are entirely dependent on a social network for adoption and use, and therefore the diffusion of these technologies within a culture should be studied [Urbaczewski, Wells et al. 2002]. The context of the mobile user includes user culture and the influence of culture on mobile phone use [Urbaczewski, Wells et al. 2002; Teo and Pok 2003a; Jones and Marsden 2005]. This necessitates a review of culture as an essential part of understanding users and the factors that influence mobile phone usage.

The word ‘culture’ originally stems from an agricultural root: ‘culture as cultivation of the soil and plants’ [Hartley 2002]. Applying this to people offers a metaphor for the cultivation of products, minds and social relations. There are various definitions of the term ‘culture’. Culture can be seen as the social production of sense, meaning and awareness [O'Sullivan, Hartley et al. 1994]. Culture can also be seen as learned behaviour consisting of thoughts, feelings and actions [Del Gado 1996], while Hall [1990] describes culture as communication through words, material things and behaviour.

Honold [2000] argues that it is more meaningful to find a definition of culture that suits the specific area of research than to produce a general definition. Ford [2005] defines culture in the context of HCI as ‘the patterns of thinking, feeling, and acting that influence the way in which people communicate among themselves and with computers’. This definition is also applicable to mobile interaction and we consequently adapted it for the purpose of this study to consider culture as ‘the patterns of thinking, feeling, and acting that influence the way in which people communicate among themselves and use mobile devices’.

Several metamodels of culture exists, such as the onion model [Trompenaars 1993]. the iceberg model, and the objective culture and subjective culture model [Stewart and Bennet 1991]. Hofstede proposed a model with international variables to show subjective culture affects human mental programming [Hofstede 1995]. Hofstede further encompassed this model within the pyramid metamodel that comprises of three levels [Hoft 1996; Hofstede 2001]

- Human nature is common to all human beings, it is inherited and not learned.
- Culture is specific to a group of people and is learned, not inherited.
- Personality is attributed to an individual and this attribute is both learned and inherited.

The metamodels of culture form the basis for the development of different models of culture. The basic models of culture are mostly based on some form of ethnic culture even though they may apply to the business environment, the work environment or peer group culture. The term 'ethnic' is defined as 'relating to a group of people having a common national or cultural tradition' [Oxford 1999]. Nevertheless, business and other organizations also have cultures that have an impact on a range of micro and macro-organisational phenomena [Boyancigiller and Adler 1995]. Hofstede [1995] uses the word 'culture' in the sense of 'collective programming of the mind' when referring to organisational culture. Organisational culture is based on the organisation's sense of identity, its goals, core values, primary ways of working, and shared assumptions [Scott and Gable 1997]. Membership of organisations and social groups is usually partial and voluntary, while the association with a nation is permanent and involuntary. National cultures differ at the level of basic values while organisational and group/peer cultures are composed of practices (like symbols, heroes and rituals) rather than values [Scott and Gable 1997].

According to Palen et al. [2000], deployment of mobile telephony varies noticeably internationally and even among western countries. In general, usability studies aim to make technology more useful. Cultural usability goes further and aims to make technology fit in with the user's lifestyle [Sun 2004]. In order to be effective, designers therefore have to understand and be aware of the cultural priorities and the value system of users, i.e. they must identify factors that are relevant and sensitive to cultural differences. Fitzgerald [2004] presents four models used for managing cross-cultural software:

- Cultural dimensions, measuring different cultures according to a number of cultural variables or factors [Marcus and Gould 2000].
- Cultural markers, using cultural dimensions in measuring interface design elements that are prevalent and possibly preferred within a particular cultural group [Badre 2002].
- Cultural behaviours, measuring on-line behaviour of web site users in terms of a four-factor model [Fitzgerald 2004].
- Activity theory, viewing people's activities as 'an object-oriented and tool-mediated process in which actions are mediated through the use of artefacts (including tools and languages) to achieve a transformative objective' [Sun 2004].

In our research the main focus was on cultural dimensions. We did not investigate cultural markers as they are based on cultural dimensions, cultural behaviours as they apply mostly to web-sites, or activity theory as it does not support a quantitative research approach. Our selection of cultural dimensions as point of departure was based on the fact that many anthropologists (e.g. [Hall 1959; Victor 1992; Trompenaars 1993]) have researched the field of cultural dimensions, and one of the best known and most cited studies was done by Hofstede [Hofstede 1995; Marcus and Gould 2000; Hofstede 2001; Baumgartner 2003]. Hofstede conceptualized culture as 'programming of the mind' and focuses on determining the patterns of thinking, feeling and acting that form a culture's mental programming. In the 1970s and 80s he did a survey at IBM that dealt with 'the employee's personal values related to the work situation' and investigated cultural variations within five different dimensions. Each of these dimensions (or 'international variables' as coined by Hoft [1996]) is a

dichotomy, in that there are two opposing sides to each dimension. The dimensions are [Hofstede 1995; Hoft 1996; Hofstede 2001]:

- Power distance, denoting the extent to which less powerful members expect and accept unequal power distribution within a culture, and scaling from high-power-distant to low-power-distant.
- Masculinity vs. femininity, referring to gender roles, not physical characteristics, as commonly characterized by the levels of assertiveness or tenderness in the user, and scaling from masculine to feminine.
- Individualism vs. collectivism, referring to the role of the individual and the group, and is characterized by the level of ties between an individual in a society, and scaling from individualistic to collectivistic.
- Uncertainty avoidance, referring to the way in which people cope with uncertainty and risk, and scaling from high-uncertainty-avoidant to low-uncertainty-avoidant.
- Time orientation, referring to people's concerns with the past, present and future and the importance they attach to each, and scaling from short-term orientation to long-term orientation.

These dimensions correspond with dimensions identified in the other models of culture mentioned above. Hall [1959; 1976], however, identified time perspective in terms of polychronic time (doing many things at the same time) and monochronic time (concentrating on one thing at a time), adding a further time dimension compared to time-orientation identified by Hofstede.

Closer to our field of research, Baumgartner [2003] researched the importance of cultural dimensions in the field of user-interface design. The following five dimensions were ranked most important:

- Context, as described by Hall [1959; 1976].
- Technological development, referring to the rate of technological development, and scaling from advanced to backward.
- Uncertainty avoidance as described by Hofstede [1995].
- Time perception as described by Hall [1959; 1976].
- Authority conception or power distance according to Hofstede [1995].

