MOBILE PHONE USE ACROSS CULTURES: A Comparison between the UK and the Sudan.

A thesis submitted for the degree of Doctor of Philosophy

By

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ABSTRACT

Over the last decade the use of mobile phones has increased dramatically everywhere by people from different cultural backgrounds. However, while such technological adoption move on at an ever increasing pace all over the world, the key problem for designers and developers of mobile phones is how to develop mobile phone services that effectively support the dynamic and flexible communication needs of such diverse groups of users.

To counter this problem, this thesis focused on establishing how people from different cultural backgrounds use mobile phones to achieve their communicative, social and informational goals. Questionnaires and interviews were undertaken and analysed to achieve this. The findings from the analysis led to the development of two prototypes missed call services; the icon-based missed call service (IBMCS) and the personalised icon-based missed call service.

Several key findings emerged from this research. For example, mobile phone users in the Sudan and the UK differed in the way they used their mobile phones especially in the public places. British participants were more comfortable using their mobile phones in public sphere. British and Sudanese stated that they would like to use an IBMCS to support their communication needs. However, Sudanese users were more keen than the British participants on personalising the developed missed call service to aid the management of their communication needs and to better coordinate their activities. The evaluation of the personalised IBMCS highlighted an important re-design implication, such as allowing the receiver to manipulate the receipt of missed calls in public settings

Keywords: mobile phone, cross-cultural communication, human computer interaction (HCI).

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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I dedicate this thesis to the memory of my god father, Abdel-Rahman Mahdi.

DECLARATION

The following papers have been published, or submitted for publication, as a result of the research conducted for this thesis.

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Chapter 1

Introduction

1.1 Overview

This thesis highlights the current limitations in incorporating cultural differences in the design of mobile phone interfaces and services. As a consequence of this, there are critical gaps in identifying the essential needs of mobile phone users who reside outside the mobile phone developers' cultural zones, and in understanding how user-centred technology can effectively support culturally-specific design preferences. To help bridge such gaps in understanding, the research presented in this thesis set out to investigate the broader context of mobile usage in two cultures, the UK and the Sudan, and to investigate mobile phone users' perception of existing mobile phone features.

The knowledge gained from the resulting rich understanding of the impact of cultural factors on mobile phone usage patterns was fed into the development of two novel prototype technologies. These were expert and user assessed. First, to establish their utility and effectiveness in supporting mobile phone users in their communication needs; second, to indicate where re-design was necessary; and third, to provide design implications for future mobile technologies.

The work presented in this thesis is situated within the fields of Human-Computer Interaction (HCI) and Cross-Cultural Communication, and used a mix of *qualitative* and *quantitative* methods to achieve its aims.

1.2 Background

According to Gartner Dataquest, mobile phones are widespread with the number of worldwide mobile phone sales exceeding 990.8 million units in 2006, a 21.3% increase from 2005 in which the sales of mobile phones units were 816.6 million (Telecom paper, 2007). Growth in the use of mobile phones by people from different cultural backgrounds has created both demands and opportunities for the design of new services that cater for specific cultural needs.

Culture can be defined as the collective programming of the mind which categorises one group of people as distinctive from another group (Hofstede, 1980). Hofstede (1980) found that people from different cultural backgrounds differ in their perceptions, cognitions, values and acceptance of notions and products. Thus, it is important to thoroughly understand different cultural characteristics of users when designing mobile phone services for people from different cultural backgrounds. To date, research related to incorporating cultural elements into technology design has been mainly focused on web site design. Little research has focused on the relationship between culture and mobile phone design, despite the pervasive use of mobile phones everywhere.

Recently, however mobile phone developers noted cultural differences and their impact on users' preferences. Nokia reports that Eastern cultures display different consumer preferences from Western ones (Christian et al., 2003).

Many cultural variables have been suggested to categorise cultures. The cultural classification adopted in this research is the Hofstede typology (Hofstede, 1980). This typology introduces five dimensions to differentiate between cultures: collectivism versus individualism, power distance, uncertainty avoidance, masculinism vs. feminism, and long-term vs. short-term orientation.

The Hofstede (1980) cultural classification is widely used to understand cultural differences, especially in the field of computing and software development. The reason behind the popularity of the Hofstede classification is closely related to the substantive results obtained from 16,000 questionnaires completed by IBM employees. Søndergaard (1994) found that researchers who used Hofstede's model

were encouraged by the relevance of the original framework and the rigour of the method. Mooij (2004) describes the Hofstede typology as a useful framework that reduces the complexities of culture and helps in mapping important cultural differences.

Two countries were selected to investigate the impact of cultural differences on mobile phone use. The UK, which is one of the leading countries in mobile phone adoption, and the Sudan, as a representative for the African continent, which is one of the fastest growing markets for mobile phones in the world, with a yearly increase of 65% (BBC News, 2004).

1.3 Motivation for the research

Over the last few years the use of mobile phones has increased dramatically everywhere by people from all over the world (Telecom paper, 2007). New ways of using the mobile phone in many cultures have emerged. For example, the practice of missed call where the caller makes a phone call and hangs up intentionally before the recipient can answer the call (Donner, 2005). Donner (2005) reported that people in Africa make use of the mobile phone and the network resources to convey different social messages, in certain cultures the missed call is a recognized mode of communication. Despite the increase use of the missed call by many users up to date the missed call was not incorporated in the design of mobile phones.

Furthermore, the growth in the availability of mobile phone, and the use of mobile phones by people from different cultural backgrounds have also created demands and opportunities for the design of cultural-specific mobile phone service that symbolize cultural elements, and meet personal needs. .Nokia reports that Eastern cultures display different consumer preferences from Western ones (Christian et al., 2003).

Up to date two approaches are used to design mobile phones that meet cultural needs, these two approaches are commonly used in website and software design and are known as globalisation and localisation. According to Yu and Tng (2001), adopting the globalisation approach allows developers to design mobile phones services and applications in a standardised and consistent way that is mainly based on Western users' without consideration for users who reside outside the developers' zone of reference.

In the localisation approach, certain types of changes (e.g. colour, appearance) are performed on mobile phones services in an attempt to meet local customs. Although this approach tries to meet local preferences, changes are performed in an already developed product which makes the changes limited and often trivial.

Many researchers have criticised both approaches for developing mobile phone services and applications. For example, Katz (2001) argues that both approaches fail to meet cultural communication needs that surpass superficial changes. There is a need to carry out a thorough investigation of mobile phone use and compare usage in the developing and the developed world to acquire better understanding of how users in different cultures use their mobile phones, and to develop mobile phone services that meet users' cultural needs.

In light of the background to this research, the academic motivation that drives this thesis is to extend the existing research in the influence of cultural differences in mobile phone usage style. Furthermore, to better understand ways of incorporating cultural elements in the design of mobile phone service to support users' in their communication.

Practical concerns are also an important driving force for this research because this approach can also provide framework for future research and development by academics that seek to investigate the impact of cultural differences in the design of mobile phone service. The research can also offer developers in the industry insights into designing cultural-specific mobile phone applications and services.

In relation to the two developed missed call services used in this research, they are not intended as 'end products'. Rather, the two missed call services are intended to be used to investigate the need for such services and their usefulness in supporting cultural communication needs.

1.4 Aim and Objectives of Research

The aim of this research is to better understand the effect of cultural differences on mobile phone use. The specific objectives of the research to support its aim are as follows:

1. Adapt appropriate research methods and analytic tools from the HCI and cross-cultural communication literature to investigate mobile phone usage.
2. Undertake a comparative study of two selected cultures to understand the pattern of mobile phone usage.
3. Identify mobile phone users' communicative, cultural and technological requirements from 2.
4. Use the findings generated from 3 to design and develop missed call services.
5. Evaluate the developed missed call services to investigate the interactional potential of mobile phone communication to support cultural and social relationships within each culture.
6. Provide recommendations that emerge from the research for future mobile phone service development to support cultural communicational needs.

These objectives will help the development of an integrated approach to the study of mobile phone usage across cultures and, by reflecting on previous research, help to identify limitations of previous research for designers of mobile phones as well as gaps in knowledge that need to be filled. By documenting and analysing the interaction of mobile phone users across two contrasting cultures, the research is able to understand 'what type of services' and 'why' mobile phone users use their mobile phones in specific ways. In addition, these objectives offer a chance to explore the concept of the 'lightweight' design solutions, which allow users to solve their communication needs effectively.

1.5 Research Methodology

For the missed call service developed in this research, a user centred design approach is adopted that incorporate users' views into the development process to enhance the usefulness and usability of developed technologies (Maguire, 2001).

An experimental methodology is also employed to provide a controlled framework for the manipulation of the independent variables of interest, and to measure their effect on the dependent variables. Field experiments, rather than laboratory experiments, are conducted in order to reflect more accurately the everyday conditions in which mobile phone services are used, and to subsequently increase the ecological validity of the

results. Chapter 3 provides a detailed discussion of the methodologies used in this thesis.

1.6 The Scope of Research

The research undertaken for this thesis involves investigating and documenting the nature and demands of mobile phone users' cultural needs for the purpose of future development of mobile phones that seek to effectively support mobile phone users' cultural needs. Given the purpose of the research presented in this thesis (a user-centred design approach was used instead of a technology-centred one) full technology development was not necessary to explore the issues at the centre of this thesis. Thus, the prototype technologies developed are designed primarily as a means of exploring communication and cultural needs.

The scope of this thesis is primarily to support and offer the HCI and Cross-Cultural communication researchers an augmentation of current knowledge of mobile phone use across cultures. As a secondary interest, the research seeks to provide some rich insights that could be usefully employed in the development of commercial mobile phone application and services.

1.7 Thesis Outline

This thesis is divided into seven chapters. The content of the following six chapters is briefly outlined below:

Chapter 2: The *Literature Review* examines the academic research to date on mobile phone use and cross-cultural issues. In particular, the idea of social interaction is examined, mobile phone adoption is described, and examples of mobile phone use across cultures, e.g. use in public places, missed call, sms are also discussed. The role of cultural typology in understanding cultural differences is also discussed and some cross-cultural studies are examined. The literature review identifies gaps in considering cultural issues in mobile phone service design.

Chapter 3: The *Research Methodology* chapter is divided into two sections, corresponding to the two methodologies used for the research. A description and justification is provided for the selection, and use of, both the Human Centred Design

(HCD) and the experimental methodologies. For the HCD process, the five design stages are described. For the experimental methodology, a general discussion is provided on the experimental design, participant sample, and the prototypes used in the two experiments.

Chapter 4: *Mobile Phone Use in UK and Sudan* describes the first study of the research which aims to explore differences in mobile phone use between UK and Sudanese users.

Chapter 5: *Use of Icon-Based Missed Call Service:* describes the first field experiment of the research, which compared users' perception of the icon-based missed call service in the UK and the Sudan. The experimental methodology is presented, including the design used, the variables measured, the participant sample, the authoring tool used to develop the prototype (Macromedia Flash), the procedure followed, and the data collection instruments. The results are then documented, followed by a discussion section and a chapter summary in conclusion.

Chapter 6: *Personalisation (Customisation) of Icon-Based Missed Call Service in the Sudan* describes the second field experiment, designed to investigate Sudanese users' perception of the personalised icon-based missed call service, focusing on the issue of customisation of the service. As in Chapter 5, the methodology, results, and discussion are presented, concluding with a chapter summary.

Chapter 7: *Conclusion* presents a summary of the research findings from Chapters 4, 5 and 6. A discussion is then presented of the findings, and the contribution these make to the understanding of the ways in which, and the extent to which, cultural differences may be used to design cultural-specific services such as the missed call service used in this study. The chapter also identifies potential limitations of the research work conducted, and possible areas for future experimental research that may extend the current research findings.

Chapter 2

Literature Review

2.1 Introduction

The main aim of the research work reported in this thesis is to investigate the influence of cultural differences in mobile phone usage style.

This chapter discusses the background to the thesis within the HCI and Cross-cultural areas. The intention is to examine several critical areas of interest relevant to the research, as they appear in the literature. Initially, Internet and social interaction, the idea of communities online are examined and how this type of interaction might not be available for users in the developing world where PC use is scarce and the mobile phone is more commonly used. Then, the use of mobile phones in different cultures and the emergence of new ways of using mobile phones such as the use of mobile phones in public places and the use of missed calls are investigated. This chapter also explores the concept of culture and the use of cultural typologies to classify cultural differences, with particular reference to the Hofstede typology adopted for research work reported in this thesis. This chapter also recapitulates findings from previous studies on cross-cultural technology use. The reason behind selecting the UK and the Sudan for the purpose of this thesis is also presented.

2.2 The Internet and Social interaction

The revolution in Internet technology has changed people's perception about connectivity, distance and time zones. The Internet has enabled people to connect with individuals who are at far distance as well as those who are at close proximity at different times. Wellman (2000, 2001b) argued about the role of the Internet in changing the idea of communication from linking people-in-places to linking people-at-any-place. According to Wellman, the place was previously the portal but with the technology of the Internet, and now mobile phones, the person has become the portal.

In the past, access to computer-mediated communication was available only to employees in the government, military, or university research communities (King, Grinter and Pickering, 1997), and to work-related duties (Greif, 1988).

As more diverse groups of people have gained access to the Internet, their motives for using it have varied. For example, looking for information, services or goods, and social interaction, which is one of its most common uses (Kraut, et al., 1999). According to Preece et al. (2003) people meet online to chat, discuss issues of interest, play games, find support, or simply just to stay connected with others. These groups that are gathered and formed online are known as *online communities*.

The term online community embraces a wide range of online activities such as discussion groups or chat rooms. Researchers have proposed several definitions for online communities.

One of the earliest definitions of online communities was put forward by Howard Rheingold (1994, p.57) who described them as
"Cultural aggregations that emerge when enough people bump into each other often enough in cyberspace".

Whittaker, Issacs, and O'Day, (1997, p. 137) pointed out the main features of online communities as follows:

- Members have a shared goal, interest, need, or activity that provides the primary reason for belonging to the community.
- Members engage in repeated, active participation and there are often intense interactions, strong emotional ties and shared activities occurring between participants.
- Members have access to shared resources and there are policies for determining access to those resources.
- Reciprocity of information, support and services between members is important.
- There is a shared context of social conventions, language, and protocols.

Jones (1997), Rheingold (1993) and Wellman (2000) viewed online communities as a group of users who have shared interests, experience and/or needs, they form relationships, mingle with other formulating social groups offering each other emotional support. These online communities offer the individual a strong feeling of fitting in and a sense of shared identity.

Preece (2000) defined the online community as a crowd of people who communicate in a virtual environment. They have a purpose, are supported by technology, and are guided by norms and policies.

Preece et al. (1998) also argued that online communities can be characterised by the software that supports them. Examples of software that support communication online are listserver, newsgroup, bulletin board, Internet Relay Chat (IRC), or Multi-User Dungeon (MUD) (Lazar, Tsao and Preece, 1999). However, Ellis, Gibbs and Rein (1991) identified two distinctive features for any of this software: whether it is synchronous or asynchronous. Examples of synchronous technologies are chat systems and instant messages. In 1988, Jarkko Okarinen developed the Internet Relay Chat (IRC). Instant Messenger (IM) is a simplified version of IRC, which allows two or more people to carry on a conversation, in real-time, using (initially) text-based messages. However, still images and videos are now enabled on IM. Communication through this synchronous technology requires the availability of users to be online during the interaction. Naturally, the response is quite swift and short. The use of IM has grown over the last few years. 40% of Internet users use it (Nielson Net Ratings, 2002). It is used to avoid boredom, to socialise (Schiano et al., 2002) and to maintain contact with casual acquaintances (Lenhart et. al., 2001). Leung (2001) found that many Chinese College students use ICQ (I seek you) a messaging programme, on a daily basis, and their motives for ICQ use differed depending on whether they were heavy or light users. Heavy use of ICQ was motivated by affection and sociability, whereas light ICQ was motivated by keeping up with fashion trends. Nardi, Whittaker and Bradner (2000) found that in the inactive state, IM participants sometimes monitor the presence of others, and use the medium to sustain a sense of connection.

The other software feature that supports interaction between social groups is asynchronous technologies, for example bulletin boards, listservers or E-mail. E-mail is a popular online application according to Kraut (1999) and the US Department of Commerce (2002). Levitt and Mahowald (2002) predicted that the number of e-mail messages sent daily, worldwide, will have increased from 31 billion in 2002 to 60 billion in 2006. Lee (1996) described E-mail as a hybrid medium combining elements of the phone and letter, i.e. conversational informality in text format. The main usage for E-mail is communication; Ducheneaut (2002) found that people tend to be more outgoing when communicating through E-mail and he argued that it actually enables its users to widen their communication circles.

Communication through E-mail and other asynchronous technology (e.g. bulletin boards) does not necessarily entail the availability of participants online at the time of communication. For example, if someone sends an E-mail he/she will not expect the receiver to reply immediately, as in instant messages. Users of this technology understand that response is not expected immediately, and communication through asynchronous technology takes longer than for synchronous technology. For this reason, online communities tend to use both synchronous and asynchronous technologies to support interaction. The nature of online activities and social interaction is similar to face-face communication. The only difference is that users do it with words on screens, leaving their bodies behind, independent of local time or location (Rheingold, 1994).

There are different types of online communities, for example 'communities of practice', physical communities, online medical support, educational and e-business communities.

2.2.1 Communities of practice

As termed by Wenger (1998), these include professionals who share knowledge and their expertise to tackle problems within their specific field. Feenberg (1993) found that members of this community have a shared mission and clear duties. They offer professionals emotional support as well as information and discussion (Moon & Sproull, 2000; Sproull & Faraj, 1997; Williams & Cothrel, 2000a). Collaboration in a

community of practice is achieved through dialoguing, participating, controlling decisions, and making meaning (Ruopp & Haavind, 1993; Shulha & Wilson, 2003).

2.2.2 Physical communities

Another type of online community is the physical community. These online communities are usually geographically-based. Examples of such communities include the Blacksburg Electronic Village (Cohill, 1997), and community free nets, such as those in Cleveland and Washington, D.C. (Schuler, 1994). These types of online communities are based on news, events, people, and locations in the physical community. Government services can be provided through these online communities (Huff and Syrcek, 1997).

2.2.3 Educational online communities

An interesting type of online community is that designed for educational purposes. Technology is employed to form learning groups; individuals in these groups can learn together, and share ideas and resources supported by teachers and instructors (Hiltz, 1998; Salmon, 2000). The communication that is available for the students online through the Internet and offline through physical meeting has enabled students to make good progress in their academic work (Lazar & Preece, 1999b).

Emerging recent quantitative results confirmed the positive impact of online learning settings in achievement. For example Morris and Zuluaga (2003) compared various computer programming courses, which were delivered on campus with traditional lectures, tutorials and laboratory classes, and online through e-mail and online chat discussions organized by students groups. Using large samples with the same assignment and final exams, they found that online students achieved higher grades than on campus students.

Poirier and Feldman (2004) assigned introductory psychology students randomly to a traditional course or to an online course from a population of students. Students in the online course performed better on exams and equally well on paper assignments compared to students in the traditional course. Online students also showed greater satisfaction with the course than those in the traditional course.

Peacock and Hooper (2007) highlight the role of e-learning as a medium that support and enhance the learning environment of pre -and post –registration physiotherapists.

2.2.4 Online communities for medical support

The Internet is an important source for health information and advice. (Sillence et al., 2007). It has been reported that 80% of adult Internet users have accessed it for general health information (Fox & Fallows, 2003). Pew Internet & American Life: Online Life Report, 2004 found about 52 million American adults, or 55% of those with Internet access have researched a disease or medical condition on the Internet and the number continues to grow (Rainie & Packel, 2001). 48% of the participants in this study reported that the advice they found online improved the way they take care of themselves, and 55% reported that their Internet access improved the way they get medical and health information (Rainie & Packel, 2001).

Different online communities have been developed to offer medical support for patients, in these communities, users are able to access more medical information about their illness, share experiences, receive and offer support (Rozmovits and Ziebland, 2004). Researchers found that the appeal of online communities is particularly strong for those who seek emotional support, the emotional support users get was found to strengthen their relationships and can be especially valuable for disable people and those who are scattered around the world. (Cummings, Sproull, & Keisler, 2001; Davidson et al., 2000; Sproull & Keisler, 1986).As with other online communities, health information is accessed using bulletin boards, UseNet News or listserver communities (Rice, 2001).

The rapid growth of online communities has highlighted the notion of trust especially within the field of medical online communities (Sillence et al., 2007). Researchers identified different reasons that influence users' decision to trust certain health sites over others. For example Wang and Emurian (2005) identify four factors of trust including interface design features i.e. structure design (the look and feel of the site) content design (inclusion of security and privacy policies seals of approval or third party certificates) and social cue design (photographs and other cues of social presence). Briggs et al., (2004) underline the importance of personalization in the formation of trust judgments. Silence et al. (2006) developed a model for understanding trust factors in web-based health sites. The framework consists of three

categories: heuristic analysis i.e. visual appeal, content evaluation (language style and tone) and longer-term engagement (personalisation and interactivity.

2.2.5 E-business communities

E-business companies offer their customers valuable information such as product information and online community sites that are focused around their goods to enhance loyalty. The aim of these companies is to gain more customers by facilitating an atmosphere for communication with and between their customers (McWilliams, 2000). This interactive communication between online e-business users provides the company with information about consumers' preferences and favourite products (de Figueiredo, 2000; Hagel & Armstrong, 1997; McWilliams, 2000; Preece, 2000). Consumers, on the other hand, seek a good deal that is delivered at an agreed time, but most importantly they want their personal details to be secure.

Researchers observed that social interaction that occurs in a virtual environment has some similarities with face-to-face communication (Katz and Aspden, 1997). For example, immediate responses, as people interact with each other in real time and receive instant replies to questions. Another similarity between face-to-face and social interaction in a virtual environment, is the ability to express the state and mood of communicators which in the case of the face-to-face interaction, can be expressed by body language, voice tone, etc., whereas in a virtual environment, smiley faces are used to convey emotional tone (Rivera et al., 1996). However, interaction in a virtual environment offers its users a special opportunity to project and portray their characters as they wish. Turkle (1995) found that some online community members tend to explore new personalities online, and they portray different traits of their personas. For example, those who are shy and find it difficult to make relationships in person can feel more confident to interact online, since the situation does not involve confrontation and appears to be less threatening for an introverted person.

Another interesting feature that is available for online communities is that users can engage in an online relationship without ever having to see or meet each other. This can actually create a more relaxing situation that leads communicators online to reveal more information about themselves (Lea. Et., 1992; Spears, Russell & Lee, 1990; Walther, 1996). In fact, it was found that when people engage online in a discussion

on limited topics and discover that they have shared experiences and understanding, a false sense of feeling alike and shared identity can develop. People can then feel more trusting and relaxed to disclose further information about themselves. Wallace (1999) termed this attitude as self- disclosure reciprocity. It works by 'If you tell me something about yourself, I'll tell you something about me.'

Interestingly Joinson et al. (2007) investigated the issue of self-disclosure on self administered online survey. Joinson et al. (2007) reported that using a personalized salutation increases response rates of online surveys when the source of the invitation or the requestor is high power/status on the organization. A justification for such attitude presented by Joinson (2007) was perhaps the personalized salutations increase people's sense of identifiability – which when linked with a high power requestor increase "socially desirable, strategic behaviour". Similarly Heewegh et al. (2005) also found some evidence that personalized surveys also tended to be associated with increased socially desirable responding. Barron and Yechiam (2002) found that there is evidence that personalized salutation which makes the respondent feel more special has a positive correlation with response rates. For example addressing an e-mail request for assistance to a single addressee as apposed to five people led to more responses, and for those responses to be both more helpful and longer in length.

Although Joinson et al., (2007) argue that personalization increases the reward of online survey, but he also found that personalized salutation serves to reduce disclosure to a sensitive personal questions such as how much is your salary. This finding suggests that a personalized salutation may serve to reduce participant's perception of anonymity and therefore, they feel less willing to disclose personal information. Similarly Andreasen (1970) reported that personalised salutation lead to reductions in response rates to sensitive questions.

Many researchers found that some online users tend not to disclose personal information or at least disclose incorrect information. A recent survey by Pew Internet and American Life project (2005) found that nine out of ten US Internet users had changed their behaviour online due to the fear of installing spyware and viruses.

Women were found more likely to switch their gender online to deflect unwanted attention (Bruckman, 1993; Herring, 1992; Turkle, 1995, 1999). But this wrong portraying of gender can easily be sensed, especially by linguists who can spot differences in semantic and syntactic conversational styles between the two genders (Herring, 1992; Reid, 1993). Tannen (1990, 1994) found that women tend to be penitent and use more adjectives in their conversations, where Herring (1992) found that women express their questions in a defensive way to avoid criticism.

The expanding growth of the Internet over the last few years and its ability to facilitate social interaction is well documented in the literature (Cole et al., 2000, Hampton and Wellman 2000, Kraut et al., 2002, Robinson et al., 2001 and Uslaner, 2000). Katz and Aspden (1997) reported that the Internet has provided a suitable environment to create new personal friendships.

Despite the unlimited benefits of the Internet in its ability to facilitate social interaction, learning environment and business opportunities but people in the developing countries do not have the same access to the Internet in comparison to the developed world. In turn, people in the developing world are eliminated from the chance of forming and participating on online communities. The Internet penetration rates vary vastly from one continent or even country to the other. For example, in Europe, 312,722,892 users have Internet access (38.7 % of the population), whereas in Africa, only 3.6% of the population have Internet access (ITU, 2004). According to Internetworldstats (2006) the total number of 32,765,700 African Internet users is smaller than those who use the Internet in the UK (37,600,000). Most African Internet users are centred in the capitals and urban areas, as in rural areas, the existence of PCs and Internet connection is scarce (Donner, 2005).

There are many reasons for the lack of access to the Internet in Africa. For example, the affordability of computer equipment. Oyeyinka and Adeya (2004) conducted a cross-country examination in Nigeria and Kenya and found that Internet use was constrained by structural as well as cost factors. In their study, they found that the cost of owning a PC compels users (especially academics) to access the Internet in cyber cafes and other public places.

Therefore, the poor connectivity of the Internet, the high cost entailed to afford the required equipment, and the cost of maintaining a monthly Internet connection have unintentionally excluded some users from communicating through the Internet. However, on the other hand, people in these parts of the developing world have made use of another available medium of communication that is the mobile phone. According to Donner (2005) the mobile phone plays an important role in Africa to manoeuvre social interaction, facilitate learning as well as creating business opportunities. Mobile phones in the developing world especially in Africa, in addition to its expected uses, enabled its users to communicate in an analogous way as communication on online communities. For example, Agar (2003) observed how people used the mobile phone to offer support for each other during the volcanic eruption in Eastern Congo. Donner (2005) reported that in Rwanda the mobile phone is used to link rural health clinics involved with the treatment of HIV patients. The support provided through the mobile phone can be similar to that received in online communities.

Interestingly, similar to online 'community of practice', Idowu, Ogunbodede & Idowu (2003) found that Nigerian doctors use mobile phones to communicate with each other across different parts of a large hospital to share knowledge, and to respond to emergencies when offsite.

The mobile phone has also been used for e-learning in Africa (Masters, 2005; Mutula, 2002; Stone, Lynch & Poole, 2003). These researchers found that the mobile's portability, simplicity, and affordability make it a natural fit for education programmes in places where PCs and Internet connectivity may be limited.

Some (Bray, 2005; Sesay, 2005) noted that mobile providers can have a positive impact on calming conflict situations in post-conflict nations like Rwanda, Afghanistan and East Timor. Others look to the everyday, arguing that mobile phones contribute to stronger social capital in Africa (Goodman, 2005). Donner (2005) found that the mobile phone is used to facilitate new business connections for small businesses. The New York Times (2005) reported on an illiterate woman living on the Congo River, who asked her customers to call her on her mobile phone if they wanted to buy fresh fish. *"She does not have electricity, she can not put the fish in the*

freezer", Mr. Nkuli of Vodacom said, "*So she keeps them in the river, tethered live on a string, until she is called on her mobile phone. Then she retrieves them and prepares them for sale*".

The importance of the mobile phone as almost the solitary tool in the developing world to maintain social support, share knowledge and its role in e-learning, e-business and politics, is undeniable. Kelly, Minge and Gray (2002) went further, as they found that the mobile phone can actually narrow the digital gap between the developing and the developed world more than the Internet.

2.3 Mobile phone adoption

The mobile phone has diffused at different rates in various world regions. Figure 2.1 shows that Europe leads (55.4%), followed by Oceania (54.4%) and North America (53%). These three regions have more than one mobile telephone subscriber per two persons. Next on the list is the American continent (21.9%), Asia (15%) and Africa (6%), all of which have less than half the penetration rates of the top three regions (ITU, 2002).

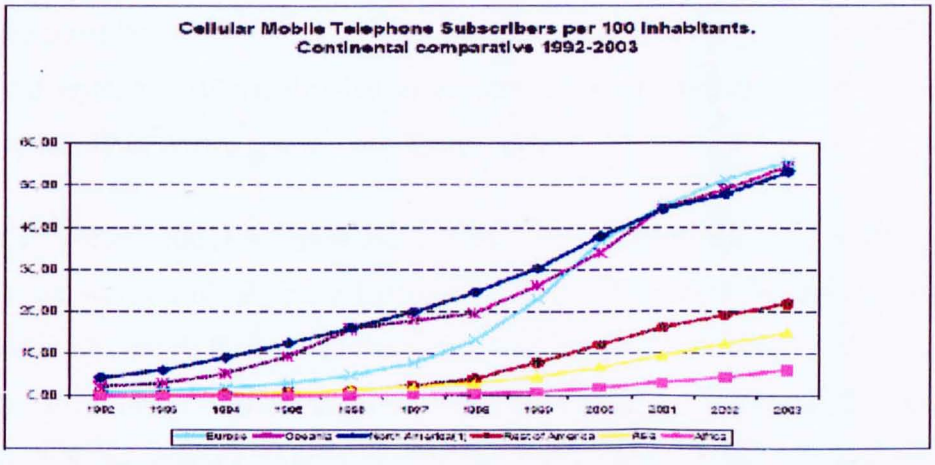


Figure 2.1 Cellular Mobile Telephone Subscribers, per 100 Inhabitants (1992-2003) by Continents

(1) North America: Canada + United States
Note: In the original, some figures referred to 2002.
Source: ITU World Telecommunication Indicators Database.

Vaananen-Vainio-Mattila and Ruuska (2000) found that European countries were the first to join this mobile phone phenomenon. Further evidence for the European advance uptake of mobile phone adoption can be been seen in Table 2.1

Table 2.1 Leading European Nations in Mobile Telephone Adoption, 2003

Luxembourg	119.38	Portugal	89.85
Italy	101.76	Denmark	88.32
Sweden	98.05	Ireland	87.96
Iceland	96.56	Austria	87.88
United Kingdom	91.17	Switzerland	84.34
Finland	90.96	Netherlands	76.76
Norway	90.89	France	69.59

Nation Cell Phones per 100 Inhabitants
Source: Compiled by author from ITU publications (2003).

Initially, the low diffusion of mobile phone adoption was related to economic factors, as most of the countries low in the range of diffusion are poorer developing countries. The relatively low levels of mobile market diffusion in most countries may be related to poor national telecommunications systems and to the cost of buying and maintaining a mobile phone (Castells et al. 2004). However when African nations began to privatise their telephone monopolies in the mid-1990s, and competitive operators began to sell airtime in smaller, cheaper units (e.g. the availability of pre-paid pricing systems) this led to an increase in the popularity of mobile phone use, especially in Africa (New York Times, 2005).

BBC News (2004) reported that Africa was the fastest-growing mobile phone market in the world with a yearly increase of 65%. The rate of mobile phone increase is reportedly more than twice the global usage. The New York Times (2005) reported that the number of mobile phone subscribers in Africa in 1999-2004 jumped from 7.5 to 76.8, an average annual increase of 58% which makes the continent the world's fastest growing mobile phone market. Mutahi Kagwe (Kenyas information and communication minister) stated that the number of mobile telephone subscribers in Africa had risen from 8 million, in 2001 to 100 million in 2006 (Mobileafrican, 2006).

2.3.1 Emerging pattern of mobile phone practice

Generally the mobile phone is used for different reasons such as socialising, for business and in emergency situations (Ling 2002).

The Expanding growth of mobile phone in both the developing and developed world has contributed to the changes we encounter in our leisure and work environments, now the mobile phone has a potent impact on the dynamics of individual daily lives and as a result, new patterns and ways of using the mobile phone has emerged. For example, in the western world it is now natural to see people downloading music to their mobile phones and listening to it while they are 'on the go'. The practice of m-voting represented in the use of SMS on popular TV shows such as Pop Idol or X Factor in the developing and the developed world (to vote for a popular talented singer) have made these programmes more interactive and prevalent for certain groups of viewers in the UK.

Recently Another way of using the mobile phone has emerged in the UK, the Home Office Secretary John Reid permitted the start of a new scheme whereby people whose visas are about to expire could be sent text messages just before their visas run out to remind them to go home (BBC, 2007).

Furthermore, in the UK, motorists in Westminster Council were able to pay for parking using their mobile phones. Alastair Gilchrist, at Westminster Council, said: *"For motorists it gives coin-free convenience when paying for parking, and the ability to pay for longer from elsewhere if you're running late."*(BBC, 2006)

One example that explicates a cultural-specific type of practice is the use of the mobile phone for religious rituals. For instance, in India, worshippers can jump the temple queues during one of Mumbay's largest Hindu festivals by making their offering through SMS. For a fee of 51 rupees (1.12 USD) in addition to the traffic charge, worshippers can text the word 'PUJA' (word meaning prayer) to the BPL Mobile cellular operator to have prayers performed for them at the temple. After the prayer, the temple sends the BPL customer a receipt, special offerings, and a portrait of Ganesha (ITU, 2004).

It is not only that mobile phones influence our cultural and social practices but, interestingly, technology is also shaped and transformed by society and the cultural history of individuals (Townsend, 2000). For example, LG Electronics developed a device that especially caters for the religious and cultural needs of the Middle East Muslim market. Muslims pray five times a day at sunrise, noon, afternoon, sunset, and midnight. They have to face in the direction of the Kaaba in Mecca, but sometimes they have difficulty locating the direction if they are not in their usual places. By setting the 5300 compass to the north and inputting their location information, Muslims can now simply locate the direction of Mecca. With this feature, it appears that religious practices and specific cultural traditions have encouraged developers to create a device that has specialised functional features for the Middle East market (ITU, 2004).

In relation to this, researchers have attempted to scrutinise the interaction between technology and society. Understanding the social meaning of technology was initially investigated by Bijker and Law (Bijker and Law, 1992; Bijker et al., 1987). Ling (2004) termed this approach as the social determinism of technology. According to this approach, technologies are repeatedly decoded by users and given new, and in many cases, unpredicted paths. For example, while the mobile telephone was developed initially as a conversational medium, in the 'missed call' mobile phone owners developed their own usage style and used the device as a courier for a coded message without requiring the user of the mobile phone to use speech or text. A definition of the missed call is provided by Donner (2005, p2) as follows:

"*Missed call is when the caller makes a phone call and hangs up before the recipient can answer the call*"

Therefore, mobile phone users, like any other technology users, perform their own 'negotiations' with the device until they develop their own patterns of usage. Another user practice that is related to mobile phone devices is people's use of SMS to communicate with each other and for the micro coordination of everyday activities. For example, mobile phone users can rearrange their meetings at short notice (Ling & Yttri, 2002). SMS is also regarded as a mobile phone feature that caters for social communication as well as religious and spiritual practices. For example, Ellwood-

Clayton (2005) described a unique application for SMS, whereby users can text religious corporations to access spiritual readings. According to Ellwood-Clayton (2005), the Manila Auxiliary Bishop Socrates Villegas' district recently launched 'Catextism', a service that provides spiritual support and prayer through SMS. The service is sponsored by the Philippines' top two cellular phone companies. To access Catextism, users text the word 'Amen' to a particular number, and then they will receive a message that includes prayers and spiritual readings sent from God. The service can also be used as a substitute for prayer. If the worshipper needs to pray, he/she can simply text the word 'Jesus' and within seconds receive a message directly from God. Previously, the priest was the medium between god and worshippers, now it is the mobile phone.

Another example of SMS use was in Ethiopia during the May 2005 elections when political parties used text messaging to advertise themselves and their parties' policies. In the Philippines, SMS was used to organise democratic campaigns to bring down the Estrada government in 2000 (BBC, 2001).

Lasen (2003) also argues that understanding the social meaning of the mobile phone is imperative, and there is a need to deflect the attention from the device to attitudes related to the performance of users. He pointed out that the use of mobile phones is influenced by a shaped set of values and practices rooted in elaborate cultural codes of communication. He argued that there is a need to understand the context in which mobile phones are used and the users' attitude when using the device in various contexts.

With economic globalisation and the ubiquitous use of mobile phones by people from different cultures, new ways of using the mobile phone have emerged (i.e. the devices are used everywhere in both private and public places for business and social conversations).

2.4 Use of mobile phone in public places

This pervasive use of the mobile phone has yielded new forms of mobile phone interaction that take place in public places. It is common now to notice 'private mobile conversations' occurring in public places.

Mobile phones have invaded public places, and it is quite normal to see people using mobile phones in public places to carry out private conversations. Mobile phones enable users to create their own private spaces regardless of where they are in physical spaces (Fortunati et al., 2000). Geser (2002) argues that public places are 'privatised' by the private lives of mobile users. Plant (2002) observed that mobile phones have created "simultaneity of place": a physical space and a virtual space of conversational interaction. The extensive use of mobile phones in public places has made mobile phone users develop new attitudes while they are on the phone. For example, turning away from people when talking on the phone. Bystanders have also developed a matching behaviour to show their uninterest in the mobile conversation performed in close proximity to them. For example, Love and Perry (2004) reported on bystanders' attitudes when a mobile phone conversation takes place, in this study bystanders were found to pretend not to be listening to the mobile phone conversation by adopting various actions such as gazing away or walking around the room.

In addition, Ling (2004) highlights how mobile phone use in public places has raised questions of what is appropriate or inappropriate behaviour in such places. In this study, he found that people perceived mobile phone use in places such as restaurants as unacceptable, partly because the restaurants norms do not cater for loud voices. Mobile phone users tend to talk louder than usual so that people nearby feel intruded upon, embarrassed, and have a sense of being coerced into the role of eavesdropper on a private conversation.

Research has also shown that mobile phones can occupy concurrent social spaces, spaces with behavioural norms that sometimes conflict, such as the space of the mobile phone user, and the virtual space where the conversation takes place (Palen, Salzman & Youngs, 2000). This feeling of conflict has led researchers in this area to propose that the use of mobile technology in public places is creating a new mixture of public and private space that has yet to be accommodated by users of mobile technology and bystanders in terms of what is acceptable or unacceptable behaviour.

This phenomenon has been analysed predominantly by using concepts drawn from Goffman's analysis of social interaction in public places (Goffman, 1963). In this work, Goffman suggested that people have specific 'public faces' and personas for

different public social locations. The idea behind this is that individuals have rules that determine their behaviour in public places, or what Burns (1992) refers to as the "observance of social propriety". For example, Murtagh (2001) presented findings from an observational study of the non-verbal aspects of mobile phone use in a train carriage. Murtagh found that changing the direction of one's gaze, turning one's head and upper body away from the other people sitting next to one in the carriage were common features of mobile phone behaviour on trains. These behavioural responses were seen as being indicative of the subtle complexities involved when using mobile phones in public locations. This study suggests that mobile phone users are actively engaged in trying to distance themselves from their current physical location in order to enter a virtual environment with the person with whom they are having a mobile phone conversation.