In the context of mobile phone design and usage existing research into the effects of culture has been aimed at the culture-based preferences for specific design attributes [Choi, Lee et al. 2005; Kim and Lee 2005] and the distinction between universal and to-be-localised components [Lee, Ryu et al. 2005b]. The following studies represent the general trends, all using Hofstede's premises:

- Choi et al. [2005a] looked at cultural influences on functionality design of mobile data services by comparing 24 Korean, Japanese and Finnish users. They found 52 attributes considered important by mobile data service users and identified 11 critical attributes related to the user interfaces of mobile data services devices. The critical attributes such as minimal keystrokes, iconic menu style, logical ordering of menu items, variety of fonts and font colours, etc., all showed a clear correlation with characteristics of the culture of the user's country (as identified by Hofstede).
- Kim & Lee [2005] investigated cultural influence and mobile interface design to clarify the relationship between cultural traits and mobile phone interfaces. Their subjects came from the USA and Korea. The results suggest

a possibility of cultural impact on icon recognition. They found that Korean subjects performed better using concrete representations, while American users preferred the abstract icon representations.

- Lee et al. [2005b] studied multi-cultural usability in mobile phone navigation in a laboratory-based usability experiment with participants from the USA, West Africa, Eastern Europe and South America. They collected cross-cultural usability information in the product development process to determine universal and to-be-localized components, detect mistakes that lead to critical miscommunication, and assess the usability of cross-cultural user interfaces. Their study was again based on Hofstede's premise, but combined with the work of Jordan [1998] on pleasurable products. They found no real differences between the various cultures for the issue of supportiveness, but found evidence that the perception of the same icons differs across cultures.

Based on the findings of these studies it can be argued that culture and mobile phones have been researched to some extent, but what we found lacking is a model to integrate the findings on culture with the other factors that influence mobile phone adoption and usage.

In order to propose such a model it is necessary to clarify the relationship between the social and the cultural aspects of mobile phone usage. Socially the emphasis seems to be on finding new ways to use mobile phones in enhancing socialisation [Jones and Marsden 2005; Schiphorst 2006] and the use of mobile phones to eliminate physical location as a determinant of communication [Geser 2004]. For the purpose of this study, culture is seen as a specific manifestation of social behaviour. Social influence will therefore encompass cultural influence.

[Section 4] will address the issue of developing a model for including cultural issues with mobile phone adoption, but before we could address this aspect, we had to determine for ourselves whether cultural factors indeed affect mobile phone adoption and usage, and whether these cultural factors correspond with the dimensions identified by Hofstede, as proposed and used by the studies mentioned above. [Section 3.2] describes our research and findings on the issue of cultural influence in mobile phone adoption and use.

3.2 Researching Cultural Influence

As stated before, our research involved four phases: structured interviews, a pilot study, a data gathering survey and finally an evaluation phase as described in [section 4.3]. The first three phases were used to determine the influence of culture on mobile phone usage (amongst other issues) and will now be discussed by describing the approach and then summarising the main findings of each phase.

3.2.1 Structured Interviews

In the context of our research question (does culture influence mobile phone adoption and usage) the initial interviews were directed towards:

- Eliciting verifiable facts and 'reality out there' through questions on basic issues such as frequency and duration of communication interaction, breadth of interaction (how many communication partners) and variety of tasks.

- Eliciting social and cultural perceptions that could influence mobile phone adoption and usage.
- Uncovering participant's perceptions about mobile phone adoption and usage and reflections about their experience of using a mobile phone.

When researching a common phenomenon such as mobile phone usage it is necessary for the researcher to focus on eliminating all preconceived issues from their mind. This was found to be easier if the researcher is not of the same age group, since age influences mobile phone adoption and usage [Kwon and Chidambaram 2000; Kleijnen, Wetzels et al. 2004]. The researcher who conducted the interviews was over the age of 40 and therefore the selection of participants of various ages for the interviews (and under the age of 30 for the surveys) helped to create the necessary distance in terms of age.

No appropriate, standardised questionnaire could be found and therefore the questions for the interviews were compiled from existing questionnaires [Kiljander 2004; Ford and Kotze 2005], a literature review on related research [Marcus and Chen 2002] and commercial information on mobile phone functions and services. Apart from biographic information, the questionnaire captured priorities in using mobile phones and frequency of feature usage.

The 10 participants for the interviews were selected with a gender balance, from the age groups 20-29, 30-39, 40-49 and 50-59, representing three different ethnic groups. The pre-defined questions were followed by an interview to give participants the opportunity to respond outside the structured format of the questions. The capacity of their phones used was gauged by going through all the sub-menus with them and counting the items used.

The following observations were made based on the outcomes of the interviews:

- Participants *over* the age of 30 used less than 40% of the available features on their phones; thought of a mobile phone mostly as a mobile version of the traditional phone; identified relationship building and security as the highest priorities; questioned the value of a feature before being willing to consider using it; and often preferred to keep the old phone when their mobile phone contracts were renewed.
- Participants *under* the age of 30 used between 40% and 50% of the features on their mobile phones; viewed the phone as a tool for communication, organization and entertainment; and demonstrated a keen interest in exploring all the features available, but were inhibited by cost.

Reasons for not using certain features included ignorance on the availability of features, cost, unavailability on a specific phone model, and personal preference.

After the interviews the questionnaire was revised and we again studied existing research to guide the way forward. The cultural dimension approach was chosen to guide our further research into cultural factors since it can be used in quantitative studies. Quantitative research was preferable in order to be compatible with the technology usage models proposed by marketing, though qualitative observations were made, when possible, as the qualitative findings were needed to provide explanations for some of the quantitative findings. Based on these findings a questionnaire was compiled for the pilot survey.

3.2.2 Pilot Survey

At this stage of our research, following an extensive literature review on past research and the findings of our interviews, we were aware that demographic variables such as age [Kwon and Chidambaram 2000; Teo and Pok 2003a; Kleijnen, Wetzels et al. 2004], education and socio-economic status [Ho and Kwok 2003; Bina and Giaglis 2005] influence mobile phone adoption and usage. We therefore controlled the demographic variables by selecting participants in the same age, education level and socio-economic group for our further research.

The participants were a group of 40 third-year computer science students, 65% male and 35% female, from Monash University (South African campus). They were all under the age of 30 but from a variety of nationalities. Most students at the University are from an above-average socio-economic background. This was important as to ensure that they would be in possession of a mobile phone with average, or above-average, functions and services, and could afford mobile phone services.

The questionnaire was a refined version of the questionnaire used in the interviews. Hofstede's [1995] and Baumgartner's [2003] dimensions, as well as a study by Ford [2005] based on Hofstede's dimensions, were used as the point of departure for designing the questionnaire. It captured biographic details and mobile phone usage behaviour in a way that could be coded for statistical analysis.

The statistical analysis sought to distinguish the participants based on technological development [Baumgartner 2003], time-perspective [Hall 1959; Hall 1976], and three of Hofstede's cultural dimensions, and then to relate these to mobile phone usage preferences. Therefore the first priority was to see if the cultural dimensions were measured consistently. The Cronbach's alpha values were computed as listed in [Table 1]. It follows that only the dimension of technological development had a correlation above 0.7, but uncertainty avoidance at 0.65 came close to 0.7 and warranted further investigation.