Licoppe and Heurtin (2002) investigated the effect of mobile phone use in ongoing face-to-face interaction and found that the incoming mobile phone call causes a risk to the in progress physical interaction and consequently to the social setting. This is due to the fact that the person receiving the call starts instantly to partition himself/ herself from those were engaged with him/her in a face-to-face interaction. In addition, Ling (2004) found that the user of the mobile phone in a public place usually tries to move to a less crowded spot of the public area to continue his or her call. The receiver of the mobile phone call enters an immediately created virtual space and engages in a greeting dialogue with a remote partner, whereas the physical partner who was participating in the face-to-face interaction just interrupted by the call has to accommodate the withdrawal of the mobile phone user into his/her virtual space.

In relation to this, Love and Perry (2004) used role play experiments to investigate the behaviour and attitudes of bystanders to a mobile phone conversation by a third party. They found that participants had strong views on embarrassment, discomfort and rudeness. They also reported that during the mobile phone call participants adopted various body language techniques such as folding their arms, walking around the room or gazing at something in front of them (e.g. newspaper). Although their non-verbal body postures implied that they were not listening to the ongoing mobile phone dialogue, they were all able to report accurately on the content of the conversation when asked later by the experimenters.

This unavoidable situation forces the bystander to eavesdrop on these ongoing conversations. Love (2001) pointed out that bystanders' personality may have an effect on how they feel when mobile phone conversations are carried out within close proximity to them. Love argued that bystanders with an introvert personality trait felt that they were drawn short-term into the mobile phone users' personal space and were uncomfortable about this.

The ubiquitous use of mobile phone everywhere has shrivelled the boundaries between time zones, countries and different social classes. As people from different cultural backgrounds use mobile phones, the question arises whether cultural differences play a role in the way people use their mobile phones in public places

However, most of the research reported to date in this area has tended to focus on what is termed the developed world. In this research the aim is to investigate the impact of culture on the mobile phone practices and attitudes towards mobile phone usage in two contrasting countries, the UK and the Sudan.

The next section discusses cross-cultural aspects of mobile phone use. One of the communication modes developed by mobile phone users in different cultures is the practice of the missed call to request a call back, as well as to convey complex social messages.

2.5 Missed calls

Mobile phone users constantly invent new ways to use their mobile phones to better satisfy their communication needs. Recently, the practice of the missed call has grown rapidly. This is an intentional action where a person places a call and disconnects before the recipient at the other end answers. Users of the missed call use the functionality available on mobile phones such as the caller display service, call registry and the address book in order to decode the meaning of the missed call sent to them. Donner (2005) deemed the missed call as one of the main sources for an elaborate set of customised, coded messages.

The missed call is more noticeable in Africa. Samuel, Shah and Hadingham (2005) observed missed calls or *beeping* among users in Tanzania and South Africa. The

consultancy Gamos (2003) mentioned beeping in a report on African Telecommunications, which found that 38% of its survey sample (users of public payphones and telecentres in Uganda, Botswana, and Ghana) regularly 'beeped' mobile users from these phones.

Donner (2005) found that missed calls are known as beeps by Sub-Saharan users who have produced elaborate codes and social messages to be exchanged over the network without bearing any cost or at least not by those who are in a less secure financial situation. Chakraborty (2004) observed the missed call phenomena in Sitakund, Bangladesh, where users developed this practice to deal with the high cost of maintaining a mobile phone. They also invented ways to communicate through the network without bearing the cost of the call or at least not by those unable to afford it. An example for the code they developed to understand the conveyed missed call messages is one ring = I am at home, where are you? two rings = 'I'm at your house, where are you?.

The practice of the missed call has also found its way into the developed world. In Japan, the practice of Wangiri (*'one and cut'*) is commonly used to deliver random solicitations for pay-per-call telephone sex line services (The Japan Times Online, 2002).

In Finland, Kasesniemi and Rautiainen (2002) noted the practice of the 'bomb call'. This is when a caller allows the mobile phone to ring for a short time before the recipient can answer it. As the number of the caller is stored in the phone's memory, the caller's identity is revealed to the recipient. The number of calls received is shown on the screen of the mobile phone. They found that similar to the SMS, teenagers were the pioneers in this social practice, especially in the early days of the mobile phone, but by 2002, the use of bomb calls had lessened significantly among 13 to 18-year-olds. However, pre-teens were still actively involved in this social practice that was not envisaged by mobile phone developers and service providers.

In the work reported in this thesis, it was observed that the missed call is also evident in the UK and the Sudan. In the Sudan, users frequently request a friend or a family to call them back by saying *Maskel-lay* (Arabic pronunciation of a request for a call

back). In the UK, the practice of the missed call is noticeable and some users request a ring cut from another, meaning a missed call. For example, their missed call may mean 'meet me at the school canteen', or sometimes it is a request for a 'call back'.

The missed call can convey a message without typing a single character or talking on the phone, but it also shares some similarities with both mobile phone calls and SMS messages. The conventions of the missed call can be quite similar to SMS use. For example, Donner (2005) found that the missed call in sub-Saharan Africa is used mainly to mean 'call me back'; here, the caller's intention is to request the recipient to bear the cost of the call. The missed call is also used as an 'instrumental message' such as 'pick me up now'. The missed call can also be used to send a 'relational sign' such as 'I am thinking of you' (Donner, 2005). He found that there is an undeclared set of rules that govern the person who should pay for the call. For example, for social and leisure communication, callers with less money can request to be called back by relatives and friends who are in better financial situations. In romantic situations, men can expect beeps from a woman they are dating but not vice versa. At the business communication level, workers can request to be called back by superiors.

Kasesniemi and Rautiainen (2002) found that in Finland a bomb call/missed call can be used with an expressive intention such as "I am thinking of you", or for coordination reasons such as "I have arrived at the arranged location". Bomb calls can be used in a teasing way just to get the receiver's attention. Kasesniemis termed bomb calls 'no calls' that are made to entice attention, for enjoyment, and for social communication that has economic and financial inference. For Kasesnimei (2002) the interpretation of the missed call is another challenging aspect that users of the missed call have to confront. The decoding of the missed call depends on the mutual agreement between users beforehand.

Donner (2005) viewed the missed call in relation to Bernstein's socio-linguistic theory of language codes. According to Bernstein (1971), there are two types of language codes: elaborated and restricted. As Atherton (2002) pointed out, the distinction between the two codes is in what the language is suited for. According to Atherton (2002), the elaborated code is more comprehensive and thorough in explaining the nature of the matter. People have to elaborate because the

circumstances do not allow the speaker to abbreviate. The elaborated code works well in situations where there is no prior or shared understanding and knowledge, where a more thorough explanation is required. Conversely, the restricted code works better than the elaborated code for situations in which there is a great deal of shared and taken-for-granted knowledge in the group of speakers. It is economical and rich, conveying a vast amount of meaning with a few words, each of which has a multifaceted set of connotations and acts like an index, pointing the hearer to a lot more information which remains unsaid. Within the restricted code, speakers depend on background, prior knowledge and shared understanding. This type of code creates a sense of belonging to a certain group. Restricted codes can be found among friends and families and other intimately knit groups. Missed calls can be viewed as a message full of restricted codes since, although the person who placed the missed call has sent a code to the recipient without saying a word or typing a single character, a comprehensive message with contextual cues was conveyed to the recipient. An outsider overhearing this missed call would probably not be able to figure out the inference of the message.

From the above, it appears that the missed call shares some similarities with the SMS in its ability to communicate, stay in touch, exchange social meanings, and fill in empty times. However, the missed call offers a unique mode of communication that enables the user to transmit the information needed without actually saying or typing a word.

Despite the increasing use of various types of missed calls, the missed call as a form of communication has not been considered in mobile phone interface design. This is an avenue that is explored subsequently in chapter 5 of this thesis.

2.6 SMS

The use of SMS is another novel way of using mobile phones that has materialised in the last few years. Text messaging is a mobile technology feature that is also known as SMS (Short Message Service). SMS can accommodate only 160 characters that are defined in the English language. Short Messages pass over the radio channel using the signalling path, each mobile telephone network has one or more messaging bases to deal with the short message. Therefore mobile phone users manage to pass

their SMS easily without facing engaged signals such as one may experience with phone calls during peak network usage times.

The use of SMS texting for supporting relationships, especially with its appealing low cost has taken root among young people and has become an important activity in their daily lives (Grinter & Eldridge, 2001). Taylor and Harper (2003) investigated reasons behind the popularity of the SMS among youngsters in an ethnographic study in the UK. They found that young people's usage of the mobile phone to text enabled them to show their participation in a social network and also their significance within that group. In addition, Ling & Yttri (2002) also investigated the reasons behind the popularity of SMS and found that the discrete aptitude of the SMS to facilitate silent communication, especially in public places or at a convenient time, is a reason for its popularity. For example, in bed at night time youngsters can be in touch with friends without parents being aware of this.
Mobile phone users prefer SMS messages as a form of communication as it offers flexible planning options, since SMS users can set new plans and change existing ones at short notice. For example, with the SMS, it is more manageable to change pre-set arrangements to alter their time and location at the very last minute termed by, Ling and Yttri (2002) 'micro coordination' of activities and behaviour.

Mobile phone users text each other for different reasons (Haddon, 2000; Thurlow & Brown, 2003) such as a tool for establishing and keeping social relationships. Ling (2004) also found that SMS are used to keep and boost relationships between friends, family, or romantic interests. In addition to the social uses of SMS, Rheingold (2002) noted that texting was used by political protestors in Manila to organise support for demonstrations which eventually led to the overthrow of the President of the Philippines in 2001. In Nigeria, Obadare (2004) found that mobile phone users used SMS to arrange to switch off their mobile phones for a day to express their disagreement with the GSM-tariff.

The Pope has also chosen to use SMS to send his messages. These messages are sent from the press office of the Holy See, the central authority of the Catholic Church within the Vatican. Registered users receive SMS "thoughts of the day" drawn from the Pope's speeches and homilies. Services are available in Italy, Ireland and the UK.

This service is shared between the network operator, the Vatican and Italian technology provider Acotel (Pope Deliveries, 2003).

Taylor and Harper (2003) viewed SMS as gifts that have value. The significance of the SMS is related to the sender, recipient and the context in which it is received. For example, messages that are sent from the Internet to mobile phones are considered of less value than SMS that are sent from an individual's mobile phone.

As with other mobile phone technical features, users have developed their own innovative usage patterns, perhaps influenced by various factors such as culture.
To investigate the culture role in SMS use, Riviere and Licoppe (2005) compared the use of SMS in Japan and France and found that in Japan, SMS are used with a large number of people within the inner and outer circle of given user contacts, whereas in France, SMS are exchanged mainly between close contacts. Although people in both countries preferred to use SMS because of its discretion other reasons for the use of SMS were linked to the ways people manage their social relationships. For example, SMS offers French users the option to exercise their social decorum in public places, as the French prefer to communicate with close contacts in a less invasive manner. On the other hand, Riviere and Licoppe (2005) found that Japanese SMS users are more oriented towards the obligation of the social relationship and SMS enables Japanese users to communicate with their contacts and fulfil their social obligations without the need to be concerned about the availability of the recipient.

Other researchers argued that mobile phones are mainly designed write SMS in English. For example, Lin and Sears (2005) argue that Chinese SMS users face a challenging task due to the Chinese language characters. The nature of the Chinese language characteristics is based on iconographic images, unlike the English language, and therefore there is a need to simplify entering text in Chinese characters.

Wei (2004) present the same argument where he found that mobile phones that do not support the Cyrillic or Uzbek alphabets (the two main ones in Russia) confront SMS users from these cultural backgrounds with the need to memorise and invent new ways to write their SMS messages. For example, sometimes they write their SMS text using Latin letters.

Other studies emphasis the role of culture in usage patterns, and how cultural practices and social obligation may produce different attitudes towards the use of SMS. For example, Sun (2003) argues that 'localisation' for the Chinese context should account for the particular types of messaging that are expected to materialise.

2.7 What is culture?

Culture in the English language has a number of meanings, all deriving from its original Latin meaning: "the cultivation of soil".

Tylor (1871, p1) provided one of the earliest definitions of culture: *"that complex whole which includes knowledge, belief, art, morals, law, custom and any other capabilities and habits acquired by man".* According to Linton (1945), culture is a collection of learned behaviours and results of behaviour whose component elements are shared and conveyed by the members of a certain group.

Useem (1963) stated that "*culture has been defined in a number of ways, but most simply, as the learned and shared behaviour of a community of interacting human beings*" (p. 169).

Others have defined culture as the properties of a typical citizen or modal personality (Inkeles & Levinson, 1969). Harris (1987) pointed out that cultures can be learned, acquired, and reflect the patterns of thinking, feeling and acting.

Lederach (1995) defines culture as the collective knowledge and schemes developed by a group of people for comprehending, understanding, expressing, and reacting to the social realities surrounding them.

One well known anthropological definition is that *"culture consists of patterned ways of thinking, feeling and reacting, acquired and transmitted mainly by symbols consisting of the distinctive achievements of human groups, including their embodiments in artifacts, the essential core of culture consists of traditional (i.e. historical derived and selected ideas and especially their attached values".* (Kluckhohn, 1951 p86).

A more simplified version of the Kluckhohn definition was introduced by Hofstede (1980) who defined culture as the 'collective programming of the mind'; it illustrates itself not only in values, but in more noticeable ways: in symbols, heroes and practices. Hofstede highlights 'values' as the building blocks of culture that are set early in childhood and shape subjective definition of rationality. Hofstede explained that values have both intensity and direction or alternatively they have a size and a sign. Values should be distinguished between the desired and the desirable: what people actually require against what they think they should require.

More simply, culture can generally be described as a way of life: how people in a particular society learn how to eat, communicate and dress, etc. Specifically, it refers to the socially learned behaviours, beliefs, and values the members of a group or society share. As different cultures exist in the world and each culture has certain cultural features such as language and other symbols, norms and values, an understanding of these cultural differences and their impact on human social behaviour, especially in relation to new technology and, more specifically to mobile phones usage is required.

Hofstede's (1980) conceptualisation of culture as 'programming of the mind' suggests that certain reactions are more likely in certain cultures than in others, based on differences between the basic values of the members of different cultures (Smith et al., 2004).

Culture can be understood by identifying a set of shared characteristics that shape the behaviour of people within a group. Culture embraces both the visible aspects of the group, for example language, food and religion, and intangible aspects such as thoughts, values and behaviour.

Culture can also be seen as a collection of attributes people acquire from their childhood training. These attributes are associated with their environment, surroundings that influence the responses of people in that culture to new ideas, practices, and use of new technology, such as mobile phones. Given that culture may affect the way people behave and interact in general, Ciborowski (1979) identified a close link between knowledge and culture. In the context of mobile phone

communication, it may be argued that culture influences knowledge or the individual's general experience therefore affecting, in this instance, their attitude towards mobile phone usage patterns.

Hoft (1996) and Masaaki (2002) pointed out that because of the difficulty of the culture concept, it is important to study culture from different dimensions by developing a conceptual model through which culture can be clearly understood. Cultural models provide an in-depth analysis of culture by identifying a number of cultural dimensions that are used to organise cultural data (Marcus and Baumgartner, 2004b).

Cultural models tend to compare various cultures on a set of values. Hofstede's (1980) model focuses on determining the patterns of thinking, feeling and acting that form a culture's 'mental programming'. This model has been adopted for the work reported in this thesis as researchers in this area consider it as a valid and useful measure of systematic categorisation (Mooij, 2003, Honald; 1999) and it is also considered to be directly related to the connection between product design and user behaviour (Mooij, 2002). The model is perhaps the most cited in cross-cultural web design papers (Fitzgerald, 2004). Other models include those put forward by Trompenaars (1993) and Hall (1959).

2.7.1 Trompenaars' Model (1993)

Trompennars developed a cultural model; the model has seven dimensions, described below:

> **1. Achievement vs. Ascription** describes the extent to which the status of the individual is important. In achievement-oriented cultures people are valued for what they have accomplished in their lives. Trompennars (1993) found that in achievement –oriented cultures, titles are only used when relevant to the competency you bring to the job. Respect for superior in hierarchy is based on how effectively his or her job is performed and how adequate their knowledge. According to Trompennars classification UK is an example of the achievement-oriented societies. Whereas in ascriptive societies, individuals derive their status from birth, age, gender, or wealth. Respect for superior in

hierarchy is seen as a measure of your commitment to the organization and its mission. Trompennars found that Argentina demonstrate a typical example of ascriptive societies.

2. **Universalism vs. Particularism** refers to the extent to which an individual is sticking to the set standards and rules. In universalistic cultures the focus is on rules. In particularistic cultures, the focus is on relationships. In universalistic cultures, there is only one truth or reality. In particularistic cultures, there are a number of perspectives on reality. Universalists treat all cases in the same way. Particularists treat cases on their special merits and create private understandings. Based on Trompennars's model (1993) North Americans - as well as 80% of the protestant countries - are Universalists. Brazilians - as well as the rest of Latin America - are considered Particularists.

3. **Individualism vs. Communitarianism** refers the extent to which individuals prioritise themselves over the group needs. In individualistic cultures authority may be the negotiator responsibility. In communitarian cultures, the negotiator is only a delegate who reports back to the group which approves the final decision. In individualistic cultures, a decision maker accepts personal responsibility. In communitarian cultures, joint responsibility is the norm. Individualists feel that their achievements are primarily the results of their own efforts. Communitarians believe that they achieve in groups. Based on Trompennars analysis (1993) Americans are part of the individualistic culture where the individual freedom is ranked higher than the need to care for others in the society. According to Trompennars (1993) French are considered as part of the collectivistic culture where less individualistic approach is adopted in the society and more priority is given to the group rather than the individual.

4. **Neutral vs. Affective** refers to the extent to which people show or suppress their emotions. People in affective societies tend to reveal thoughts and feelings verbally and non-verbally. According to Trompennars (1993), emotions flow easily and strongly without inhibition, physical contact gesturing and strong facial expression are common in affective societies. Whereas in neutral societies do not reveal what they are thinking or feeling physical contact, strong facial expressions

are not admired. Based on Trompennars analysis (1993) Egypt belongs to the affective culture with their expressive emotions and feelings whereas Japan is an example of neutral societies with their abilities to keep feelings and expressions carefully subdued and controlled.

5. Diffuse vs. Specific describes the extent to which people get involved with one another's life space, so specificists believe relationships with others should be explicit, defined and regulated as in a contract. Trompennars reported that Swedish as part of the specific cultures tend to separate between work and personal life. Diffuse-oriented cultures are characterized by a high degree of interpersonal relationships, engaging others in a huge spectre of the private life. Borders and barriers between work and personal life practically do not exist. Trompennars (1993) reported that Nigeria is a typical example of diffuse oriented culture.

6. Time orientation refers to cultures' response to time. Which is two types of: monochronic (sequentially) and polychronic (synchronic) time. Sequential time is characterised by schedules, promptness, and compartmentalisation or isolation of activities. According to Trompennars People in Sweden and other northern-western European countries are part of the sequential cultures they tend to do one task at a time, and sticking to schedule is an essential. Trompennars reported that in the Polychromic time culture such as India people tolerate many things occurring simultaneously and emphasise the involvement of people. Even if there is a final goal it can take a variety of actions to reach it and there is emphasis on the activities that are running parallel. For example Trompennars found that your schedule is never an excuse for passing a friend by.

7. Internal vs. External Control: describes people's attitudes towards nature. Trompennars found that some cultures believe that they can and should control nature by enforcing their forces upon it, according to Trompennars UK is a typical example of cultures that has an internal control. Cultures that has external control of the environment believe in external control, deem man as being part of nature and must go along with its laws, direction and forces, examples of which are found in Egypt.

2.7.2 Hall analysis (1959)

1. **Space** It refers to the unseen border around an individual that is considered 'personal' and the use of physical space within a society. Social distance between people is greatly linked to physical distance. Hall (1966) found that personal space could be divided into a series of distance zones: intimate, personal, social and public. According to the analysis:

    - Intimate distance is for embracing, touching or whispering. Close phase - less than 6 inches, far phase - 6 to 18 inches.
    - Personal distance is for interactions among good friends. Close phase - 1.5 to 2.5 feet, far phase - 2.5 to 4 feet.
    - Social distance is for interactions among acquaintances. Close phase - 5 to 7 feet, far phase - 7 to 12 feet.
    - Public distance is used for public speaking. Close phase - 12 to 25 feet, far phase - 25 feet or more.
    - Hall found that different cultures have different standards of personal space. In the Arab culture, and for instance, those relative distances are smaller, and people tend to be more comfortable standing close to each other; in Nordic cultures, the opposite is true.

2. **Time** refers to the way people handle time. As with Trompennars model (1993), Hall identified two types of cultures monochronic or polychronic. Monochronic cultures handle one task at a time and strictly follow their set plans. According to Hall (1976) an example of this type of culture is USA. In contrast polychronic cultures tend to handle more than one task at the same time and change plans easily. Arab countries are an example of this.

3. **Context** describes the amount of information that must be stated explicitly for the communication to be successful. In a high context communication most of the meaning lies in the context. A high context culture places more emphasis on the unspoken meaning of the message meaning of a given situation, very little of the information is in the actual transmitted message. Hall (1976)

reported that the French culture is an example of a high context culture. A low context culture places much more importance an explicit messages being transmitted, the USA culture is an example of this.

4. **Action Chains** are sequences of events that are necessary to lead to the accomplishment of a goal. Cultures vary in the degree to which members are committed to complete an action chain in a certain amount of time and in a certain order. This dimension is strongly linked to the Time dimensions. The theory is that monochronic cultures are negatively affected by interruptions. In a country like the USA, the sequence of events needed to accomplish the goal is far shorter than the sequence of events in a country like France.

5. **Information Flow** concerns the length of time a message takes to travel within the organisation and produce the expected effect. Hall's research shows that high-context cultures tend to have very fast information flow. Examples of such cultures are the UK and USA. In contrast, low-context cultures tend to be much slower in relation to the information flow, an example of which is France.

2.7.3 Hofstede Classification (1980)

One of the most widely used sets of national cultural characteristics is that established by Geert Hofstede (1980). Hofstede developed an empirically based typology of cultural attributes by analysing data obtained from surveys conducted among individuals in 53 countries for the period between 1968 and 1972.

The survey questions were designed to measure work-related values. Hofstede used these measures of values which are components of culture, to identify national level cultural characteristics common among all of the respondents. Hofstede created scales which provided a score on each of the characteristics for each of the 53 countries represented in the sample. Hofstede introduced four dimensions in 1980. These dimensions are (1) power distance, (2) uncertainty avoidance, (3) individualism vs. collectivism, (4) masculinity vs. femininity. Subsequently, Hofstede and Bond (1988) identified an additional fifth cultural dimension which was termed Confucian

dynamism and has since been renamed 'long-term orientation'. Hofstede dimensions can be defined as follows:

1. **Individualism vs. Collectivism**

This dimension stresses the relationship between the individual and social groups. Hofstede found that countries differ on the weight they give to the concept of collectivism/interdependence or individualism/independence. He found some countries emphasise the importance of the individual over the social group, and these are known as individualistic cultures. In such highly individualistic cultures, a person is expected to look after him/herself and probably his/her nuclear family. The individual is expected to make decisions based on his/her own needs and to be self-oriented, there is more stress on thinking and believing in the 'I' term. There is also an emphasis on individual initiative and attainment. A person from an individualistic culture expects to have a private life. Alternatively, people in highly collectivistic cultures believe that the group is the most important unit. Individuals expect their social groups to look out for their needs and essential requirements. The person is raised and encouraged to be mainly loyal to the group (nuclear family, extended family, caste, and organisation). The needs of the group always come first and decisions are taken based on the group's priority. There is more stress on thinking and believing in the 'We' term. The individual's identity is determined by the social groups, and the person's private life is mainly invaded/ filled by the social group goals.

Table 2.2 summarises the main differences between high and low individualistic societies (Hofstede, 1991).

Table 2.2 Main differences between High Individualism vs. Low Individualism (Collectivism)

	High Individualism	Low Individualism (collectivism)
National	More economic development developed/wealthy modern industry, urbanisation	Less economic development, underdeveloped poor, more traditional agriculture
	Greater social mobility /larger middle class	Less social mobility/smaller middle class
	Nuclear family	Extended family / tribe
Politics	Political power by voter	Political power by interest groups
Religion/ideas	Monotheistic	Polytheistic
	Individual conversion	Group conversions
	Matter of fact about science / technology	Science / technology seen as magic
Social	Everyone is expected to look after him/herself and his/her nuclear family.	Strong relationship with extended families or other in-groups which look after them in exchange for loyalty
	Children learn to think in terms of 'I'	Children learn to think in terms of 'we'
	Harmony should be maintained and direct confrontation should be avoided.	Expressing one's mind is a trait of an honest person.
School	Teachers deal with individuals	Teachers deal with groups
	Students expected to speak up	Students expected to listen
	Learn how to learn	Learn how to do
other	Disability a handicap to overcome	Disability a shame
	Children take care of self as soon as possible	Children maintain lifelong contacts with family
	Security through insurance	Security through social network
Climate	Cold	Warm

Source: Hofstede (1991)

Some of these characteristics were more prominent in one type of culture than in the other. For example, in an individualistic culture, people speak out, question, confront arising matters, they are more direct and to the point. An example of an individualistic culture is Australia. In contrast, people in collectivistic culture avoid confrontation, they mingle in easily, and they avoid conflict. The Arab world is an example of collectivistic culture.

2. Power Distance

The extent to which less powerful members of the society expect and agree to unequal power distribution within a culture. The two aspects of this dimension are high and low power distance. Aspects of inequality are: physical / mental abilities and characteristics, social status and prestige, wealth, power and law. Table 2.3 summarises the main differences between high and low power distances societies (Hofstede, 1991). An example of a high power distance culture is Venezuela. The UK represents a culture of a low power distance.

Table 2.3 Main differences between High power distance vs. Low power distance

Predictors	High power distance	Low power distance
Politics	Power / authority are facts of life	Minimise social / class structures
	Everyone has a specific place in society.	Hierarchy in organisations indicates existence of inequality between higher-ups and lower-downs.
	Those in power emphasise position	Those in power minimise position
National	Respect for authority	Respect for individuality
	Centralised authority	Decentralised authority
	Parents teach children obedience. Children treat parents with respect. Teachers should be treated with respect and teachers take all initiatives in class.	Parents and children treat each other as equal. Students treat teachers as equal. Teachers expect some initiatives from students in class.
Climate	Warm	Cold
Population Size	Large	Small
Wealth	Unequal distribution	Equal distribution

Source: Hofstede (1991)

Some consequences related to the high power distance culture is that people are obedient to authority represented in certain figures such as a parent, boss, officials and religious figures who address others in a language filled with power and authority. In contrast, people in low power distance cultures are considered as equal. An example of a country with low power distance is the UK.

3. Masculinity vs. Femininity

This dimension focuses on the extent to which the society focuses on achievement or nurture. In a masculine society, values that are emphasised are ambition, acquisition of wealth, and differentiated gender roles. In this type of culture, men are seen as assertive and they tend to be competitive, visible, stress success, and vocation-oriented. According to Hofstede (1980) women however, are seen as nurturing and caring agents, who have a different role from men such as avoiding certain types of jobs for example bus driver or pilot.

In a feminine society, the dominant values for both men and women are nurturing and caring behaviours. There is less emphasis on assertiveness for both men and women and the focus is on cooperation, and sexual equality. An example of a masculine

culture is Japan, whereas Malaysia is an example of a feminine culture (Hofstede, 1980).

Table 2.4 summarises the main differences between high masculine and low masculine (feminine) societies (Hofstede, 1991).

Table 2.4 Main differences between masculine and low masculine (feminine) societies

Predictors	High Masculine	Low Masculine (Feminine)
Social norms	Dominant values success and progress	Dominant values caring for others
	Money and things important	People and warm relationships important
	Live in order to work	Work in order to live
	Women expected to care for relationships	Men and women expected to care for relationships
Politics and economics	Economic growth high priority	Environment protection high priority
	Conflict solved through force	Conflict solved through negotiation
Religion	Most important in life	Less important in life
	Only men can be priests	Both men and women as priests
Work	Larger gender wage gap	Smaller gender wage gap
	Fewer women in management	More women in management
	Preference for higher pay	Preference for fewer working hours
Family and school	Traditional family structure	Flexible family structure
	Girls cry, boys don't; boys fight, girls don't	Both boys and girls cry; neither fight
	Failing disaster	Failing is a minor accident
Climate	Warm	Cold

Source: Hofstede (1991)

4. Uncertainty Avoidance

This dimension can be defined as the extent to which the members of a culture feel threatened by uncertainty and ambiguity, along with their desire to avoid such situations (Hofstede, 1980). People in high uncertainty avoidance cultures view uncertainty as dangerous and find it difficult to deal with ambiguity. They are more resistant to uncertain situations by believing in absolute truths and expertise by seeking stability and by reflecting unusual ideas and behaviours. In contrast, people in low uncertainty-avoidance cultures are more tolerable to ambiguous situations, they tend to accept competition and they approve risk taking. Switzerland is an example of low uncertainty avoidance culture, whereas Singapore is an example of a high uncertainty avoidance culture (Hofstede, 1980).

Table 2.5 summarises the main differences between high and low uncertainty avoidance in societies, taken from Hofstede, (1991).

Table 2.5 Main differences between high and low uncertainty avoidance societies

Predictors	High Uncertainty Avoidance	Low Uncertainty Avoidance
Social norms	Conservatism, law and order	Openness to change, innovation
	Comfortable with familiar risk, uncomfortable with ambiguous situations and with unfamiliar risks	Relax in ambiguous situations and with unfamiliar risks
	Express emotions	Suppress emotions
	Repression of unusual ideas and behaviour, resistance to change	Tolerance of unusual ideas and behaviour
Politics / legal system	Weak interest in politics	High interest in politics
	Citizen protest repressed	Citizen protest accepted
	More and specific laws and regulations	Fewer and general laws and regulations
Religion	Catholic, Islam, Judaism, Shintoism	Protestant, Buddhism, Taoism, Hinduism
	Ritualised / ceremonial	Avoid ritualisation and ceremony
School	Teachers have all answers	Teachers may say "don't know"
	Structured learning	Open-ended learning
Family	Traditional gender roles	Fewer gender roles

Source: Hofstede (1991)

5. Long-term orientation vs. short-term

Hofstede's new dimension is based on a study of Michael Bond in Hong Kong (1989) which noted that Hofstede's previous four cultural dimensions did not adequately reflect Asian perspectives on culture. It also reflects the time orientation of Kluckhohn and Strodbeck (1961). According to Hofstede (2001, p359), the dimension reflects on the time and the values related to the future:

"Long Term Orientation stands for the fostering of virtues oriented towards future rewards, in particular perseverance and thrift. Its opposite pole, Short Term Orientation". An example of Long-term culture is Pakistan. "*Short term orientation stands for the fostering of virtues related to the past and present, in particular respect for tradition, preservation of 'face' and fulfilling social obligations.*" An example of a short-term orientation culture is that of UK (Hofstede, 1991).

Table 2.6 summarises the main differences between long and short-term orientation dimension (Hofstede, 1991).

Table 2.6 Main differences between long and short term orientation

Predictors	High Long Term	Low Long Term (i.e. Short Term)
National	Adaptation of traditions to a modern context	Respect for traditions
	Relationships ordered by status	Status not a major issue in relationships
	Respect for social and status obligations regardless of cost	Respect for social and status obligations within limits
	Face considerations common but seen as weakness	Protection of one's "face" is important
Economics	Leisure time not too important	Leisure time important
	Concern with possessing Truth	Concern with demands of Virtue
	Invest in real estate	Invest in mutual funds
	Relationships and market position important	Bottom line important
	Good or evil depends on circumstances	Belief in absolutes about good and evil

Source: Hofstede (1991)

Generally the use of cultural models has been criticised mainly because cultural models have been viewed as a way of stereotyping people (Bourges-Waldegg & Scrivener, 1998; Light, 2003). Hofstede (2001, p. 14) defines stereotype as a "fixed notion about persons in a certain category, with no distinctions made among individuals".

Light (2003) and Jagne et al. (2004) found that cultural models do not accommodate for individual differences within them. Cultural models appeared to neglect sub-cultures that exist within a classified culture.

Especially, Hofstede's cultural model has been regarded as too stereotypical (Bourges-Waldegg & Scrivener, 1998) or rigid (Nocera and Hall 2003), and (Jagne et al., 2004). The model has been criticised for disregarding internal ethnic and language differences. For example, the model classifies all British as individualistic and all Chinese as collectivistic (Hofstede, 1980).

A central critique of Hofstede's model relates to the sample he used to collect his data. Participants were all employees in IBM in the 1960s and 1970s, thus raising questions about generalising any of Hofstede's findings to national cultures (Banai, 1982, p.354; Blankenberg, 1983, p.390; Kidd, 1982, p.71; Graves, 1986, p.7; Korman, 1985, p.244; McCoy, 2003, Merker, 1982, p. 196; Robinson, 1983, p.112; Rose, 1986, p.250; Schooler, 1983, p.167; Sorge, 1983, p.628; Triandis, 1982, p.89)

In addition, many researchers questioned whether the dimensions developed from data collected between 1968 and 1973 were artefacts or a historical piece of work not relevant or valid for work today. (Baumgartel & Hill, 1982, p.195; Lowe, 1981, p.312; Warner, 1981p.76).

Furthermore, Müller and Gelbrich (2004) have found some critical statistical deficiencies, for example redundancies and internal correlations among Hofstede's five dimensions. According to them, Hofstede's model includes only three independent dimensions (Individualism, Masculinity, Uncertainty Avoidance).

2.7.3.1 Why using Hofstede model for this research?

The substantive results obtained from 16,000 questionnaires appeared to encourage many researchers to use Hofstede's model, Søndergaard (1994) found that researchers who used the model were encouraged by the relevance of the original framework and the rigour of the method. Hickson (1996, p.222) also commented that Hofstede had "frail data, but robust concepts".

De Mooij (2004) describes the Hofstede typology as a useful framework that reduces the complexities of culture and helps in mapping important cultural differences. Mooij (2004) points out that several replications of Hofstede's study on different samples have proven that his data are still valid.

Søndergaard (1994) reviewed a number of replications of Hofstede analysis, and found that the analysis of the replications indicated that the differences predicted by Hofstede's dimensions were largely confirmed. Full confirmation with all dimensions in the predicted direction was found in four applications (Hoppe, 1990; Punnett & Withaney, 1988b, 1988c; Shackleton and Ali 1990 ;). Fifteen replications showed partial confirmation (Ashkanini, 1984; Chew & Putti, 1993; Chow et al., 1991; Dunphy & Shi, 1986; Fidalgo, 1993; Forss, 1989; Huo and Randall, 1991; Lowe, 1994; Maldonado, 1983; Pooyan, 1984; Punnett and Whitaney 1988a; Redding, 1982; Seddon, 1983; Westwood and Everett 1987; Yeh, 1988). Interestingly, there was not one single dimension that any of these studies failed to confirm.

Søndergaard (1994) also reviewed the use of Hofstede's typology as a paradigm for further research and found that 274 studies have used Hofstede's dimensions to classify and explain the influence of culture on the research topic. In particular, Hofstede has gained popularity in the areas of Information Systems and Human-Computer Interaction and many researchers in these areas have used the model to interpret their results. (Anandarejen et al., 2002; Ford, 2003; Ford & Kotzè, 2005; Forer & Hall et al., 2003; Marcus, 2004b; Massey et al., 2001; Smith and Chang, 2003; Straub et al., 1997).

In addition, with respect to the use of Hofstede model to study the phenomena of global Internet usage, Hermeking (2005) describes the correlation between two of Hofstede's dimensions, individualism vs. collectivism and uncertainty avoidance, and the use of the Internet over the world, Europe, and within the Scandinavian countries. Hermeking (2005) identified a strong positive association between Individualism and Internet usage, and a strong negative correlation between high Uncertainty Avoidance and Internet usage. The same findings were found in other studies (e.g., Maitland & Bauer, 2001).

Furthermore, researchers who adopted the Hofstede model, such as Ford, Kotzè (2005) and Marcus (2004), suggest that the use of Hofstede's model in designing user interfaces would help to decrease the cognitive load, since Hofstede's cultural model focuses on determining patterns of thinking, feeling and acting that form a culture's mental model (Hoft, 1996). Thus Ford, Kotzè (2005) and Marcus (2004) suggest that Hofstede's cultural dimensions do influence the cognitive resources required for performance to take place.

Therefore, given the significance of the results of this previous research it was decided to adopt the Hofstede model to interpret the data obtained from the research work reported in this thesis.

2.8 Cross-cultural studies

Given that culture may affect the way people behave and interact in general, Ciborowski (1979) identified a close link between knowledge and culture. In this context, a number of cross-cultural studies have investigated differences in attitudes

towards new technology. Smith, et al., (2001) carried out a study using Hofstede's model. They adapted the Taguchi method – a partial factorial experimental design in order to investigate differences between British and Chinese users' satisfaction and preferences for websites. They found significant differences between British and Chinese users in their preference of detailed e-finance product information. For example, Chinese users tend to adopt a more holistic approach to viewing web content as compared to British users.

In another study, Honald (1999) found that German mobile phone users preferred clearly-written and inclusive rich user manuals, whereas Chinese mobile phone users focused on the quality of the pictorial information.

Evers and Day (1997) found that there are clear cultural differences between users acceptance of interfaces for different cultural groups. In their study, they found differences between Chinese and Indonesian users. Indonesians were found to like soft colours, black and white displays, and pop-up menus more than Chinese users. Also, Indonesian users seemed to prefer alternative input and output modes (e.g. sounds, touch screens, data gloves and multimedia) in comparison to the Chinese, who preferred the use of many different colours for the interface design.

Riviere and Licoppe (2005) noted distinct differences between the French and Japanese users in relation to uses of SMS. They found that the Japanese use SMS with a large number of contacts within the inner and outer circles, whereas French users limit their SMS to close correspondents. Japanese SMS users also considered text messages to be an effective medium to manage relationships within their inner circle and used them to save time and attention. French SMS users are more sensitive to the expected behaviour in public and private places. For example, they choose to use SMS to distance themselves and their remote partners from bystanders.

Rose, Evaristo and Straub (2003) studied the effect of culture on the attitude of e-commerce users towards web download time. The study is based on Hall's (1976) cultural model. According to Hall (1976), perceptions of time in different cultures are either monochronic or polychronic. Monochronic cultures tend to work on one issue at a time, and therefore delays in one task will have a delaying impact on the other

tasks. People in monochronic cultures tend to be task-oriented; they value speed and normally do not change plans at the last minute (Bluedorn, Kaufman and Lane, 1992). Examples of monochronic cultures are the European /North American.

On the other hand, Hall (1976) found that people in polychronic cultures tend to change plans and focus on relationships rather than on tasks. Tella (2000) gave an example of how polychronic people perform their tasks in parallel; he suggested that polychronic people find it acceptable to answer their phone whilst having a videoconference with foreign partners, or even talk to a student while leaving the foreign partner on the line to wait. Polychronic cultures tend to perform more than one task at once; they can carry out other tasks while waiting for the first task to process. A person could simply turn his/ her attention from a main task to another that can be performed in parallel segments. Since polychronic cultures tend to perform more than one task at once, this attitude has made them more accommodating for delays in web download time. Example of polychronic cultures are Latin American and Middle Eastern countries (Hall, 1976).

In their study, Rose, Evaristo and Straub (2003) chose the US and Finnish cultures as representatives of monochronic cultures, and Egypt and Peru as representatives of polychromic cultures. Results showed that participants from polychronic cultures were significantly less concerned with download delays than participants in monochronic cultures. Also, perceived wait times varied significantly between the two types of culture. The result of this study suggested that the reason polychronic people were more willing to accept longer download time in e-commerce was not just related to their multi-tasking characteristic, but it can also be related to their 'cultural training' that prepared them to endure longer waits, even in the absence of parallel tasks to occupy their time.

In addition, people in monochronic cultures would appear to prefer a reduction in some functionalities and features in order to reduce time delay in comparison to their polychronic counterparts. Rose, Evaristo and Straub (2003) indicated that this finding may suggest that polychronic cultures can cater for more services than would have been assumed, based on monochronic interests.