All the questions in the questionnaire were reviewed to see if they captured the cultural dimensions as intended. In the case of the individualism dimension, it was found that the questions focused on the individual versus a group, while they should have focused on the individual versus relatives and family in order to represent collectivism. These questions were adapted accordingly. No content changes were made to the questions for the other dimensions. Based on the results of the pilot study and the support in literature for the difficulties in identifying time-orientation [Ford and Kotze 2005], only the dimensions of technological development, time-perspective, uncertainty avoidance and individualism/collectivism were retained in the survey questionnaire (with a revised set of questions for the latter).

Dimension	**Cronbach's Alpha Coefficient**	
	Variables	*Alpha*
Technological development	Raw	0.731244
	Standardised	0.731047
Time-perspective	Raw	0.250291
	Standardised	0.182336
Uncertainty avoidance	Raw	0.654830
	Standardised	0.679292
Time-orientation	Raw	-0.732048
	Standardised	-0.873414
Individualism	Raw	-0.086748
	Standardised	-0.057296

Table 1: Reliability of cultural dimensions

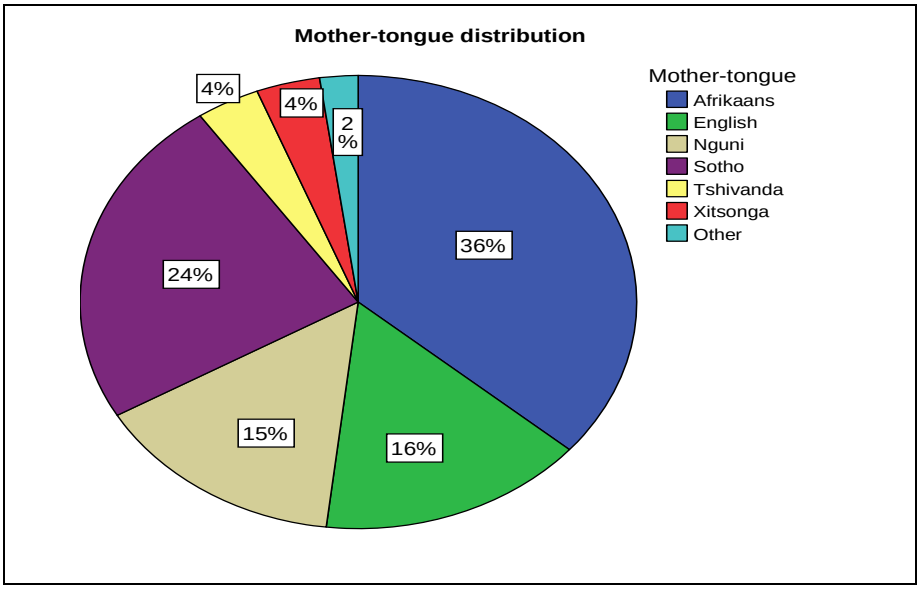

Figure 1: Mother-tongue distribution

3.2.3 Data Gathering Survey

Our data gathering survey involved 138 participants of whom 64 (46%) were male and 74 (54%) female, 69% attended urban schools, while 31% completed their matriculation in a rural area. All participants have successfully completed the matriculation examination and were third-level (third-year) students from two universities in Pretoria, namely the Tshwane University of Technology (60 students) and the University of Pretoria (78 students). Their ages ranged from 17 to 27 with a

mean age of 21. Mother-tongue was captured as an indicator of ethnic distribution, as depicted in [Figure 1].

The questionnaire was a refined version of the questionnaire used in the pilot survey. The demographic data was analysed with descriptive statistics to verify that the participants fitted the target group, i.e. university students under the age of 30. Apart from the cultural dimensions, the priorities on buying was captured and coded to ascertain if infrastructural variables have a significant influence on mobile phone adoption.

In the end the participants were not grouped by language as an indicator of ethnic group. Categorisation according to ethnic culture was found problematic for three reasons.

- Firstly, it was observed in the interviews that some people marked English as their mother-tongue although it was known not to be, and this invalidated any ethnic classification based on mother-tongue.
- Secondly, many of the participants across the interviews, pilot survey and data gathering survey were found to be bi-cultured or multi-cultured.
- Thirdly, even if the problems listed above could be overcome the division into ethnic culture groups would result in small samples of unequal size.

The reliability of the analysis (Cronbach's Alpha values) was less than 0.7 for the individual cultural dimensions of uncertainty avoidance, individualism/collectivism and time-perspective, but 0.83 on the combined data set. This implied that all the questions were consistently measuring the same construct but the measurement of the individual dimensions (represented by grouping questions according to the Hofstede classification) did not exhibit consistency within the dimension.

In order to explore alternative groupings of the questions the method of optimal scaling was then employed. Optimal scaling, like factor analysis, is a data reduction method to identify clusters within a data set. Optimal scaling was done on the entire data set and from inspection of the plot (not depicted here) responses to certain questions clustered together. The groups of responses that correlated significantly were grouped together into new variables that were identified as follows:

- Variable 1 - Uncertainty avoidance.
- Variable 2 - Independence from assistance.
- Variable 3 - Independence to explore and solve problems.
- Variable 4 - Efforts to maximise time and technology.
- Variable 5 - Family orientation.

These five variables describe various distinct aspects of behaviour and attitude towards mobile phone usage. Variable 1 confirmed the dimensions of uncertainty avoidance as proposed by Hofstede, while variables 2, 3 and 5 seem to the support individualism/collectivism dimension, although not being directly equivalent to the definitions as put forward by Hofstede. Variable 4 pointed towards a need to optimise and explore.

Hofstede proposed that on each of the dimensions, people from both sides of the scale would be found, but that one side would be more prevalent for each ethnic culture [Hofstede and McCrae 2004]. We thus found that some of the dimensions identified by Hofstede do play a role in mobile phone usage and adoption, and also that there may be other dimensions, not identified by Hofstede and others, that should be explored.

Our findings suggest that mobile phone use might have a unique set of cultural dimensions not necessarily corresponding to those proposed by Hofstede, and also that the concept of a 'unique mobile phone usage culture' may exist that does not necessarily correspond to the culture that exist in human-human relations. This has been identified as a major future research direction to pursue.

These combined findings affirm the first research question on whether culture influence mobile phone adoption and usage, though not necessarily in the expected way, and leads to the second question on how this can be related to mobile phone adoption and usage.

4 Cultural Factors and Technology Adoption and Usage Models

We will now address the second research question, namely 'how do cultural factors fit into the bigger picture of mobile phone technology adoption and usage'. In order to do this it is necessary to look at the literature on technology adoption and therefore this section starts with an overview of the existing research on technology adoption and use.