Choi, Lee and Kim (2005) studied the role of cultural differences in the design of a mobile data service in Finland, Korea and Japan. They drew out critical attributes that users in the three cultures required. The results of the study indicated that users' preferences for design attributes of a mobile data service differ from one culture to another. Four cultural dimensions developed by Hofstede (1980) and Hall (1976) were adopted to analyse the data: uncertainty avoidance, individualism vs. collectivism, that are part of the Hofstede (1980) framework, and context and time perception that are part of the Hall (1976) analysis. According to Hofstede (1980) Japanese and Koreans are part of the high uncertainty avoidance cultures, whereas Finnish belong to a low uncertainty avoidance culture. The results indicated that Korean and Japanese participants were found to be more averse to unclear situations. They preferred an efficient layout or space usage, a large amount of information within a screen, clear menu labelling, and secondary information about content. These features were found to help Japanese and Korean users to visualise the overall structure of menu items without moving to the next page. Marcus and Gould (2000) echoed the same results when they studied the effect of culture on website design and found that a large amount of information within the screen and clear menu labelling and secondary information about site contents decrease ambiguous situations and ultimately satisfy users' specific cultural needs.

In contrast, Finnish users had a negative attitude towards secondary information about content. According to Hofstede (1980), they are part of the low uncertainty group and are more willing to take risk and thus explore their required data without the need to have much information about the content.

Hofstede (1980) classified the Japanese and Finnish as part of the individualistic society. Choi, Lee and Kim (2005) found that Japanese and Finnish participants were more positive about having a limited variety of options for content but were not too keen on having too much information on the actual content as this interferes with their individualism. Finnish and Japanese participants perceived the variety of options available on content as a means to enhance their interaction experience. For example, knowing about popular mobile phone ring tones can be handy but not essential information for both Finnish and Japanese users.

In contrast, Korean participants preferred to have a wide variety of content, especially ranked content as ranked content provides detailed information about topics covered on the website such as movies, songs, books, etc.. For example, knowing more information about the name of the movie, how many people watched the movie, and the ranking of the movie helped Korean participants make their decisions in relation to buying movies. Accessing information that has already been browsed and ranked by others helps web surfers from a collectivistic society to feel more connected to other groups, and this attitude corresponds with their collectivistic nature as defined by Hofstede (1980).

Based on Hall's (1976) analysis, Koreans and Japanese belong to high context cultures, and according to Hall, in such cultures people prefer implicit messages and the use of metaphors, they also tend to prefer visual elements and symbols. In contrast, low context cultures (such as Finland) prefer explicit information in clear and simple messages. Results obtained from Choi, Lee and Kim (2005) indicated that Japanese and Korean participants preferred to have an iconic menu style, a variety of font colours, and a selection of font sizes. In contrast, Finnish participants were found not to be interested in font colours and iconic menus, they preferred the mono-colour and text–based screen layouts.

The fourth dimension used to interpret the result of this study was time perception. Hall (1976) found that there is monochronic time perception and polychronic time perception, and according to him, Japan and Korea are parts of the monochronic time culture whereas Finland is part of the polychronic culture.

The results from Choi, Lee and Kim (2005) indicated that Korean, Japanese Finnish participants all showed monochronic traits. For example, participants from all the three countries chose to perform only one task at a time when using mobile data services, for example, downloading ring tones, downloading games, reserving movie tickets, and reading sports news.

In another study, Siala, O'Keefe and Hone (2004) studied the relationship between participants' religion and their attitudes towards websites that represent their faith. Muslim, Christian and non-religious participants took part on this study. The results

indicated that Muslim participants were more trusting of a Muslim site compared to a Christian one. Muslims were also found to be more trusting of a Muslim site than the other two sites, whereas Christians preferred the non-religious one to the Christian site.

Despite the importance and the relevance of cultural factors and their impact on the use of global products and services (such as mobile phones), little research has compared the effect of cultural differences on issues such as social usability of mobile phones in the developing and the developed world. Han and Hong (2003) developed a relationship model to identify differences and similarities in the design features related to affective satisfaction of Korean, Hong Kong Chinese, and US users. They defined affective satisfaction as the user's subjective feelings towards the product shape and the actual impression they had after using the product. Han and Hong (2002) found that a mobile phone design that is accepted in Korea may not affectively satisfy US or Hong Kong Chinese users. Therefore they suggested that mobile phone designers need to tailor mobile phone design features to suit the nationality of the target user group. In support of this, Sun (2003) argues that variation in cultural states will cause different attitudes or ways of using mobile phones.

2.9 Reasons for choosing UK and Sudan for research

For the purpose of the research reported in this thesis two contrasting cultures were selected, the UK and Sudan. These two countries differ in many aspects such as economy and mobile penetration rate. These differences are summarised in the next section.

2.9.1 Economic differences

According to the World Bank categorisation 2003, the Sudan is classified as one of the 54 low income countries in the world with an individual income level of around $640.00 annually, whereas the UK is classified as one of the 24 high-income countries in the world, with an average personal income level of $37,600 annually. Interestingly, there is a relationship between the economic status of the country and the penetration rate of mobile phones, according to the International Telecommunication Union (ITU) (2004).

2.9.2 Divergence in mobile phone penetration rate

ITU (2004) indicated that there is a strong positive correlation between mobile phone adoption and level of income. Wealthy countries have higher penetration rates than poorer ones. The ITU (2004) revealed that more than half of mobile subscribers worldwide are in the high-income group, see Figure 2.2.

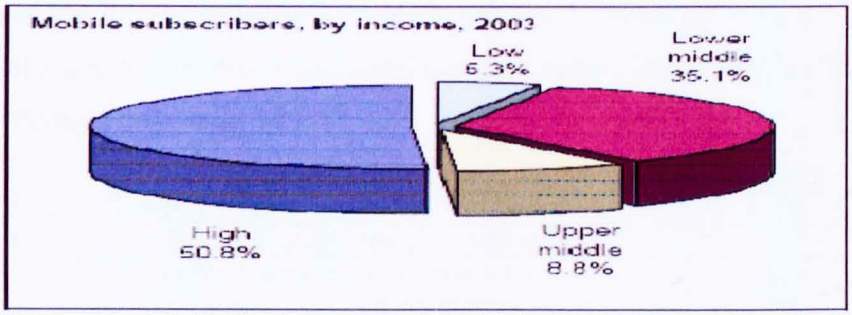


Figure 2.2 Mobile phone subscribers by income, 2003 (worldwide)

Source: ITU (2004, p. A-13).

The UK, as part of the developed world, is one of the leading nations in mobile telephony adoption as shown in Table 2.1 on p.19. The mobile phone has also found its way to the developing world despite the individual low level of earnings for individuals. For example, the Sudan as the tenth largest country in the world and the largest African country, with a population of over 36 million people, has maintained a rapid and profound level of mobile phone adoption with over 2 million subscribers joining the leading mobile communication company Mobitel (Africa and Middle East telecom, 2006).

This increase in mobile phone use in the Sudan underlines other reasons that may account for the uptake of mobile phone penetration in the developing world. An online information analysis known as The Taylor Nelson Sofres (TNS, 2002) found that culture and government policy may influence the rate of wireless technology penetration. For example in the Sudan, the unreliable, inefficient and limited landline telecommunication infrastructure may have encouraged people to use the mobile phone as a technological substitute for fixed landlines. The New York Times (2005)

reported that in Africa there is almost one landline for every 33 people. This has made the mobile phone the only available communication tool for many people.

In the Sudan, the problem is not just related to fixed landlines there are also financial, political barriers in acquiring other information and communication technologies such as the Internet. Table 2.7 presents the differences between the Sudan and the UK in the use of the information and communication technologies (ICT) (The World Bank, 2004).

Table 2.7 Differences between UK and Sudan in use of ICT

ICT USE	UK	Sudan
Telephone main lines (per 1,000 people)	567	31
Internet users (per 1,000 people)	533	9
Personal computers (per 1,000 people)	496	6

Source: (The World Bank, 2004)

Other researchers related the high adoption of mobile phone use in the developing world to its capacity to include partly illiterate mass populations who can not afford to have computers (Townsend, 2000). Others argue that people in the developing countries perceive the mobile phone as their 'pass' to enter the sphere of digitalised information (World Telecommunication Development, 2002) which can help narrow the gap between the developed and the developing world.

Yet despite the increased number of subscribers in the Sudan, it is relatively low in comparison with the UK market. Table 2.8 presents the differences in mobile phone penetration rates in the UK and Sudan.

Table 2.8 Breakdown of mobile phone penetration in Sudan and UK.

World Bank Categorisation (GNI Per Capita)	Country	Population 2005 (millions)	Mobiles 2003 (000s)	Mobiles per 100 people, 2003 (category median)
Low-Income $640.00	Sudan (classified as one of 54 low income countries)	36.2	650	2.00
High-Income $37,600.00	UK (classified as one of the 24 high-income members)	60.2	52,984	91.17

2.9.3 Cultural factors

Another difference between the UK and the Sudan is based on Hofstede (1980) framework Hofstede (2001) under took research on 53 countries that demonstrates cultural differences on the basis of his five dimensions on a scale form 1 to 100 and he also produced the rank of the country compared to others.. According to Hofstede (1980) countries differ along four or five dimensions; individualism/collectivism, power distance, masculinity/femininity and uncertainty avoidance. The results developed by Hofstede (1980) for UK and Sudan are produced in Table 2.9.

Table 2.9 Scores on Hofstede Cultural dimensions for the UK and Sudan

Country	PDI		II		MI		UAI		LTOI	
	Rank	Score	rank	Score	Rank	Score	Rank	Score	Rank	Score
Sudan	7	80	26/27	38	23	53	27	68		
UK	42/44	35	3	89	9/10	66	47/48	35	18	25
(Hofstede, 1991)										

The source: Compiled by the researcher, Sudan data considered as part of Arab world group
Key: (PDI: Power Distance Index; II: Individualistic Index; MI: Masculinity Index; UAI: Uncertainty Avoidance Index; LTOI: Long Term Orientation Index).

Table 2.9 shows that the British show signs of a greater degree of individualism than the Sudanese; they score 89 on the Individualism Index (II) and are ranked third, whereas the Sudanese as part of the Arab world, score 38 and are ranked 26 (Hofstede, 1994). Therefore, the UK belongs to individualistic cultures, whereas the Sudan is classified as part of the collectivistic cultures. In individualistic cultures, people prioritise their personal goals, even if these goals collide with those of their family, friends, and country. In contrast, people in collectivistic cultures give priority to group goals and this can be regarded as a credit to the society, since individuals can tackle problems and support each other. In individualistic cultures, the unit of analysis is the individual, where the individual is self-directed and disconnected from the other (group). An individual can be member of many groups. On the other hand, in collectivistic cultures, using Hofstede's typology the person is not self-directed and is often defined in connection with the group. Individuals are connected to many groups, but connection is strong and central to one's identity.

The Sudan has a greater power distance than the UK, scoring 80 on the power distance index (PDI) as opposed to the UK score of 35 (Hofstede, 1994). In countries with a large power distance, employees exhibit a greater dependence on their superiors and are unlikely to approach or contradict them, whereas in countries with a

small power distance, employees are not so dependent on their superiors and have a preference for consultation (Hofstede, 1991).

Uncertainty avoidance (UA) can be defined as the extent to which the members of a culture feel threatened by uncertain or unknown situations. The Sudanese prefer to avoid uncertainty more than the British; the Sudan scores 68 on the uncertainty avoidance index (UAI) whilst the UK scores 35 on the UAI (Hofstede, 1994). As a result of this high uncertainty avoidance characteristic, the society does not readily accept change and is very risk averse. Anxious cultures are more expressive; the people use gestures and are more openly emotional, whereas in countries with lower uncertainty avoidance (like the UK) people are less expressive and conservative in showing their emotions in public.

Masculinity (MA), the final cultural dimension, is the degree to which society values masculine or feminine qualities. The UK is a more masculine society than the Sudan in Hofstede's rating. The UK scores 66 on the masculinity index (MAI) and ranks joint ninth, whilst the Sudan scores 53 and ranks joint thirty-fifth (Hofstede, 1994). A masculine society such as the UK places greater emphasis on high earnings, recognition, advancement and challenging work, whereas a feminine society such as the Sudan, places more emphasis on qualities such as a good working relationships with superiors, co-operation, and employment security.

As for the Long Term Orientation (LTO), the UK scores 25 on this dimension; however the Sudan was not included in the study carried out by Hofstede and Bond (1989) in a limited number of countries. Therefore this dimension was disregarded in work reported in this thesis.

Mobile phones are widely adopted in the UK as part of the industrialised world, at least a decade before it was used in the Sudan. This late emergence of mobile phones in the Sudan makes it an exciting gadget especially as landlines were not widely available. The Sudan is an under developed African country which is predominantly influenced by the Arab and Islamic world (BBC News, 2007). The researcher observed that, its distinctive cultural values and the social fabric play a role in the way people act in general and more specifically regarding mobile phone use. For example,

generally people tend to avoid confrontation and discussing private issues in public places. In relation to mobile phone use, a very important phone call might be ignored or rejected to avoid reflecting a negative image in public place. As people care about how other people see or classify them.

The researcher noted that in the Sudan, females are well guarded and looked after by other members of the society, they are expected to behave in a certain way and to adhere to social etiquette. For example, even for a female to answer a mobile phone in a public place is not considered appropriate. Whereas in the UK, females answer their mobile phones easily without being judged on that action.

Another cultural difference that was noted between the UK and the Sudan is related to the perception of time. Sudanese are generally relaxed about time, and it is natural to come two hours late for an appointment. They do not give a specific time for meetings. For example, they say "let us meet in the evening", or "let us meet on Friday". And it is quite acceptable not to make a phone call to give a specific time for arrival or to update others on your delay.

In the UK, people value time more, and the individual is expected to stick to his timetable, or to inform involved parties about any changes.

An interesting cultural difference between the British and the Sudanese is related to food element. In the Sudan people eat in together, it is a collective experience, where people sit in together around a small table full of large dishes and they eat from the same dishes with their hands. Eating time is a ceremony that has set norms and etiquettes, people are expected to sit together and pass the food around. They tend not to engage in other activities e.g. using mobile phone during meal times, this attitude is perhaps influenced by the fact that a person will be so immersed in eating by hands and it is difficult to attend to the mobile phone. Eating in is the norm and fast food culture is not prevalent in Sudan and inviting people to eat out is looked down upon and considered as a less generous attitude.

The researcher also noted that in the UK, children tend to leave home after certain age, live independently. Young generation is usually a fast food generation. People are relaxed about eating out and it is considered a nice gesture to invite people out.

People in the Sudan consider the mobile phone one of the most valued presents. Sudanese who live abroad (e.g. EAU, UK) often send mobile phones to their relatives in the Sudan. Young mobile phone users' in the Sudan struggle to maintain the daily running cost of their mobile phones, which puts some financial strain on parents and working family members. For example, the parent or the working brother feels oblige to top up his younger brother mobile phone.

In the UK, although parents are also responsible for maintaining the running cost of their children's mobile phones, children themselves have other resources such as allowances, pocket money even government provides subsidiaries e.g. free bus passes, free prescription, which releases some of the financial strain on the family.

Another interesting point is related to mobile phone service culture, in the Sudan there are only two mobile phone service providers Mobitel and Areeba, the mobile phone service is a monopoly, whereas in the UK there are many companies that provide interesting and attractive offers regularly to mobile phone users. In the UK, mobile phone user can easily get a free mobile phone and free talk-time allowances; whereas in the Sudan such offers do not exist.

2.10 Chapter Summary

This chapter discussed the research literature relating to communication, communities of practice, and mobile phones. The review presented material from a wide range of sources to highlight the myriad of social and cultural implications on the use of mobile phones. The research indicates that mobile phone use as a means to emphasise social connection between groups or to meet individuals' needs is essential to all people in various cultures. In the next chapter, the methods chosen to investigate these issues in the research work reported in this thesis will be discussed and justified.

Chapter 3

Research Methodology

3.1 Introduction

This chapter introduces the methods used to conduct the research presented in this thesis. This chapter begins by providing information about the first study, and then presents an experimental overview to explain the two subsequent studies, and the experimental designs and techniques used in these studies. The chapter is divided into two parts on the basis of the two main methodologies used: a human-centred design (HCD) methodology used to develop and evaluate the prototype icon-based missed call service (IBMCS), and an experimental methodology used to investigate users' perception of the two versions of the latter. The planning and conducting of Study 1 and the two experiments are then explained with reference to the variables, the sample of participants, the design of the experiment, and the data analysis techniques used.

3.2 Overview of programme of research

In this research, 3 main studies and 3 pilot studies were carried out. The selection of appropriate research methods was a major challenge that faced the researcher. Mackay and Fayard (1997, p223) noted that HCI researchers face real problems in determining appropriate techniques for their research:

"Unlike researchers or designers working within a single academic discipline, with well-established procedures for conducting their work, we find ourselves constantly borrowing, inventing and re-inventing techniques as we go.... At the same time, we must conduct our work in a way that is ... viewed as legitimate by our academic colleagues"

Two different methodologies were used to achieve different experimental objectives: a human-centred design (HCD) methodology, and an experimental methodology.

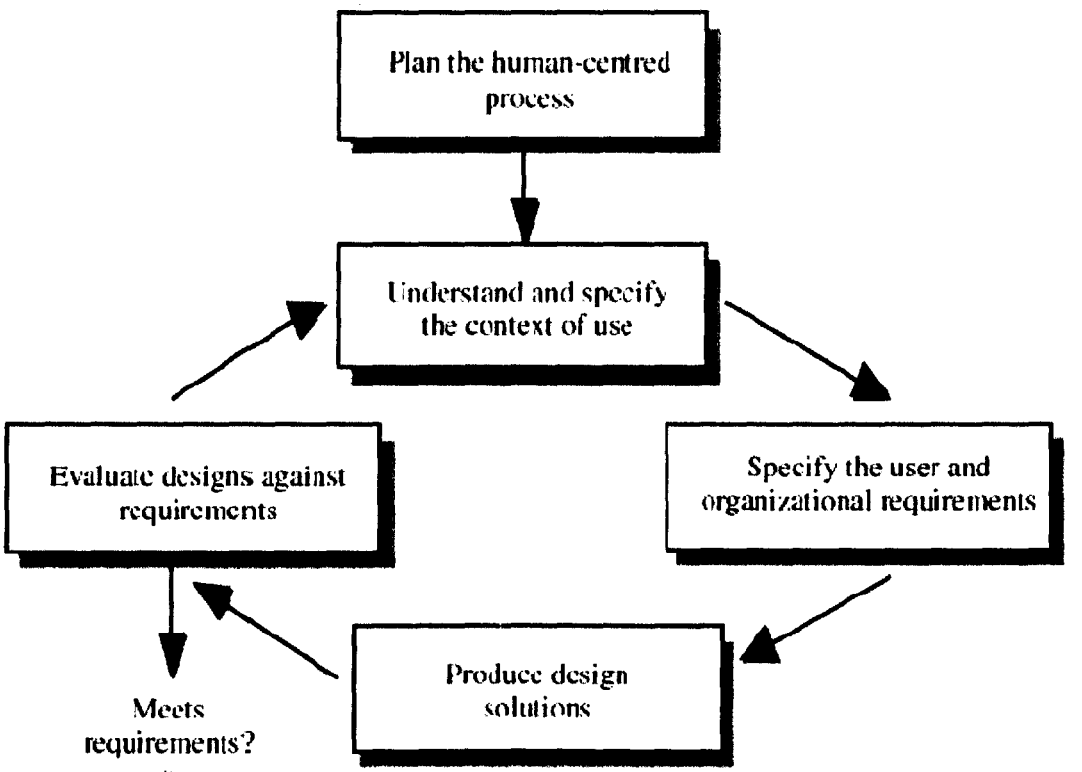
The first study formed the basis for the development and the personalisation of the icon-based missed call service. The second and third experiments used an experimental methodology, and the main aims were to (1) investigate users' perception of the IBMCS (2) investigate the impact of culture on users' perception of the Icon-based missed call service (IBMCS), and (3) investigate ways to personalise the Icon-based missed call service (IBMCS). The following sections will describe these methodologies, and the techniques and materials used in each of the experiments.

3.3 Methodology 1: Human-centred design (HCD)

Maguire (2001) emphasised that in order to develop more usable systems, there is a need to consider users' views during the development process. A HCD methodology has been accredited as an efficient method to obtain system usability (Preece et al., 1994; Maguire, 2001). HCD is concerned with making user needs vital in the design process, performing early testing and evaluation with users, and designing iteratively (Preece et al., 1994). According to the ISO 13407 (1999) standard on HCD, there are five essential steps that need to be considered when developing usable systems:

1. Plan the human-centred design process
2. Understand and specify the context of use
3. Specify the user and organisational requirements
4. Produce designs and prototypes
5. Perform user-based assessment

Once the initial planning stage is achieved, the four other steps should be carried out cyclically to achieve the usability of the system. Figure 3.1 gives a diagrammatic view of the HCD approach from ISO 13407 (1999).



Source: Based on ISO 13407

Figure 3.1 Human-centred design activities

For each of the HCD activities, Maguire (2001) developed a summary of the methods and activities that can support each stage of the design process, which are presented in Table 3.1. The methods highlighted in bold are those chosen for the research reported in this thesis. The sections that follow explain the importance of each stage of the HCD process, the methods used to design and evaluate the prototypes as part of the work conducted for this research, and justification for the selection of the methods employed.

Table 3.1 Methods for human-centred design

Planning	Context of use	Requirements	Design	Evaluation
Usability planning and scoping	***Identify stakeholders***	***User requirements interview***	***Brainstorming***	***Controlled user testing***
Usability cost-benefit analysis	***Context of use analysis (informally)***	***Existing system/competitor analysis***	Design guidelines and standards	***Satisfaction questionnaires***
	Survey of existing users	***User, usability and organisational requirements***	Card sorting	***Post-experience interviews***
	Field study/ user observation	Focus groups	Wizard-of-Oz prototyping	Participatory evaluation
	Diary keeping	Scenarios of use	Sketching	Assisted evaluation
	Task analysis	Personas	***Paper prototyping***	Critical incidents
		User cost-benefit analysis	Affinity diagramming	Heuristic or expert evaluation
		Task/function mapping	***Software prototyping***	
		Allocation of function	Parallel design	
		Stakeholder analysis	Organisational prototyping	

Source: Adapted from Maguire (2001) and based on ISO 13407 standard on human-centred design (ISO, 1999).

Note: Methods used in research in bold.

3.3.1 Stage 1: Planning human-centred design process

Maguire (2001) suggests that for the application of a HCD approach to be usable, it must be thoroughly planned and managed throughout all parts of the system development process. At this stage, the focus is on discussing and agreeing with stakeholders the importance of usability in the project objectives and ways to prioritise usability work.

According to Maguire (2001), the kind of information that needs to be gathered at this stage is:

- Why is the system being developed? What are the overall objectives of developing this system? How will it be considered as a successful system?
- Who is going to use this system, their capabilities and experience, and the tasks they will perform using the system?
- What are the technical and environmental constraints? What types of hardware will be used in what environments?
- What is the key functionality needed in this system to support the users?
- How and why will the system be used? (Typical scenarios of how and why users will interact with the system)?
- Are there any initial design concepts?

These issues were investigated based on the literature review and from discussion with other domain experts. The literature review helped to identify drawbacks in the current missed call service, and the expected usability benefits offered by the developed service. In addition to the literature, the results obtained from Study 1 also provided valuable descriptions of the functionality of the current missed call system. The researcher also discussed thoroughly with three other HCI experts issues involved with system functionality, target users, and their motivations. As well as this, they also discussed different scenarios of use, the usability goals, and the technical limitations of trying to develop an icon-based missed call service.

3.3.2 Stage 2: Understand and specify the context of use

Any developed system is used within a certain context. To understand the context Of use, certain types of information need to be gathered (Maguire, 2001):

- Users' tasks
- Users' attributes
- Organisational environment
- Technical environment
- Physical environment

According to Maguire (2001), for a fairly simple system, such as the one designed for the research conducted for this thesis, a context of use analysis can be informally conducted as part of discussions held at the planning stage. In this case, context of use issues were, for example, related to intended context of use, and users' characteristics such as target users' age group, their type of mobile phone contract, etc.

3.3.3 Stage 3: Specify user and organisational requirements

The system designed for this research was not intended to be used within an organisation, and therefore only the user requirements were specified. User requirements captured the characteristics of the intended user groups in the two countries, and the needs of those users in relation to the system being developed (Maguire, 2001). The result is a description of tasks the system needs to support, functionality that will support these tasks, potential scenarios of use, and possible interaction steps through the system.

In order to ensure that the service would support the type of communication people would need, requirements were gathered from two sources: one-to-one interviews were conducted in Study 1 with 88 participants to find out about the limitations of the current system. In addition, further one-to-one interviews were conducted with 6 participants in the UK and the Sudan who were all 'heavy' users of missed calls. The themes that were highlighted in these interviews formed the core of missed call types used in the development of the prototype service.

Usability requirements were based on the ISO 9241-11 (1998) standard, and were defined as being an improvement in effectiveness, efficiency and usability relative to the current missed call service. Effectiveness refers to how good the system is at doing what it is supposed to do, efficiency refers to the way a system supports users in carrying out their communication tasks, and the subjective usability of the system refers to users' perception of how easy the system is to use.

3.3.4 Stage 4: Produce design solutions

The designer's role is to select the most appropriate design option to transform users' requirements into a conceptual model for design (Preece et al., 2002). Preece (2002, p 40) defines conceptual models as a *"description of the proposed system in terms of a set of integrated ideas and concepts about what it should do, behave and look like".*

There are many methods that can be used to emulate the process of design. For example, scenario building, sketching, and storyboarding. In the following section, methods that were used to aid the design process of the missed call service will be discussed. The first step discussed is brainstorming.

3.3.4.1 Brainstorming

Brainstorming is a popular technique used in the design process. Brainstorming sessions involve a set of design and task experts stimulating each other in the production and idea generation stage of the problem-solving process. The brainstorming technique enables the designer to generate various creative ideas about the system. Designers need to be ready to explore a wide range of creative thoughts and, at the same time, be able to transform these new ideas into real designs (Salustri, 2003). At the end of a brainstorming session, the designer will have the chance to emulate different scenarios and produce solutions based on these.

Brainstorming was adopted in this research to create design ideas for solving problems related to mobile phone services. Six HCI experts took part in these sessions, three from UK (two lectures and a PhD researcher) and three (lecturers) from the Sudan. The reason for selecting these specific experts was mainly related to their expertise and their speciality in the design area but also using British and Sudanese HCI experts provide valuable information since those participants are from the Sudan and UK.

A joint brainstorming session was conducted with the British HCI experts and then individual sessions were conduced to amend and refine the functionality of the system. For the Sudanese HCI experts joint series of brainstorming sessions were conducted and ideas were revised and modified until the functionality of the system was decided.

Another important aspect of the user-centred design process covered in this thesis is the use of iteration and the use of paper prototyping. Both of these research methods are discussed in the next section.

3.3.4.2 Iteration, storyboarding and paper prototyping

Usually, design is an iterative process that attempts to deal with the "inherent problems of incomplete requirements specification by cycling through several designs, incrementally improving upon the final product with each pass" (Dix et al., 1998, p.205).

The use of the iteration technique enables the designer to improve and refine the design outcome. Preece et al., (1994), suggest that the iteration process offers the designer the chance to explore various alternatives during the design process. Storyboarding and paper prototyping are means that enable the designer to reflect on users' perspective and iterate the prototype accordingly.

Storyboarding is drawing a set of screens that illustrate elements of user interaction with the technology and demonstrate the future-use scenarios. This is usually followed by a development of a paper prototype. Snyder (2003) viewed the paper prototype as a tool that enables the developer to design, create, test and communicate a user interface. On the early design stages story boarding and paper prototype techniques were used to collect users' comments.

Paper-based prototyping known as low fidelity prototyping is a quick and inexpensive way of representing the system and of providing valuable early insights in the design process (Preece et al., 2002). However, on the other hand, paper prototyping does not exemplify the design clearly; the designer cannot project perfectly what the system will look like for the user, since it provides static snapshots of the design.

Computer-based prototyping enables the designer to offer the user a more realistic dynamic look at the future design of the system or service, and the user can experience

some of the system functionality. It has some drawbacks, for example it is classed as high fidelity, and therefore the user may think that the prototype is the actual system.

Preece et al. (2002) suggest that HCD should involve both low and high fidelity prototyping. For this research, the low fidelity phase involved rapid prototyping using paper prototyping of storyboarding shots. This technique was used for the second and the third studies. The high fidelity option involved evolutionary prototyping using Flash 8 to produce the software prototype.

3.3.4.3 Flash

The Macromedia Flash Platform is a lightweight cross-platform runtime that offers the developer an environment to develop rich media for web content and mobile applications. For the purpose of this research, Macromedia Flash was used to generate the software prototype with its basic functionality, as well as the final version of the IBMCS. The reason for choosing Macromedia Flash was because it is possible to run the application on both mobile phones as well as the PC. The ability to run the application on a mobile phone platform was essential for several reasons:

- It offered users the opportunity to experience using the IBMCS in its true environment, a mobile phone platform.
- It offered the experimenter the chance to observe users using the service in a real mobile context (outside the laboratory setting)
- It made the experiment more viable, especially in the Sudan, where users are more familiar with mobile phones than pc computers.

3.3.5 Stage five: Evaluation

There are different methods used in HCI to evaluate the design of a prototype during its lifecycle. Evaluation can be defined as collecting the view of specified users for certain activities within a defined setting or context of use (Preece, et al. 1994). Preece pointed out the main aims of carrying out evaluations:

- To see how users use technology in real settings
- To compare different designs
- To test if the prototype is usable
- To certify that the prototype has achieved the required standard

There are two types of evaluation, formative evaluation which can take place during the design lifecycle, or summative evaluation which assesses the quality of the finished product.

According to Maguire (2001), there are various evaluation methods that range from formative to more formal methods of evaluating the developed system. A set of evaluation methods are described in the next section.

3.3.5.1 Participative approach

This is the least formal evaluation approach and it is regarded as being very cost effective. The approach is suitable for understanding users' perception of the design and ways to improve it early in the design process. One form of participatory evaluation is known as an evaluation workshop. In this type of evaluation, users' work with the system to carry out certain tasks while designers observe. Designers can then conduct a facilitated discussion. The advantage of using this technique is that it allows users and developers to discuss issues related to the developed system. The involvement of many users can highlight different design issues.

An evaluation walk-through is another form of participatory evaluation. In this type of design, a team guides users in a step-by-step process through the system. A human factors' specialist may also help in this process. Users comment on the system as they walk-through. A list of problems is compiled by consensus and corresponding severity ratings are identified as they arise. Based on the users' feedback and severity ratings, the design of the prototype is changed accordingly.

3.3.5.2 Assisted approach

This approach is more formal than the participative approach and requires users' to carry out tasks and to discuss aloud issues related to them. However, the experimenter is not expected to interfere unless the user cannot proceed with using the system. The purpose of using the assisted approach is to get the greatest feedback from the user while trying to maintain as realistic a setting as possible.

3.3.5.3 Heuristic or expert Evaluation

Heuristic or expert evaluation is a technique where one or more usability experts review the usability of a system prototype and identify potential problems that users may encounter. The advantage of an expert evaluation is that it is a quick and easy way to obtain feedback and recommendations. The drawbacks of this type of evaluation are that experts may have personal biases towards specific design features, and it is difficult for experts to forget their role and act as users.

3.3.5.4 Controlled user-testing approach

Controlled testing is the most formal evaluation and is used to find out how users will interact with the full working system in a series of 'set up' trials. Some of the measures that are used in controlled user tests are effectiveness, efficiency and satisfaction. A controlled user testing study to evaluate a prototype will typically involve running test sessions with 8-25 users (Maguire, 2001). Piloting is required to ensure that the correct procedure and recording mechanisms are in place.

The advantage of this approach is that the system will be tested under conditions similar to conditions where it will be used, and useful data can be collected quickly. Users' comments and feedback can form the base for new ideas in the design. The disadvantage is that it is demanding of time and effort from the experimenters and users.

3.3.5.5 Subjective user questionnaires

Subjective user questionnaires collect the subjective impressions of users based on their experiences with a working system or a new prototype. Users' impressions are collected

using questionnaires or through direct communication with users. Users are often asked to complete a standardised questionnaire and then the data are analysed statistically.

3.3.5.6 Assessing Cognitive Workload

Cognitive workload evaluation means measuring the mental effort users' use to perform tasks on the prototype. Measuring cognitive workload can be carried out using questionnaires such as the Subjective Mental Effort Questionnaire (SMEQ) (Zijlstra, 1993), and the Task Load Index (TLX) (Nasa-Ames Research Centre, Human Performance Group, 1986). It is also possible to collect objective physiological data from heart rate variability and respiration rate.

3.3.5.7 Critical incidents

In this type of evaluation, critical events that signify errors in the design are recorded. Verbal reports of the incident are analysed and categorised to determine the frequency of different incident categories. The main advantage of this approach is that it can be a cost effective way of gathering data. The drawback of this method is that it relies on the accuracy of users recall. Automatic system monitoring may be set up whereby the system itself records interaction events of importance.

3.3.5.8 Post-experience interviews

Individual interviews are a way of collecting subjective feedback from users based on their interaction with the prototype. The advantage of this method is that it is quick and cost effective. The interviews may be based on the current system they are using or be part of a debriefing session following the testing of a new prototype. The interview should be semi-structured to enable the interviewer to check on a set list of items while at the same time offering users the chance of adding further views and opinions.

The reason for evaluating the prototypes in Experiment 2 and 3 of this research by using interview was to collect fast feedback to redesign the prototype and ensure that the prototype matched user requirements. The evaluation methods used in Experiments 2

and 3 are controlled user testing, satisfaction questionnaire, and post-experience interviews.

The controlled user testing method was chosen for this work as it enables users to test the prototype system and provide the designer with valuable feedback on how the system will behave when exposed to real use. The method can also be useful in identifying usability problems. Two pilot studies were carried out for the two experiments to test the prototypes and to ensure that the experimental procedure was set up properly.

The other evaluation method used is user-subjective questionnaires. In this type of evaluation, designers attempt to find out about the attitude and performance of the intended users towards the system (Dumas & Redish, 1999). The computer system usability questionnaire (CSUQ) that was developed by Lewis (1995) was adopted to measure users' satisfaction towards the developed missed call service see Appendix 2. The reason for using this type of evaluation was that it is a quick and inexpensive way of collecting users' feedback for the developed prototype.

A post-experience interview technique was also used to obtain users' comments and suggestions on the prototype. A semi-structured interview was conducted with participants in both experiments. The main advantage of this method is that it offers users the chance to suggest more freely ideas about how to improve the design of the prototype. Since it could not always take place in the laboratory, it offered the designer and the user an informal environment to discuss design issues. For more details on the interview format used please see section 3.4.

Another type of evaluation that can be used is the 'quick and dirty' approach. In this type of evaluation, designers get feedback informally from users or experts to ensure that their ideas are aligned with users' needs and are accepted. Quick and dirty evaluations can be done at any time; in the experiments reported as part of this thesis, they were carried out at early stages. The stress is on quick input to the design process rather than carefully documented findings. Informal regular meetings were carried out with three HCI experts

that led to the re-design of the prototype, as well as carrying out regular discussions and meetings with potential users. The advantage of the 'quick and dirty' evaluation is that it is quick, and experts can highlight design shortcomings in an informal way.

The advantage of using this kind of evaluation is that it saves the need to conduct heuristics evaluation that is a more time consuming evaluation and requires a set of experts.

3.4 Methodology 2: Experimental methodology

Dix et al. (2004) define the experiment as one the most potent methods of evaluating a design or an aspect of a design. According to Sanders and Pinhey (1974), the goal of experiments is to show the occurrence or absence of a causal relationship between two or more variables. Broadly, an experiment is an investigation that is performed under controlled conditions to prove a known fact, or examine the validity of a hypothesis. Preece et al. (2002) suggested that experiments are performed to test a hypothesis that interprets a relationship between two or more events (known as variables) and the hypotheses are tested by controlling one variable or more. Robson (2002) provides a more detailed explanation for experiments:

- Allocation of participants to various conditions.
- Control of one or more of the variables known as the independent variable
- Measurement of the effect of the manipulation of the independent variable on the dependent variable
- Control of all other variables.

3.4.1 Variables used in experimental studies

Christensen (1997, p.191) defines a variable as "any characteristic of an organism, environment, or experimental situation that can vary from one organism to another from one environment to another or from one experimental situation to another". According to Sanders and Pinhey (1974, p.61) a variable is a "type of concrete concept that varies and takes on different values".

Researchers have distinguished between two types of variables: dependent and independent. Kirk (1995) defines an independent variable as any expected causal event that is under investigation. The independent variable is actually used to describe variations in the dependent variables. A dependent variable is measured to calculate the effects, if any, of controlling the independent variable. For example, if the aim of the study is to investigate the attitude of mobile phone users towards the IBMCS then the dependent variable is the "attitude of participants towards the IBMCS and the independent variable is the IBMCS.

There are two distinct types of experiment: laboratory experiments and field experiments. Laboratory experiments are conducted in a laboratory, which is a dedicated place to carry out experimental work or to research in general. The other type of experiment is a field experiment. These are typically performed in the work environment, or 'in the field'.

Boudreau et al. (2001) found that laboratory experiments are performed in an environment that is designed by the researcher for the investigation of a particular phenomenon. With this research method, the researcher has control over the independent variable(s) and the random assignment of research participants to various treatment and non-treatment conditions. Participants who take part in laboratory experiments have the chance to be more task-focused, since the environment is controlled and there are no interruptions by other factors.

Robson (2002) highlighted a problem that weakens the notion of generalising the results of laboratory experiments because of subjective bias. In this case, participants amend their input and respond to the experiment based on their understanding of what the experimenter is testing in order to please the experimenter. Although subjective bias may be controlled by minimising the contact between participants and the experimenter, which is often the case with human-computer interaction experiments, many have argued that laboratory results should not be generalised to the real world.

Laboratory experiments have been criticised for the 'artificiality' of the experimental environment (Sanders & Pinhey, 1974). The deliberately created environment makes it difficult to generalise the results to the larger social world outside the laboratory. Aronson and Carlsmith (1986) identified a problem related to laboratory experiments which is the lack of realism, and they divided the realism into experimental realism and mundane realism. Experimental realism is if the situation presented to participants is realistic and has impact on their lives. Mundane realism is if participants are dealing with events unlikely to happen in the real world. Absence of the two types of realism leads to an accumulation of inconclusive findings and invalid results.

In order to compensate for the problems of external validity and generalising the results of laboratory experiments, another type of experiment has been developed. In field experiments, the same logic of laboratory experiments applies. The difference is that the researcher examines the effect of the dependent and independent variables outside the laboratory settings in a more realistic environment (Sanders & Pinhey, 1974).

Sanders and Pinhey (1974) identified a clear difference between laboratory and field experiments. They found that field experiments can be used to obtain results that can be more generalised to the real world. Since the experiment is conducted in a natural, real environment, this reduces the artificiality of the experiment. However, in order to obtain reliable results from field experiments, Robson (2002) highlighted the need to use a random allocation of participants to obtain more ecologically valid results.

Robson (2002) also highlighted one of the weaknesses of using field experiments, where the experimenter has less control over the variables and this may affect the chance of getting replicable results. However, Sanders and Pinhey (1974) argue that less control over variables produces truer findings with higher external validity.