4.1 Theoretical Foundation

Technology adoption involves the user, the technology and the context [Humphreys 2005]. Various models for understanding technology adoption have been proposed. Pedersen [2005] lists Roger's innovation diffusion model, the domestication model and the technology acceptance model (TAM) as the three most commonly applied:

- Rogers' innovation diffusion model [Rogers 2003] is founded in sociology but has also been applied to the world of marketing where users are seen as economic entities. The model provides an approach to understanding how innovations are adopted by a particular population.
- Silverstone and Haddon [1996] proposed the domestication model where users are seen as social entities and the model aims to provide a framework for understanding how technology innovations change and are changed by their social contexts.
- The technology acceptance model was developed by Davis [1989] to explain the determinants of computer acceptance and usage behaviour.

While Rogers' innovation diffusion model focuses on marketing and sales processes, the domestication approach deals with a more global analysis of adoption ex post facto, and TAM focuses on information technology adoption in organisations [Ling 2001].

This paper focuses on understanding the cultural factors that influence mobile phone adoption and usage and we therefore consider all three adoption models in more detail in order to establish their applicability.

4.1.1 Domestication Theory

The domestication theory [Silverstone and Haddon 1996] views technologies as social, cultural, political and economic products that play a symbolic and aesthetic, as well as material and functional role. The domestication approach aims to discern the interaction between the innovation and the context in which it is being placed.

Therefore contexts are often contrasted, for example work versus leisure, private versus public, and contrasts between users in different demographic groups [Ling 2001].

The concept of domestication is derived from the British studies on consumption [Sun 2004]. It refers to the taming of innovation by the individual and focuses on the process that integrates technology into everyday domestic life [Sun 2004; Pedersen 2005]. The domestication approach considers the following phases in the adoption process [Silverstone and Haddon 1996; Ling 2001; Habib 2003]:

- Commodification: the way a technology is designed to give it an image with a number of functional, aesthetic and symbolic claims.
- Imagination: the way in which an innovation enters our consciousness.
- Appropriation: the actual purchase of the technology.
- Objectification: the phase in which the technology is made acceptable and familiar in the daily life of the consumer.
- Incorporation: integrating the technology with daily use.
- Conversion: the technology becomes fitted into routines and is seen by others as part of the individual's identity.

Pedersen et al. [2002] distinguishes between the first purchase decision, which refers to adoption, and post-decision buying behaviour. They recommend that usage be seen as a transition between stages of increasing consumer sophistication in the consumer life cycle rather than a specific event. This is in line with the domestication approach which considers consumption rather than mere use, and views adoption as a process rather than a specific event [Ling 2001; Haddon 2003].

Brown and Randell [2004] use the term 'dwelling' with technology to describe the study of technology use over a long period of time where the context in which technology is used may change. Domestication studies do ex post facto examination of technology adoption to understand why a technology has been adopted and why not [Pedersen 2005]. It is therefore intended as a tool for observing adoption rather than a tool for the prognosis of an adoption [Ling 2001].

The acknowledgement of the importance of context and the post-adoption focus make the domestication approach relevant to understanding the factors that influence mobile phone usage. Our research views users as social entities, which is in accordance with the domestication approach. Given the widespread adoption of mobile phones, they are already in the appropriation phase and beyond. Therefore our study will not consider specific phases in the adoption process, but rather the factors relating to adoption and post-adoption usage.

4.1.2 Rogers' Innovations of Diffusion

Rogers, a sociologist, developed the innovation diffusion model to explain how an innovation diffuses through a society [Geoghegan 1994; Walton and Vukovic 2003; Kiljander 2004; Rogers 2003]. The innovation diffusion model has been used extensively to explain the acceptance or rejection of IT innovations in an organisation or society [Urbaczewski, Wells et al. 2002].

According to Rogers [2003] 'an innovation is an idea, a practice, or object that is perceived as new by an individual or another unit of adoption'. Diffusion is defined as

the process by which an innovation is communicated by means of certain channels over a period of time between the members of a social system.

Rogers' adoption/innovation curve divides adopters of innovations into five categories each representing a unique psychographic profile based on the idea that some individuals are more open to adoption than others are. The categories can be described as follows [Geoghegan 1994; Leung, Chan et al. 2003; Walton and Vukovic 2003; Kiljander 2004; Rogers 2003]:

- Innovators (± 2.5% of the adopter population): These are the 'techies', the experimenters who have technology as a central interest in their lives and pursue new technology as soon as it appears, no matter what the function is.
- Early adopters (± 13.5% of the adopter population): They are the 'visionaries' who blend an interest in technology with a concern for significant professional problems and tasks. They are mostly not technologists but exploit the new capability.
- Early majority (± 34% per cent of the adopter population): They are the 'pragmatists'. Although fairly comfortable with technology in general, their focus is on concrete professional problems rather than on the tools (technological or otherwise) that might be used to address them.
- Late majority (± 34% per cent of the adopter population): They are the conservatives or 'sceptics'. They share the attitude of the early majority, though being less comfortable with technology.
- Laggards (± 16% per cent of the adopter population): They are the most likely never to adopt at all. They are not interested in new technology and they generally buy technology products only when these are buried inside other products.

A successful innovation will be adopted in this order, beginning with the innovators, followed by the early adopters, the early and late majority, and perchance the laggards. A new technology is best focused on innovative adopters since they do not insist that the technology should have a track record, as they value a product on the basis of the latest technology built into it [Leung, Chan et al. 2003].

Ling [2001] notes the following problem with Rogers's model: the model stops with the adoption of the innovation and does not consider ex post facto analyses of adoptions. This may not be a problem from the marketing and sales perspective, but in HCI and sociology research, the post-adoption of innovations are of interest.

Other models that deal with technology diffusions are the Bass diffusion model [Ali-Vehmas and Luukkainen 2005], the product life cycle by Levitt and the Positioning model by Trout and Reis [2006]. According to all these models, the number of success factors are limited [Ali-Vehmas and Luukkainen 2005]. The fact that there are a limited number of factors determining the success of technology adoption makes it more feasible to model technology adoption.

The Rogers Innovation Diffusion Model focuses only on adoption and therefore it cannot be used to represent mobile phone usage. However, the innovation diffusion model has implications for mobile phone usage since adoption is a prerequisite to usage.

4.1.3 Technology Adoption Models

The Technology Acceptance Model (TAM) proposes that beliefs about usefulness and ease of use are essential elements in determining user attitude towards using a new technology [Davis 1989; Malhotra and Galletta 1999; Kleijnen, Wetzels et al. 2004]. The theoretical foundation for TAM is based on Fishbein and Ajzen's [1975] theory of reasoned action (TRA) model.