For the work reported in this thesis, effort was made to accommodate for the pitfalls of using field experiments. For example, avoiding any possible order effects. Order effects can be defined as when one task in the experiment is always taken first and the other task

comes second. This way of working may result in the first task being performed better than the following one. The results of performing better on the first task may be influenced by various causes such as practice effect or just being more interested at the beginning of the session. To avoid the problem of order effect, Robson (2002) suggested that a counter-balancing effect should be adopted. In the two field experiments in this research participants were divided into two experimental groups using random assignment. The first group were asked to perform task one (sending a missed call using the IBMCS) and then task two (receiving a missed call using the IBMCS), whereas the second experimental group were asked to perform task two first followed by task one. Therefore, the order effect is balanced out and it is hoped, minimised.

To deal with the impact of the acquiescence effect, when participants amend their answers and reactions based on their understanding of what the experimenter wanted (Love, 2005), the attitude scale used in this research included a combination of positive and negative Likert statements.

3.4.2 Experimental plan

Robson (2002) stated that it is essential for experimenters to cover all the elements in their experiment plans. For example, the variables of the experiment, the selection of samples of individuals from the known population to take part in the study, and the allocation of samples to different experimental conditions. Coolican (2004) also highlighted other features that the experimenter needs to take into account when planning the experiment, such as the design of the experiment and the statistical tests that will be used to analyse the results obtained from the experiment. These features will be discussed in relation to the experimental work carried out in this research in sections 3.4.3 and 3.4.5.4.

The international standard ISO 9241-11 (1998) defines usability as the degree to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. In Experiments 2 and 3, the

Computer Systems Usability Questionnaire CSUQ Lewis (1995) was adopted to measure participants' satisfaction towards the IBMCS.

Subjective satisfaction is one of the five human factors goals proposed by Shneiderman (1987) for quantifying the efficiency and usability of an interactive system. Lewis (1995) developed the CSUQ to measure users' satisfaction at IBM. Researchers consider subjective usability evaluation using questionnaires is closely linked to psychological measurement, as usability has a clear psychological element (Chin, Diehl, and Norman, 1988; Kirakowski, 1996; LaLomia and Sidowski, 1990; Lewis, 1995). Many usability researchers have adopted psychometric approaches to develop their measurement scales. For the experiments in this research, the user satisfaction questionnaire was based on Lewis's (1995), CSUQ.

The CSUQ consists of 20 usability questions to which respondents have to agree or disagree on a seven-point scale, ranging from 7 (Strongly disagree) to −1 (Strongly agree). The main measures used in the CSUQ are defined below and were used in the development of the user satisfaction questionnaire used in the research reported in this thesis:

- **Ease of use**: how easy to use the service to place or receive a missed call.
- **Enjoyability**: whether the user found the experience of using the new service enjoyable.
- **Recovering from mistakes**: users' opinion about the ability to recover from mistakes and amend wrong keypad hits.
- **Organisation of information on the screen**: the degree to which the user found the information provided and the layout of the screen clear and systematic.
- **Likeability:** whether or not the user found the service useful and pleasant and whether or not he/she would choose to use it again.
- **Expectability:** whether the user's conceptual model of the service has matched the design of the service, and whether the service has met all the expectations of the user.

- **Overall satisfaction:** degree to which the user found the service useful and satisfying to use.

3.4.3 Design of experiments

The design of an experiment is essential to produce reliable and generalisable results. There are two main types of experimental design: between-subjects and within-subjects (Robson, 2002). In a between-subjects design, the difference between the two groups is related to the independent variable (Davis & David, 2002). In other it compares separate group of participants. For work reported in this thesis between subjects design was used in experiment 2. A disadvantage of this design is that more participants are needed, and that differences between groups and between users can negatively affect the results (Dix et al., 2004). For the work reported in this thesis, matching all groups for age, gender, and mobile phone experience mediated these negative effects.

In within-subjects design each participants provides data for all the levels of the independent variables. A within subject designs is an experiment in which the same group of subjects serves in more than one treatment. In experiment 3 a within subjects design was used. An advantage of within subject design is it is powerful and it requires relatively few participants. The disadvantage of using within subject design is related to order effect these are changes in behaviour or performance related to participation in an earlier treatment condition. For work reported in this thesis, a counterbalancing technique was used to eliminate the potential for confounding by disrupting any systematic effects from factors related to time or the order of treatment. To enable a counterbalancing technique participants are divided into 2 groups using random assignment, the first group is asked to perform task one which was sending a missed call using the personalised IBMCS followed by task 2 which is receiving a missed call using the personalised IBMCS, whereas the second group is asked to perform task two and then task one.

3.4.4 Sample of participants

Similarly to other areas of research in HCI, one of the main aims of conducting a study is to be able to generalise the results to the intended user population. It is therefore imperative that a sample of participants is chosen for the study that is representative of the intended target population. Population refers to all the cases of people who will use mobile phones, whereas a sample is a selection from that population. For the work reported in this thesis, the target population were the British and the Sudanese who own mobile phones and who have lived in the country of residence (i.e. the UK or the Sudan) for 15 years or more. The first participant requirement (to be a mobile owner for over one year) was met through the use of filter questions during participant recruitment. The other participant requirement was the period of residence in the country. This was to ensure that the participant belongs culturally to that country; this was met by discarding all questionnaires completed by participants who had lived for less than fifteen years in the UK or the Sudan.

Participants were recruited through opportunistic sampling methods, whereby colleagues, friends, volunteers were approached and asked to take part in the study.

All experiments were conducted in accordance with the ethical principles outlined in The British Psychological Society (1993) 'Code of Conduct, Ethical principles, & Guidelines'.

3.4.5 Data collection instruments

In Experiments 2 and 3 (reported in Chapters 5 and 6) subjective attitude data were collected using an adapted version of the CSUQ (see Appendix 3). Qualitative data were collected using interviews. For the exploratory study reported in Chapter 4, data about mobile phone use in the UK and the Sudan was collected using questionnaires and interviews. The tools used to collect the research data will be discussed in the following sections.

3.4.5.1 Usability questionnaire

User satisfaction is one of the three facets of usability defined by ISO 9241-11 (1998). Satisfaction involves the feeling of the user when interacting with the system and can be measured by using a user-satisfaction questionnaire. For the experiments reported in Chapter 5 and 6, an adapted version of the Lewis's (1995) CSUQ was used to measure users' satisfaction towards the IBMCS. The usability questionnaire has 14 Likert-scale statements and six descriptive questions. Many researchers have identified the advantage of using Likert scales. For example, Coolican (2004) considered the Likert scale as more natural to complete and maintains the respondent's direct involvement; it has been shown to have a high degree of validity and reliability; and it has been shown to be effective at measuring changes over time. Scales usually range from 1 to 3 points, to a maximum of 1 to 9 points, but it is generally agreed that taking the middle ground, by using scales of 1 to 5, or 1 to 7, is the most effective method (Dix et al., 2004). For the work reported in this thesis 2 measuring scales were used, 1 to 5 and 1 to 7. In Chapter four (study one) a scale of 1 to 5 was used as it has a middle point and it is one of the most common scales. For the work reported on Chapter 5 and six the scale that originally developed by Lewis (1995) and adopted for experiments two and three was ranging from 1 to 7. The scale has high reliability and validity and therefore decided to use a scale of 1 to 7 without the need to change it. An example of the scale that was in experiment two as follows:

It was easy to learn how to send a missed call using the icon-based missed call service

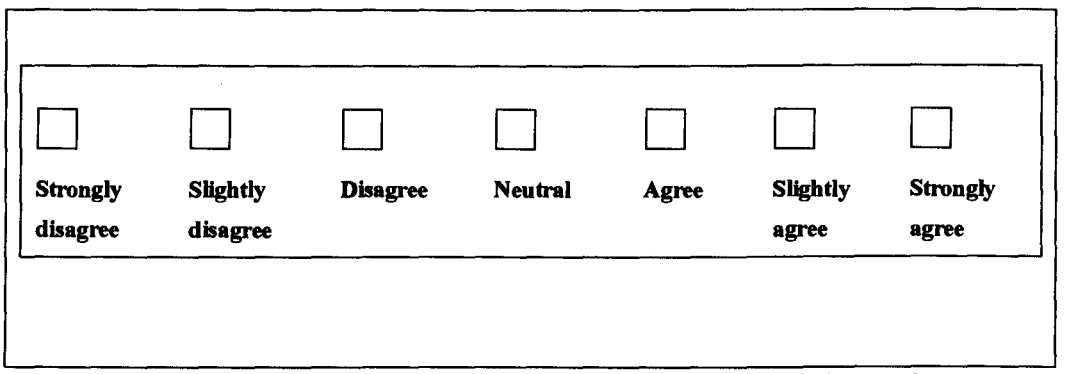


Figure 3.2: Example of attitude statement used in Experiment 2

3.4.5.2 Questionnaire development

The development of the questionnaire went through several stages. First, the generation of the questionnaire was collated by employing an exhaustive review of the literature on mobile phones, human computer interaction and cultural issues in relation to mobile phone use. Secondly, an in-depth session was conducted with six participants from both countries the (UK and the Sudan) to develop the questionnaire. A total of 25 questions were developed, 20 open and close-end questions plus 6 Likert questions. The scale was then tested for content validity, which can be defined as the extent to which a test actually measures what it is supposed to measure (Rust and Golombok, 1989). To check the validity of the questionnaire items and to ensure that the questionnaire is measuring what it was designed for, a content validity analysis was performed. Overall, content validity involves evaluation of a questionnaire in order to ensure that it includes all the items that are essential and eliminates undesirable items from a particular construct domain (Boudreau et al., 2001; Kitchenham, et, al., 2002; Lewis, 1995; Straub et al., 2004). There are two approaches to assessing content validity: judgemental and statistical methods. The application of content validity differs in terms of when it is used, how it is carried out, and how many experts evaluated the content. For this work, the judgemental approach was used to evaluate the content of the questionnaire to ensure that the items were representative of the area that they were supposed to cover, and were not weighted towards specific aspects of the area. This process was conducted with three mobile HCI experts, and was consequently revised to ensure that each factor was measuring what it was supposed to measure. This process resulted in a total of 26 questionnaire items.

Six of the questionnaire items were Likert statements, and were then divided into two unequal groups of positively and negatively worded statements. This was to control for possible acquiescence effects. In order to assess the reliability of the questionnaire an internal consistency indicator was employed. Internal consistency is the degree to which the items that make up the scale are all measuring the same underlying attribute (Coolican, 2004). The test used to determine the internal consistency was the cronbach's coefficient alpha test, using the SPSS. Hinton et al. (1993) have suggested four cut-off points for reliability, which includes excellent reliability (0.90 and above), high reliability

(0.70-0.90), moderate reliability (0.50-0.70) and low reliability (0.50 and below) (Hinton et al., 2004). For the questionnaire scale used in Study 1, the statistical Cronbach's coefficient alpha results confirmed the internal consistency of the instrument. All the scales included in the questionnaire had Cronbach's alpha above 0.70, confirming high reliability.

Finally a pilot study was administered with 10 participants from both countries (6 females and 4 males) see Chapter 4 for further details). The reason for conducting the pilot study was to check for any wording problems and to suggest improvements to the questionnaire and make any amendments as necessary see Appendix 3.

3.4.5.3 Interviews

Robson (1993, p.229) defined an interview as

"Flexible and adaptable way of finding things out,... it offers the possibility of modifying one's line of enquiry in a way that postal and other self-administered questionnaires cannot. Non-verbal cues may give messages which help in understanding the verbal response, possibly changing or even, in extreme cases, reversing its meaning".

Three types of interviews were identified: the fully structured interview which has preset questions and answers are reported on a standardised template by the interviewer. The semi-structured interview is where the interviewer prepares a set of questions in advance, but can omit some of the questions based on the context of the conversation. The third type is unstructured interview where the interviewer has a general area of interest and the interview develops within this area (Robson, 2002). An in-depth semi-structured interview was conducted in Study 1, Experiments 2 and 3 reported in Chapters 4, 5 and 6 of this thesis.

The type of interview used will depend on the evaluation goals. The aim of using the interview method in this work was to collect information that could shed light on the meaning of the questionnaire data, and to offer the participants the option of elaborating on their responses. The semi-structured interview must also be generally replicable and

was therefore considered to be more suited to experimental testing, which requires that an experiment should generate replicable data. The interviews were conducted at the end of the testing sessions, and the actual interview questions used for Study 1, 2, and 3 can be seen in Appendices 4, 5, 6 respectively.

3.4.5.4 Data analysis

A Mann-Whitney U-test is a powerful non-parametric test that was used to compare the mean attitude scores of two experimental groups in the three studies reported in this thesis. A chi square test was also used to treat data which have been measured on nominal s

Thematic analysis was also used to analyse the qualitative data collected in this research. Braun and Clarke (2006) deemed that thematic analysis can be useful to summarize key features of a large body of data, it can also offer a 'thick description' of the data set. They also found that thematic analysis can underline similarities and differences across the data set as well as generating unanticipated insights. There are two types of thematic analysis theoretical thematic and inductive analysis (Braun and Clarke, 2006),). The theoretical thematic would tend to be driven by the researcher's theoretical or analytic interest in the area, and it is considered to be clearly analyst-driven. The other type of thematic analysis is an inductive approach or 'bottom up' way means the themes identified are strongly linked to the data themselves (Patton, 1990). In this approach if the data have been collected specifically for the research (e.g., via interview), the themes identified may not be closely related to the specific questions that were asked of the participants. Themes would also not be driven by the researcher's theoretical interest in the area or topic. The Inductive analysis is a process of coding the data without trying to fit it with a pre-code or assumption. This kind of thematic analysis is perceived as a data-driven analysis. To analysis qualitative data in this research an inductive analysis described by Brown and Clarke (2006) was used.

First data has been transcribed to an appropriate level of detail and it has been checked against the tapes for accuracy. For the Sudanese responses, the transcripts have been translated to English. Second, the transcripts were read carefully to identify meaningful

units of text relevant to the research topic, which were compiled into tables and then read and re-read to identify recurring themes (Braun & Clarke, 2006). Then codes were developed and direct quotes from the data were grouped under the thematic headings (Breakwell, 1995), providing both a clear illustration of each theme in participants' own words and also some indication of the number of participants who addressed each theme. The themes were refined through repeated investigation both of patterns of unity, and of regularity (Potter and Wetherell, 1987). Then, the data were systematically analysed, reviewed to ensure that a name, definition, and exhaustive set of data to support each category that was identified.

In addition, SPSS software was used to analyse the quantitative data.

3.5 Chapter Summary

The research methodology chapter has explained the general methodologies and techniques used for the work conducted in this thesis, provided a justification for their selection, and shown how the overall system design was planned according to the HCD process. The HCD process facilitated an iterative style of developing an icon-based missed call service (IBMCS), and prototypes were designed with great involvement of user participation and HCI experts, in order to produce a realistic interface. The experimental methodology then provided a controlled means of comparing the different prototype designs to evaluate which was the most usable. The next chapter describes the first study that was conducted as part of this thesis and investigated mobile phone usage patterns in the UK and the Sudan.

Chapter 4

Mobile Phone Usage Pattern in the UK and the Sudan

4.1 Introduction

The first investigation of this research was a cross-cultural study of the role of cultural differences in the mobile phone usage patterns between the UK and the Sudan.

The focus of the study was to explore the impact of culture on the way people use their mobile phones in public places, mobile phone modes of communication, and whether any culture specific designs were identified for mobile phone services.

4.1.1 Study objectives

The specific objectives of this study were:

1. To compare the use of mobile phones in public places in the UK and the Sudan.
2. To investigate the practice of mobile phone 'missed calls' in both countries
3. To compare the use of SMS in the UK and the Sudan.
4. To identify any design interface issues for different cultures.

4.2 Pilot study

A small-scale pilot study (10 participants) from the UK and the Sudan was carried out prior to conducting Study 1. Sanders & Pinhey (1974, p.381) define a pilot study as:

"*A study that is performed to sensitize concepts and work out any bugs in the instruments and procedures*".

In this research, the pilot study was conducted to ensure that the research plan was feasible, and that interview scripts, questionnaires, and the set-up of the study run were correct. The pilot study was also used to detect difficulties that may face participants when completing the questionnaire and the clarity of the accompanying instructions for completion (Moore and Benbasat, 1991). Based on the data obtained from the pilot study adjustments were made accordingly.

One of the techniques employed to collect data in this study was the questionnaire. The development of the questionnaire had several phases. First, a thorough review of the literature on various areas such as mobile phones, human computer interaction (HCI) and cross-cultural communication was undertaken. Second, to develop the questionnaire a set of in-depth sessions were conducted with participants from both countries.

A total of 26 questions were developed, 20 open and close end questions plus 6 Likert-type items. Please see Appendix 3 for the pilot questionnaire. The scale was then tested for content validity, which can be defined as the extent to which a test actually measures what it is supposed to measure (Rust and Golombok, 1989). There are two approaches to testing content validity: the judgemental and the statistical methods.

After using the judgemental approach to check the content validity, the resultant 5 page questionnaire consisted of 26 items. Please see Appendix 1 for a copy of the complete questionnaire. The questions were divided broadly into seven sections that are summarised below:

(1) Questions examining mobile phone brands used by participants, contract types, who pays the mobile phone bills of participants (Questions 1-4).
(2) The most used mode of communication (phone call, missed call and SMS) (Questions 5-7).
(3) The use of mobile phone in public places (Questions 8-11).
(4) Participants' views on certain design issues (Questions 12-16).
(5) The use of mobile phone missed call, the most used missed call type, and frequency of use (Questions 17-20).

(6) The use of SMS, reasons for the use of SMS, and frequency of use (Questions 21-23).

(7) Finally, participants were requested to describe the easiest and most difficult functions of mobile phones (questions 24-25).

To determine participants' understanding of the questionnaire and the clarity of the items, six questions were developed. Responses of the respondents to these six questions are summarised in Table 4.1.

The six developed questions were:

(1) Is the length of the questionnaire appropriate?

(2) Are the questions used in the questionnaire understandable?

(3) Is the layout of the questionnaire acceptable?

(4) How long did it take to complete the questionnaire?

(5) Are the interview questions clearly worded?

(6) Are questions covered on the interview adequate?

The pilot questionnaires were distributed to a total of 20 participants (10 in the UK, and 10 in the Sudan) in the month of July 2005. A total of 16 replies were received within the specified time limit. Of these, there were 10 usable responses and the remaining six replies were incomplete, or had to be discarded because they did not fulfil the criterion of participants' of being settled for 15 years or more in the two countries under research, and as they offered no relevance were excluded from the analysis.

4.2.1 Pilot study findings

The scale items included in the questionnaire had Cronbach's alpha above 0.70. The literature offers advice that in order to satisfy the internal consistency criteria *"Cronbach's alpha should be above 0.60 for an exploratory survey, and 0.70 for a confirmatory study"* (Straub et al, 2004, p.411).

There were no comments obtained from the pilot respondents on improving the questionnaire. The only suggestion was to omit Question 8 where participants felt it was a repeated question. Question 8 was: *Does the use of mobile telephones in public places disturb you?*

Table 4.1 illustrates that of the 10 pilot respondents, 8 (80%) agreed that the length of the questionnaire was appropriate. Of the 10, 9 (90%) respondents found the questions to be understandable and 7 (70%) respondents indicated that the layout of the questionnaire was appropriate.

The results presented in Table 4.1 also show that 10 % of the respondents took around 10 minutes to complete the questionnaire, 60% took around 15 minutes, and 30% took around 20 minutes.

Since the outcomes of the pilot findings were positive in relation to the questionnaire instrument, it was decided that the only change necessary was to delete Question 8.

For the interviews, results indicated that participants who were interviewed found the questions to be appropriate and understandable, therefore it was decided that the interview questions were appropriate for the final study.

Table 4.1 Respondents' perceptions of questionnaire instrument (N=10)

Question	**Frequency**		**Percentage**	
	Yes	No	Yes	No
Is the length of the questionnaire appropriate?	8	2	80%	20%
Are the questions understandable?	9	1	90%	10%
Is the layout of the questionnaire acceptable?	7	3	70%	30%

Table 4.2 Respondents' views on time required to complete questionnaire (N=10)

Question	**Time required to complete the questionnaire**			
How long did it take to complete the questionnaire?	10 min	15 min	20 min	25 min
Frequency	1	6	3	0
Percentage	10%	60%	30%	0

4.3 Main Study

Following the pilot study, the main experiment was conducted to investigate mobile phone usage patterns in the UK and the Sudan.