TRA is a widely studied model in social psychology [Malhotra and Galletta 1999; Kwon and Chidambaram 2000]. It attempts to explain why people behave as they do in situations of 'reasoned action' by identifying causal relations between beliefs, attitudes, intentions and behaviour [Kwon and Chidambaram 2000; Barnes and Huff 2003; Pedersen 2005]. Attitude is defined as the individual's positive or negative feelings about enacting a target behaviour [Uzoke, Seleke et al. 2006]. TRA is illustrated in [Figure 2] and has the following components [Fishbein and Ajzen 1975; Davis, Bagozzi et al. 1989; Malhotra and Galletta 1999; Kwon and Chidambaram 2000]:

- Actual behaviour: According to TRA a person's performance in a specified behaviour is determined by the behavioural intention (BI) to enact the behaviour.
- Behavioural intention (BI): BI is jointly determined by the person's attitude (A) and the subjective norm (SN) concerning the behaviour in question, with relative weights estimated by regression:

  $$BI = A + SN$$

- Attitude towards behaviour (*A*): A person's attitude towards behaviour is determined by their salient beliefs (b_i) about the consequences of performing the behaviour multiplied by the evaluation (e_i) of those consequences.

  $$A = \sum_{i=1}^{n} b_i e_i$$

  where *n* ♏ *N*.
- Subjective norm (*SN*): Subjective norm refers to the social pressure exercised on the person to either enact or not enact the behaviour and is expressed as the sum of all the person's normative beliefs (nb_i), which consists of the perceived expectations of specific significant individuals or groups' reaction, multiplied by the person's motivation to comply (mc_i).with these expectations:

  $$SN = \sum_{i=1}^{n} nb_i mc_i$$

  where *n* ♏ *N*.

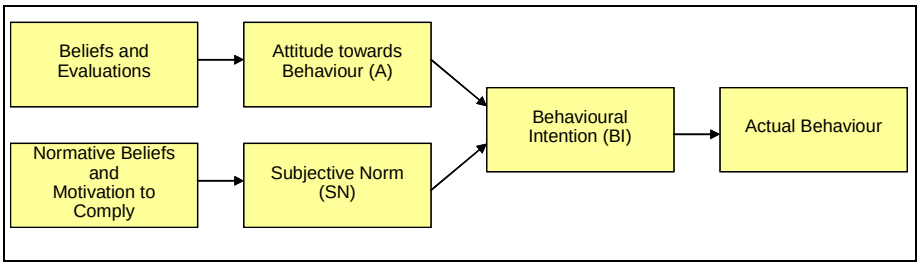

Figure 2: Diagrammatic representation of the TRA adapted from Davis et al. [1989]

TRA is a general model and it does not specify the active beliefs for a specific behaviour. Therefore a researcher using TRA has to identify the beliefs that are relevant for subjects regarding the behaviour under investigation. For example, if TRA is applied to mobile phone use, people's beliefs regarding the benefits or liabilities of mobile phone use have to be identified by the researcher.

TAM is a special case of TRA for modelling technology adoption in organisations [Pedersen 2005]. TAM, as illustrated in [Figure 3], includes six concepts [Davis, Bagozzi et al. 1989; Malhotra and Galletta 1999; Venkatesh and Davis 2000; Urbaczewski, Wells et al. 2002]:

- External variables (*EV*): External variables represent system design characteristics, user characteristics, task characteristics, organisational and managerial interventions. External variables influence perceived usefulness (*PU*) and perceived ease of use (*PEU*). .
- Perceived usefulness (*PU*): Perceived usefulness is defined as the extent to which a person believes using the system will enhance his or her job performance.
- Perceived ease of use (*PEU*): perceived ease of use is the extent to which a person believes using the system will be free of effort.
- Attitudes towards use (*A*): Attitude towards use is defined as the user's desirability of his or her using the system.
- Perceived usefulness (*PU*) and perceived ease of use (*PEU*) are the sole determinants of attitude (*A*) towards the technology system. Perceived usefulness and perceived ease of use is determined by external variables (EV) and attitudes toward use (A) can therefore be defined as:

$$A = PU + PEU + EV$$

- Behavioural intention (*BI*): Attitude (*A*) combined with perceived usefulness (PU) predict behavioural intention (*BI*):

$$BI = A + PU$$

- Actual use: Behavioural intention (*BI*) in turn predicts actual use.

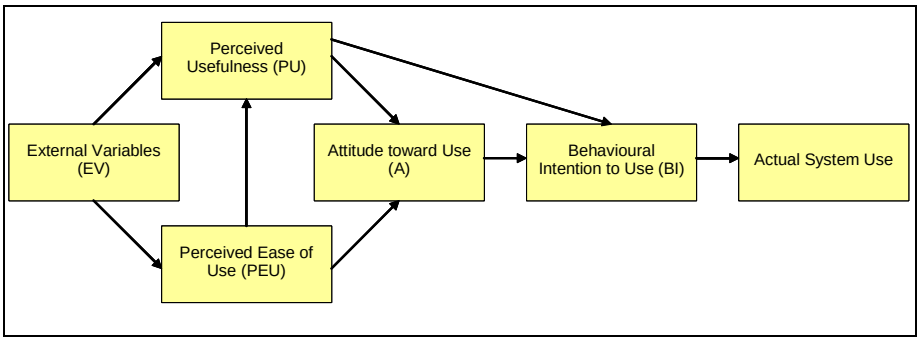

Figure 3 : Technology Adoption Model (TAM) [Davis, Bagozzi et al. 1989]

TAM is noted as one of the most influential models in technology adoption research and represents an important theoretical contribution towards understanding information system usage and information system acceptance behaviour. While the TAM model is mainly applied to explaining the adoption of technology within organizations, the constructs of the model are meant to be fairly general and universal to different types of computer systems and user populations. Attitude towards adopting a technology is believed to be influenced by personal and social influences and the fact that TAM does not account for social influence has been identified as a limitation [Davis, Bagozzi et al. 1989; Malhotra and Galletta 1999].

In addressing this problem, Malhotra and Galetta [1999] established a theoretical and empirical base for the introduction of social influence through the processes of internalization, identification and compliance with the TAM model. According to their findings, users' attitudes are directly affected by social influence, while behavioural intentions are indirectly affected. This supports our argument that social and cultural factors should be represented in a technology adoption model.

Several studies have applied TAM to research mobile phone technology adoption, notably Kwon and Chidambaram [2000], Lee et al. [2002], Pedersen [2005], Teo and Pok,[2003b], Kleijnen et al. [2004] and Roberts [2004]. Two of the findings regarding mobile phone adoption have special significance for our research:

- Given that cultural factors are encompassed in social factors, the finding that social factors influence mobile phone adoption [Peterson 1994; Urbaczewski, Wells et al. 2002; Teo and Pok 2003b] provides justification for investigating cultural factors as an influence in mobile phone adoption and usage.
- The importance of infrastructural factors in mobile phone adoption [Kleijnen, Wetzels et al. 2004] means that infrastructural factors will have to be taken into account during our research, e.g. selection of participants with access to similar infrastructure, etc. The TAM model is based on the assumption of the availability of basic infrastructure and organisational context for the adoption of new technology. If this is not the case then conditions facilitating infrastructure become important in technology adoption.

Venkatesh et al. [2003] developed the Unified Theory of Acceptance and Use of Technology (UTAUT) model to explain user intentions to use an information system and subsequent usage behaviour. UTAUT was developed through a review and consolidation of the constructs of the following models [Venkatesh, Morris et al. 2003]: theory of reasoned action [Fishbein and Ajzen 1975], technology acceptance model [Davis 1989], motivational model [Davis, Bagozzi et al. 1992], theory of planned behaviour [Ajzen 1991], a combined theory of planned behaviour/technology acceptance model [Taylor and Todd 1995], model of PC utilization [Thompson, Higgins et al. 1991], innovation diffusion theory [[Rogers 2003, Moore and Benbasat 1991] and social cognitive theory [Compeau and Higgins 1995].

According to UTAUT [Venkatesh, Morris et al. 2003] as depicted in [Figure 4], performance expectancy, effort expectancy, social influence and facilitating conditions are the four key constructs that determine usage intention and behaviour. Gender, age, experience, and voluntariness (i.e. the degree to which use of the innovation is perceived as being of free will) are mediating factors in the impact of the key constructs on usage intention and behaviour. An important contribution of UTAUT is to distinguish between mediating factors and determining factors.

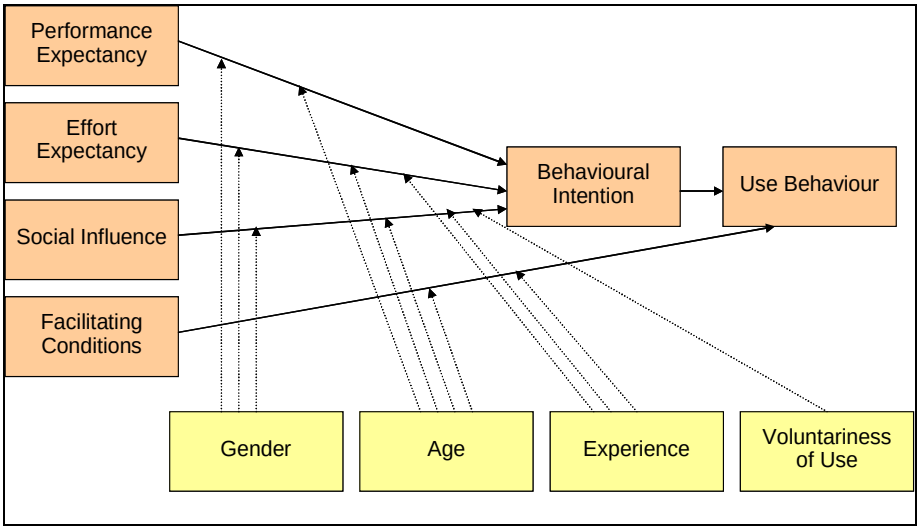

Figure 4: Diagrammatic representation of the UTAUT adapted from Venkatesh et al. [2003]

4.2 Proposed Model

Considering the research on culture and mobile phones as discussed in [section 3] and research on technology adoption as discussed in the previous section, it follows that mobile phones and culture as well as technology adoption have been well researched. What is lacking is a model to integrate the findings on culture with the other factors that influence mobile phone adoption and usage.

To address the second research question, we integrate the findings on the cultural factors that influence mobile phone usage from [section 3] with the extant models on

technology adoption as discussed in [section 4.1] to create the model presented in [Figure 5]. Like UTAUT this model is structured to have two groups of components namely the determining factors as discussed in [section 4.2.1] and the mediating factors as discussed in [section 4.2.2].

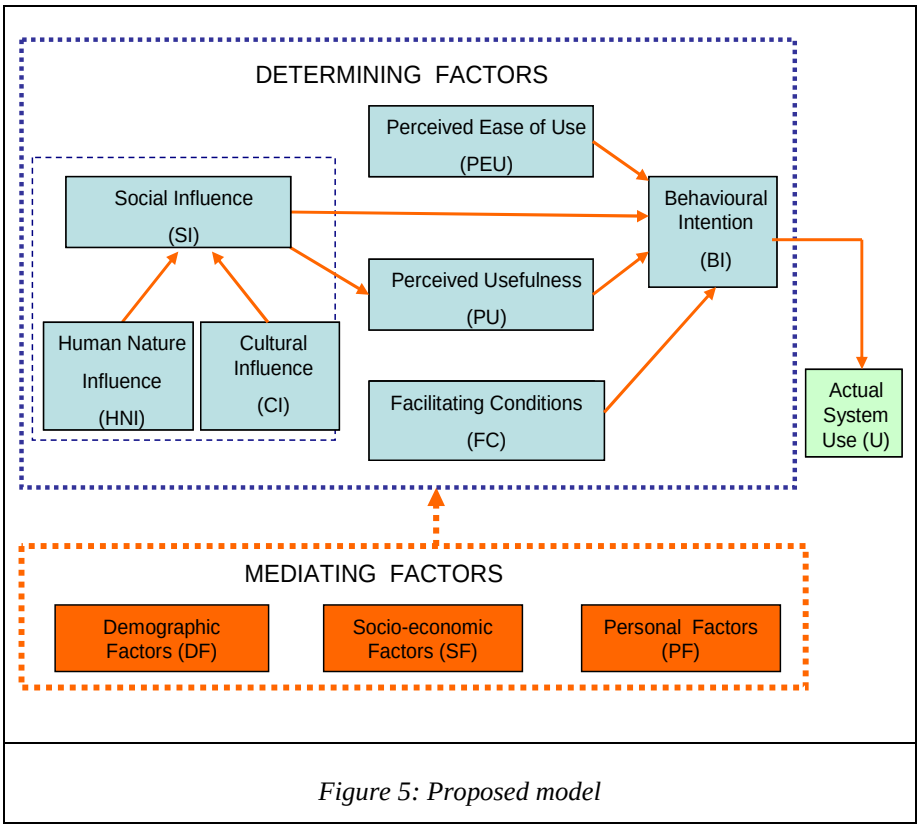

Figure 5: Proposed model

4.2.1 Determining Factors

The determining factors are the basic constructs that influence mobile phone usage. In our model they consist of social influence (SI) that encompasses human nature influence (HNI) and cultural influence (CI), facilitating conditions (FC), perceived ease of use (PEU), perceived usefulness (PU) and behavioural intention to use (BI). The external variables component in TAM has been replaced with two components namely social influence (SI) and facilitating conditions (FC). These components are now described in more detail together with the evidence from literature to support their inclusion in the model:

- Social influence (SI) (also referred to as subjective norm (SN) in the TRA [Fishbein and Ajzen 1975]): This encompasses the social pressure exerted on the individual by the opinions of other individuals or groups. SI is a component of the mobile phone technology adoption and use model by Kwon and Chidambaram [2000] and UTAUT [Venkatesh, Morris et al.

2003]. SI is also a component of the TRA [Fishbein and Ajzen 1975] but not of TAM. The need to add social norm to the TAM has been recommended by several researchers [Malhotra and Galletta 1999; Urbaczewski, Wells et al. 2002; Teo and Pok 2003b; Pedersen 2005]. In our model SI is differentiated into human nature influence (HNI) and cultural influence. (CI). We distinguish between HNI and CI on the basis that HNI represents the basic motivational needs that all humans have, whereas CI pertains to the learned, culturalised needs.

- Human nature influence (HNI): This is a new component representing basic human nature as described by the bottom layer in Hofstede's Pyramid metamodel [Hofstede 2001]. Considering mobile phone adoption we found in associated research that the influence of motivational human needs (as a component of human nature) is an important factor in explaining mobile phone adoption and usage (our research on motivational human needs is discussed in Van Biljon et al.[2007]).
- Cultural influence (CI): This is a new component, based on our findings as described in [section 3] and literature recommendations such as Urbaczewski et al. [2002]. CI has not been explicitly identified in TAM or UTAUT, although culture influences can possibly be seen as part of social influence in UTAUT.
- Facilitating conditions (FC): TAM was developed for organisations where the infrastructure and cost did not concern the user [Pedersen 2005]. Other studies on technology adoption and use have noted the need to recognise system factors notably security, reliability, digital standards and web connectivity [Kleijnen, Wetzels et al. 2004; Roberts 2004; Meso, Musa et al. 2005], while Uzoke et al. [2006] added the importance of management factors.
- Perceived usefulness (PU): The extent to which a user believes that he or she will benefit from using the mobile phone. PU is a component of the TAM. The importance of this component was also observed in the interviews we conducted.
- Perceived ease of use (PEU): The extent to which a user believes that using the mobile phone will be free of effort. PEU is a component of the TAM and the model by Kwon and Chidambaram [2000], while UTAUT [Venkatesh, Morris et al. 2003] refers to effort expectancy. The importance of PEU was verified in our interviews, observations and the quantitative findings of our study.
- Behavioural intention (BI): The intention to enact the behaviour of using the phone. BI is a component of both TAM and UTAUT.
- Actual usage (U): The actual use of the mobile phone can be measured in terms of frequency of use, usage breadth (i.e. how many contacts) and usage variety (i.e. how many different applications) [Geser 2004].

Additional influences are represented by the mediating factors as discussed below.

4.2.2 Mediating Factors

Mediating factors influence the determining factors. For example, a person may find a mobile phone useful and easy to use, but socio-economic status (mediating factor) may inhibit the adoption and use for financial reasons. Based on the existing models for technology adoption as described in [section 4.1.3] and the findings from our research, demographic, socio-economic and personal factors have been selected as the most important aspects for technology adoption and usage. Each of these factors is now explained together with some evidence from the literature for including the specific factors.

- Personal factors (PF): Refers to personal preference and user's beliefs about the benefit of technology including relative advantage, compatibility, complexity, trialability, observability, image and trust. Personal factors encompass individual beliefs (IB) which are included in the external variables (EV) component of the TAM model and explicitly noted by Barnes and Huff [2003].
- Demographic factors (DF): Variables like age and gender (included in UTAUT), education [Bina and Giaglis 2005] and technological development [Kleijnen, Wetzels et al. 2004] have been found to influence technology adoption and use.
- Socio-economic factors (SF): Described by variables like job status, occupation, and income. SF is a component of the mobile phone technology adoption and use model by Kwon and Chidambaram [2000]. Socio-economic status has also been found to influence mobile phone usage in other studies [Rice and Katz 2003].

UTAUT listed age, gender experience and voluntariness as mediating factors. Arguably gender, age and experience can be grouped under demographic factors but voluntariness is relevant only to technology use in organisations, since all personal mobile phone use is voluntary. The addition of socio-economic factors are necessary since a person's job status often determines what kind of phone the person has and what it is used for. Due to the possibilities to customise mobile phones and the fact that the device is mostly with the person and switched on, personal factors have been introduced as a factor that influences mobile phone usage.

4.3 Evaluation of the Proposed Model

The proposed model is based on qualitative as well as quantitative findings and hence it needs to be tested both qualitatively and quantitatively.

A qualitative evaluation was done in one-to-one interviews with the same set of participants as those from the first round of interviews. The model was evaluated against the criteria of simplicity, comprehensiveness, generality, exactness and clarity [Olivier 2004]. According to the results from the evaluation interviews the model is simple, comprehensive and exact. There were some suggestions about improving clarity by colour coding the determining factors and the mediating factors appropriately. The model was found to be general enough to capture influences applicable to all age groups, but the strength of the influence would probably vary between age groups. During the initial interviews we noted how personality

differences could influence mobile phone adoption and usage. This notion was strengthened in the evaluation interviews.

To evaluate the proposed model quantitatively a survey was conducted with 59 students from the university where the pilot survey was done. The participants in the validation survey were undergraduate university students, 39 (66%) of who were male, 16 (27%) female, while 4 (7%) did not indicate their gender. Considering age, 95% of the participants were between 18 and 30 years of age. The remaining 5% were under the age of 35, with a mean age of 23. The ethnic distribution (based on mother tongue) indicates that Setswana (48%) and English (29%) are the biggest groups. The quantitative evaluation was aimed at verifying the importance of the components and the relationships between the components of the model, i.e. between the different determining and mediating factors.

A multi-variant correlation was done between factors representing the components namely the social influence (SI), perceived ease of use (PEU), perceived usefulness (PU), behavioural intensity (BI), actual usage (U), as depicted in [Table 2]. The Pearson correlation coefficient was used and the significant two-tailed values at 0.05 level are indicated by one asterisk (*) and those at 0.01 by two asterisks (**).

		SI	**PEU**	**PU**	**BI**	**Usage**	**FC**
SI	Pearson	1					
	Sig.						
PEU	Pearson	.255	1				
	Sig.	.058					
PU	Pearson	.325(*)	.503(**)	1			
	Sig.	.015	.000				
BI	Pearson	.277(*)	.549(**)	.293(*)	1		
	Sig.	.039	.000	.024			
U	Pearson	.082	.051	.018	.288(*)	1	
	Sig.	.547	.703	.893	.027		
FC	Pearson	.430(**)	.126	.220	.292(*)	.141	1
	Sig.	.001	.350	.101	.027	.294	
	N	56	57	57	57	57	57

Table 2: Correlation between components of proposed model

On vertical inspection of [Table 2] it follows that SI has a significant positive correlation (0.05 level) with PU and BI and a highly significant positive correlation (0.01 level) with FC. This verifies that SI affects PU and BI as proposed in the model. The correlation between SI and FC had not been anticipated and can possibly be attributed to the target group of students exposed to the same student culture and facilitating conditions. PEU influences BI as proposed in the model and there is also a correlation between PEU and PU. PU influences BI and BI influences U as proposed by the model, while BI is influenced by FC. The correlation between BI and FC is important in distinguishing mobile phone adoption and usage from other technology adoption and usage where facilitating conditions are not as important.

Regarding mediating factors, the socio-economic and demographic factors were partially controlled for by selecting students. Having selected participants for age and education, the variable of technological development was used to represent the demographic influence. Significant correlations were found between technological development on the one hand and PEU (0.480**) and actual usage (0.274*) on the other. Using one variable to verify the concept of demographic influence is limiting but demographic factors are retained due to evidence from literature and our findings from the interviews.

The last mediating factor is personal factors (PF) which was based on the variable of technical orientation i.e. Rogers's scale which goes from laggard to innovator. Significant correlations were found between PF and PEU (0.661**) and we can conclude that there is at least one personal factor, i.e. technical orientation, which mediates perceived ease of use (a determining factor).

5 Discussion

The findings of our study support the fact that culture influence mobile phone adoption and usage (the first research question). But doing the research on cultural issues affecting mobile phone use was not always plain sailing. We encountered several problems along the way. The most prominent of these are highlighted below:

- Ethnic culture is a sensitive issue,. As noted, categorisation according to culture in our studies was problematic since participants selected to represent non-English cultures, did select English as their mother-tongue. In South Africa, English has a higher status than most other languages in the working environment and this may explain this selection. Another problem with cultural categorisation is that many of the participants were found to be bi-cultured or multi-cultured by birth or education. This means that they do not identify with any one specific ethnic culture.
- The lack of suitable standardised questionnaires to research the influence or effect of culture is a problem. The questionnaires on cultural awareness are often aimed at measuring human-human interaction which is quite different from human-computer interaction. For example, when answering a question on time-orientation, one participant noted that in human-human interaction he tends to be long-term oriented but in human-computer interactions he is short-term orientated.
- Furthermore, when analysing data from questionnaires it is important not to analyse them from given perspectives only. Data captured from these surveys had to be analysed in detail to see if the questionnaire design was not masking alternative possibilities or findings. For example, in our data collection survey analysis the grouping of the questions, as planned, did not provide consistency in measuring the dimensions. However, alternative groupings of cultural dimensions did emerge from the optimal scaling method. This implies that the support for cultural dimensions was in the data but could only be extracted by applying an alternative method.

Considering the second research question, the evaluation interviews provided evidence that the proposed model is useful in representing the factors that influence

mobile phone adoption and use. The inclusion of social influence in technology adoption has been recommended in the literature as discussed in [section 4.1.3]. The main contribution of this research is to provide evidence that SI (which encompasses human nature influence as well as cultural influence) influences perceived usefulness (PU) and behavioural intention (BI), and then to represent the social influence together with the other determining and mediating factors. A secondary contribution is the identification and positioning of facilitating conditions and personal factors in the mobile phone adoption and usage scenario.

We provided evidence for the influence of cultural factors on mobile phone adoption in [section 3.2] and we provided evidence for the influence of human nature on mobile phone adoption in related work [Van Biljon, Kotze et al. 2007]. However, a limitation of our evaluation is that we validated social influence as a whole, and not the responses to CI and HNI separately.

When we compare the proposed model with previous models, we find that UTAUT did include social influence (SI) but limited the influence of SI to behavioural intention (BI). Furthermore UTAUT represented facilitating conditions but noted only the relationship between facilitating conditions and actual use, whilst we found that facilitating conditions also influence BI. Like TAM this model has perceived ease of use (PEU) and perceived usefulness (PU) as components that influence BI and eventually actual use. Unlike TAM the relationships between the basic elements are mediated by demographic factors, socio-economic factors and personal factors. The TAM component of attitude has been omitted, like it has also been omitted from UTAUT.

Like UTAUT the proposed model makes a distinction between determining factors and mediating factors but the mediating factors, namely demographic, socio-economic and personal factors differ from the factors proposed by UTAUT. This difference in mediating factors reflects the nature of the mobile phone scenario. Facilitating factors, which include cost, infrastructure and service, emerged strongly from the qualitative observations although they may not be important in technology adoption within organisations.

Apart from acknowledging that human and personal factors mediate mobile phone adoption and usage, a detailed investigation of personality has been excluded from the scope of our study. However, the personality attributes of nervousness, enthusiasm, originality, appreciativeness and control, as noted by Hofstede and McCrae [2004], could possibly be useful in understanding user behaviour not accounted for by this model. The fact that the mobile phone is the ultimate, personal computer supports the idea that personality could possibly be included as a mediating factor.

The proposed model could be useful in bridging the gap between research from the fields of HCI, marketing and sociology as it integrates factors investigated in these different fields. Finally, the development of a set of questionnaires to capture mobile phone usage needs and behaviour is seen as a major contribution of this research.

6 Conclusion

Based on the findings of our study we conclude that cultural dimensions do influence mobile phone adoption and usage. Our findings suggest that mobile phone use have a

unique set of cultural dimensions not necessarily corresponding to those international variables proposed by Hofstede or other researchers. This would imply that the concept of a 'unique mobile phone usage culture' may exist that do not necessarily correspond to the culture that exist in human-human relations. This issue has been identified as a major future research project to pursue.

The second important contribution of this paper is a model that explicitly includes social influence in representing the factors that influence mobile phone adoption and usage, where social influence encompasses the components of human nature (inherited) and culture (learned). The model combines the influence of mediating factors (personal, demographic and socio-economic) and determining factors (social influence, perceived ease of use, perceived usefulness, and facilitating conditions) on behavioural intention and actual mobile phone usage. Given the individual's vulnerability to infrastructural factors, the effect of facilitating conditions on behavioural intention, as well as on actual use, distinguishes personal mobile phone usage from technology used in organisations.

Mobile phones are the ultimate, personalised, personal computer, mobile phone adoption and usage therefore seem to differ from other technology adoption and use in ways we are only beginning to understand. The research reported on in this paper makes a contribution on integrating research from sociology, marketing and HCI in the domain of mobile phone adoption and usage. However, we found many unanswered questions along the way and there is therefore a need for much more debate on integrating research on mobile phone adoption and usage across disciplines.

Note: All the questionnaires used in our research can be found in Van Biljon [2007]

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