4.4 Data Collection Methods

For this study, data were collected using the following two methods:

1. Questionnaire
2. Interviews

4.4.1 Questionnaire

To gather subjective attitude data for the work conducted for this study, a 6-item, 5-point Likert-type questionnaire was designed (see Appendix 1 for the Likert-type questionnaire used in this study).

Likert scales are used for measuring opinions and have been widely used for measuring attitudes and beliefs. Coolican (2004) proposed a number of advantages of using the Likert technique: it is more natural to complete and maintains the respondents' direct involvement; it has been shown to have a high degree of validity and reliability; and it has also been shown to be effective at measuring changes in attitude over time. Scales usually range from 1 to 3 points, to a maximum of 1 to 9 points, but it is generally agreed that having a neutral midpoint, by using scales of 1 to 5 or 1 to 7 with a neutral mid-point of 3 is the most effective method (Dix et al., 2004). For the work reported in this study, it was therefore decided to use a scale of 1 to 5 since it is eff. An example of the format used in this study is given in Figure 4.1 below:

How comfortable do you feel about using mobile phones in public transport?

☐ Very Comfortable	☐ Comfortable	☐ Neutral	☐ Uncomfortable	☐ Very uncomfortable

Figure 4.1 Example of Likert statement used in study 1

The attitude scale had a combination of positive and negative statements in order to control for any possible acquiescence effect from participants when they were completing the attitude questionnaire. This is a phenomenon whereby participants in a study may unwittingly try to respond positively to every question in order to help the investigator with their study. This type of questionnaire format is one of the most common methods used to elicit attitudes from users in HCI research (Love, 2005).

4.4.2 Interview

In addition to the Likert scales, a semi structured interview was carried out (see Appendix 4 for the interview schedule used in this study). The interview questions included open-ended and closed questions, designed to gather information on the practice of missed calls, and other features such as the use of mobile phone Caller ID. The reason for using open-ended questions was to gather richer, fuller information, and it also decreases ambiguity, whilst the use of fixed choice items make numerical comparison relatively easy (Coolican, 2004). The following shows an example of the type of open-ended questions used in this study:

- *Which type of mobile phone missed call do you use the most and why?*

- *Does the use of mobile phones in public places disturb you?*

Specific points covered in the interview were as follows:

- What is the missed call used for?
- How are different meanings of missed calls understood?
- Can missed calls be seen as an emotional gift?
- Use of text messages.
- Texting styles in the two cultures.

All interviews were transcribed verbatim. The Sudanese transcripts were transcribed in the native language first, and then translated into English.

4.5 Sampling

The participants who took part on this study were chosen from an opportunistic sample. The number of participants (88) is considered to be adequate to investigate the research question (Coolican, 2004)

4.5.1 Participants

Eighty-eight participants took part in the study: 43 British (22 male, 21 female) and 45 Sudanese (20 male and 25 female) ranging in age from 15 to 63 years old, with an average age of 30 years. All participants were mobile phone users. The range of mobile phone use for the Sudanese participants was from 2 to 5 years, whereas the British participants had used mobile phones for 4 to 12 years.

4.6 Procedure

Participants were asked to complete the questionnaire and return it to the researcher. The questionnaires took approximately 15 minutes to complete. At this point, an arrangement was made to interview a subset of the participants who had been selected randomly and volunteered to answer the interview questions. The semi-structured interview conducted with the participants lasted, on average, for 45 minutes. Participants were informed from the outset that the results of the study would be anonymous and they would be able to get the results of the study from the researcher on request.

4.7 Data analysis

The primary analysis method used in this study was the Chi square test and the Mann-Whitney test (using SPSS software). The Mann-Whitney test was used to compare the means of the two groups towards the use of mobile phone, whereas the Chi square test was used to determine whether the frequency distributions of one or more categorical variables are statistically independent.

4.8 Results

The next section presents the questionnaire and interview results obtained from Study 1.

4.8.1 Use of mobile phones in public places

A Mann Whitney U test was carried out to compare attitudes towards using mobile phones in public places in the UK and the Sudan. There was a significant difference found in the attitudes for using mobile phones on public transport between the British and the Sudanese ($U=.000$, $p<0.001$). The British were found to be more willing to use mobile phones on public transport than the Sudanese.

Another significant difference was noted between the two countries towards using mobile phones whilst walking in the street. Again, the British were more favourable towards this than the Sudanese ($U=.000$, $p<0.001$). However, the Sudanese were found to be more willing to switch off their mobile phones in places of worship ($U=.004$, $p<0.01$). The Sudanese attitude towards switching off their mobile phones in meetings ($U=.002$, $p<0.01$) and in schools during classes ($U=.004$, $p<0.01$) was also more positive than the British attitude. Please see Table 4.3 summarises the main attitude results obtained from this study.

Table 4.3 Attitudes towards use of mobile phones in public places in UK and Sudan

Theme	Country	N	Mean Rank	2-tailed Sig level	Sig level
I would be comfortable using my mobile phone in restaurants	UK	42	47.13	.238	
	Sudan	45	41.08		
I would not be comfortable using my mobile phone on public transport	UK	42	57.43	.000	***
	Sudan	45	31.47		
I would be comfortable using my mobile phone whilst walking down the street	UK	42	54.38	.000	***
	Sudan	45	34.31		
Mobile phones should be switched off in places of worship	UK	42	38.11	.004	**
	Sudan	45	49.50		
Mobile phones should not be switched off during meetings	UK	42	35.90	.002	**
	Sudan	45	51.56		
Mobile phones should be switched off in schools during classes	UK	42	37.12	.004	**
	Sudan	45	50.42		

**P<0.01

***P<0.001

In terms of differences between the attitude of the UK and the Sudanese males, a Mann Whitney test revealed that UK males are more willing to use mobile phones in restaurants than Sudanese males (U=.005, p<0.01). The results from this study also showed that UK males are more happy using their mobile phones on public transport (U=.009, p<0.01) and when walking in the street (U=.014, p<.05) than Sudanese males. The result also showed that Sudanese males were more willing to switch off their mobile phones in places of worship (U=.000, p<0.001) and during meetings (U=.001,p<0.01) in comparison with UK males. Please see Table 4.4 for a summary of the findings for the comparison of UK and Sudanese male attitudes.

Table 4.4 Attitude differences in using mobile phones in public places between Sudanese males and British males

Theme	Country (Males)	N	Mean Rank	p value sig 2-tailed	Sig level
I would be comfortable using my mobile phone in restaurants	UK	23	26.89	.005	**
	Sudan	20	16.38		
I would not be comfortable using my mobile phone on public transport	UK	23	26.50	.009	**
	Sudan	20	16.83		
I would be comfortable using my mobile phone whilst walking down the street	UK	23	26.24	.014	*
	Sudan	20	17.13		
Mobile phones should be switched off in places of worships	UK	23	14.00		
	Sudan	20	31.20	.000	***
Mobile phones should not be switched off during meetings	UK	23	16.17		
	Sudan	20	28.70	.001	**
Mobile phones should be switched off in schools during classes	UK	23	21.30		
	Sudan	20	22.80	.631	

*P<0.05

**P<0.01

***P<0.001

Next, the attitudes of British and the Sudanese females towards the use of mobile phones in public places were compared. Table 4.5 summarises the findings for comparison of British and Sudanese female attitudes.

Table 4.5 Attitude differences in using mobile phones in public places between Sudanese and UK females

	Country (Female)	N	Mean Rank	P value sig 2 tailed	Sig Level
I would be comfortable using my mobile phone in restaurants	UK	19	24.26	.387	
	Sudan	25	21.16	.	
I would not be comfortable using my mobile phone on public transport	UK	19	29.16	.002	**
	Sudan	25	17.44		
I would be comfortable using my mobile phone whilst walking down the street	UK	19	29.32	.002	**
	Sudan	25	17.32	.134	
Mobile phones should be switched off in places of worships	UK	19	19.47		
	Sudan	25	24.80		
Mobile phones should not be switched off during meetings	UK	19	15.79	.002	**
	Sudan	25	27.60		
Mobile phones should be switched off in schools during classes	UK	19	21.55	.596	
	Sudan	25	23.22		

**P<0.01

A Mann Whitney test revealed that UK females are more relaxed using mobile phones on public transport than the Sudanese females (U=.002, p<0.01); they are also more comfortable using mobile phones whilst walking down the street (U=.002, p <0.01). Interestingly, UK females were also found to be less willing to switch off their mobile phones during meetings than Sudanese females (U=.002, p<0.01).

4.8.2 Design features

To compare the attitude of the British and the Sudanese towards SMS design issues, a Mann-Whitney test was performed. The Sudanese showed more interest than the British in increasing the maximum number of 160 characters for text messages (U=.000 p<0.001). The Sudanese were also found to be more willing to increase the memory of the mobile phone to store more text messages (U=.000 p<0.001).

Table 4.6 gives a summary of the findings for the comparison of British and Sudanese attitudes.

Table 4.6 Design issues differences between UK and Sudanese participants

	Country	N	Mean Rank	p value Sig 2 tailed	Sig Level
Increasing the capacity of SMS to include more than 160 characters is not important	UK	42	33.94	.000	***
	Sudan	45	53.39		
Increasing mobile memory to store more SMS is a good idea	UK	42	33.32	.000	***
	Sudan	45	53.97		

***P<0.001

The Mann Whitney test showed no significant differences between the attitude of UK and Sudanese males towards increasing the mobile phone memory to store more SMS (U=.250, p>0.05). However, Sudanese females showed a more positive attitude than British females towards increasing the mobile phone memory to store more SMS (U= .070, p<0.01).

The results also showed no significant differences between Sudanese and British males towards increasing the capacity of the SMS to include more than 160 characters (U=.838). Similar to Sudanese male's attitudes, Sudanese females showed no more significant attitude than British females towards increasing the capacity of SMS to include more characters (U=.637).

A chi squared test was also used to assess if the British and the Sudanese wanted to have a mobile phone with a camera. The result showed no significant differences between the attitudes of British and Sudanese males towards having a mobile phone with a camera (X^2 =.553, p=.758). The result also showed no significant association between the attitude of British and Sudanese females (X^2 =.498, p=.780) towards having a camera phone.

The Chi squared test also showed no significant differences between age group and the need to have a mobile phone with a camera (X^2 =4.77, p=.312).

Another Chi square test was carried out to assess the difference between the British and the Sudanese towards using and paying for a mobile phone caller ID service. The result showed no significant difference between the British and the Sudanese towards having a mobile phone caller display service (X^2 =765, p=1.000).

However, a significant difference was reported between the Sudanese and the British in their willingness to pay for the mobile phone caller ID service. The Sudanese were found to be more willing to pay for this service than the British (X^2 =7.261, p=.010). In addition, the Chi squared test showed no significant difference between Sudanese males and Sudanese females in relation to their preference to pay for the mobile phone caller display service (X^2 =1.401, p=.236)

4.8.3. The attitude of the British and the Sudanese towards using mobile phone missed call

An interesting finding that emerged from this study was the missed call practice and uses of the missed call. The results indicate a strong link between the type of missed call used and country (X^2 =33.774, p=.000). Table 4.7 provides a summary of the main results. The Sudanese were found more likely to use the missed call as an emotional gift in comparison to the British. In addition, the Sudanese were also more likely to use the missed call before sending a text message than the British who were in favour of placing a missed call after sending an SMS. However, overall, the British were unlikely to use the missed call at all.

Table 4.7 Types of missed calls used by participants from Sudan and UK

Missed Call types		Missed call used classified by Country		Total
		UK	Sudan	
Request call back	Count	8	13	21
	Expected Count	10.3	10.7	21.0
Emotional gift	Count	0	14	14
	Expected Count	6.8	7.2	14.0
Before sending SMS	Count	1	8	9
	Expected Count	4.4	4.6	9.0
After sending SMS	Count	6	2	8
	Expected Count	3.9	4.1	8.0
Reminder	Count	9	3	12
	Expected Count	5.9	6.1	12.0
Never use them	Count	19	5	24
	Expected Count	11.7	12.3	24.0
Total	Count	43	45	88
	Expected Count	43.0	45.0	88.0

4.8.3.1 Relationship between type of contract and use of missed call

A Chi squared test indicated a significant difference between type of contract and country (X^2 =12.033, p=.001). Interestingly, the result also showed that British are more likely to have a mobile phone with a monthly contract than the Sudanese. Table 4.8 gives a summary of the main results.

Table 4.8 The number of participants in the UK and the Sudan who have monthly and pay as you go contracts

(Pay as you go) **Sudan**	*(Pay as you go)* **UK**	*(Monthly)* **Sudan**	*(Monthly)* **UK**
36	19	9	24
28.1	26.1	16.9	16.1
55	55.0	33	33.0

4.8.3.2 Gender and type of missed call

A CHI square test was undertaken to assess the relationship between missed call type and gender. The results indicated there was no significant association between gender and type of missed call used (X^2 =12.38, p=.193).

4.8.3.3 Age and type of missed call used

A Chi squared test showed significant differences between age and preference for using missed calls in general (X^2 =36.50, p=.000). In the UK, teenagers appeared to use the missed call to request a call back more than the older age group, whereas in the Sudan, both teenagers and slightly older people (25-34) indicated that they would use the missed call to request a call back. The results also indicated that the Sudanese were found to use the missed call as an emotional gift more than the British, who were not interested in using it for this purpose. However, the British were found to be keen in using the missed call after sending an SMS and as a reminder for a meeting more than the Sudanese participants. Please see Table 4.9 for a summary of the main results.

Table 4.9 Different age groups uses of the missed call

Missed call types	**Count**	**UK Age group**			**Sudan Age group**		
		15-24	**25-34**	**35-65**	**15-24**	**25-34**	**35-65**
Request a call back		6	1	1	2	4	0
Emotional Gift		0	0	0	2	4	1
Before sending SMS		0	1	0	0	1	2
After sending SMS		3	2	1	0	0	0
Reminder		2	6	1	1	1	1
Never use them		5	3	11	1	0	0
Total		27	16	13	5	11	4

4.8.4 Preference of British and Sudanese for mobile brands

Another theme that came out from this study was the relationship between mobile phone brand and country. The Sudanese were more likely than the British to prefer Nokia brand over other mobile phone brands. To simplify the comparison between the British and the Sudanese data used in this result was based on the most popular brands of mobile phone in the Sudan. However, it is worth mentioning, that British participants sometimes had more than mobile phone but brands that differed from the three identified ones were discarded. Please see Table 4.10 for a summary of the results.

Table 4.10 Preference for mobile phone brands in the UK and the Sudan

Brand	Count	Country		Total
		UK	Sudan	
Nokia		21	37	58
Sony Ericson		13	6	19
Motorola		9	2	11
		43	45	88

4.8.5 Summary of main finding from questionnaire data

A summary of the main questionnaire results will be discussed in the next section.

4.8.5.1 Attitudes to mobile phone use in public places

The results obtained from this questionnaire showed some significant differences between the attitudes of mobile phone users to the use of mobile phones in public places in the UK and the Sudan. The British were found to be more willing to use mobile phones on public transport than the Sudanese ($U=.000$, $p<0.001$). The British were also found to be more comfortable using mobile phones while walking down the street in comparison with the Sudanese counterpart ($U=.000$, $p<0.001$). The Sudanese showed more interest than the British in switching off their mobile phones in places of worship ($U=.004$, $p<0.01$), during meetings ($U=.002$, $p<0.01$), and in schools during classes ($U=.004$, $p<0.01$).

The results of the questionnaire revealed differences in attitude related to gender. British males were more relaxed about using their mobile phones in restaurants (U=.005, p<0.01), public transport (U=.009, p<0.01), and whilst walking down the street (U=.014, p<.05) than the Sudanese males. The results also showed that Sudanese males were more willing to switch off their mobile phones in places of worship (U=.000, p<0.001) and during meetings (U=.001, p<0.01) in comparison with British males.

British females were more relaxed using mobile phones on public transport than the Sudanese (U=.002, p<0.01), and they were also more comfortable using mobile phones whilst walking down the street (U=.002, p <0.01).

Interestingly, British females were also found to be less willing to switch off their mobile phones during meetings than Sudanese females (U=.002, p<0.01).

4.8.5.2 Design features

The Sudanese showed more interest than the British participants in the wish to increase the maximum number 160 characters for text messages (U=.000, p<0.001). The Sudanese were also found to be more willing to increase the memory of the mobile phone to store more text messages (U=.000 p<0.001).

In relation to other design features a significant difference was reported between the Sudanese and the British in their willingness to pay for the mobile phone caller ID service. The Sudanese were found to be more willing to pay for this service than the British (X^2 =7.261, p<0.010).

An interesting finding that emerged from this study was the missed call practice and uses of missed call. There was a significant difference between country and type of missed calls preferred (X^2 =33.774, p<0.000) The Sudanese were found more likely to prefer certain types of missed calls over others such as the emotional gift, and before sending SMS, whereas the British were found to prefer using the missed call after sending SMS, but not as an emotional gift. There was also significant difference found between type of contract and country (X^2 =12.033, p<0.001). The British are more likely to have a mobile phone that has a monthly contract than the Sudanese.

To summarise the results also showed that in the Sudan, younger people preferred to use missed calls more than older people (X^2 =38.13, p<0.000). Another theme that came out from this study was the relationship between mobile phone brands and country. The Sudanese were more likely than the British to prefer the Nokia brand over others.

After analysing the questionnaire data, the next step was to analyse of the data obtained from the interview. This is presented and discussed in the next section.

4.9 Interview Data

In this section of the chapter the interview results will be discussed.

4.9.1 Missed calls

The first theme to be discussed is the use of the missed call. Table 4.11 provides examples for various uses of missed calls in the UK and the Sudan.

Table 4.11 Different uses of missed calls between British and Sudanese users

British	Sudanese
1. To request call back from close friends and family in monthly contract, only if you know that they have free talking minutes.	1. To request call back from friend or family in prepaid or monthly contract
2. Mainly not used at all.	2. Reply back for missed call by missed call
3. After sending SMS to get recipient's attention	3. Mainly as emotional gift saying thinking of you, good morning/night, etc
4. Reminder	4. Reminder
5. Used as short cut to save someone's phone number	5. To call registrar to A&E by junior staff
6. To request a rewind for your CD track from the radio station. Examples of these stations are Origin, Cool FM.	6. Get them from daughter who lives in another city to say that she has arrived safely at her flat

4.9.1.1 Missed call as a request for call back

From the results, it seems that both British and Sudanese use the missed call to request a call back. However, the British are more likely to use this type of missed call if the recipient has free talking time to call back, as one of the interviewees said:

"I request a call back from my mum or friend if I know that she has free minutes to call me back"

4.9.1.2 Missed call as an emotional gift

The Sudanese were found to be more interested in using the missed call as an emotional gift than the British. According to the Sudanese, in this case, it can contain different sets of emotions or messages that can be transmitted and shared with the recipient. For example, it can mean "hi", or "thinking of you" "how are you today?" etc. The Sudanese seem to enjoy the emotional gift and trying to unfold its meaning, as some of the interviewees commented:

"Missed call as emotional gift is understandable; although it is just a ring, it means a lot. I usually get them from my friends who are distant and we do not meet every day, so we make sure we are fine, also I use it with my extended family as well".

"Missed call as an emotional gift makes me happy and it is a nice way to stay in touch especially if you do not have credit. When I get one of them, I usually reply back by a phone call, SMS or even a missed call, depending on my credit."

In contrast, British mobile phone users were found to prefer using phone calls or SMS to socialise and convey their social messages rather than sending a missed call. This was expressed by one of the interviewees as follows:

"A missed call is just a ring even if it is used as an emotional gift. How would I know that the caller wanted to send me an emotional gift? Maybe it was done accidentally. Perhaps the caller pressed my number by mistake when he actually wanted to delete my name from his contact list".

The British also expressed their willingness to bear the cost of communication in return for a clearer message, as one of the interviewees stated:

"I communicate with my contacts through phone calls as they are clear and quick and I don't mind paying the cost."

4.9.1.3 Comparing role of missed call and SMS in recalling past thoughts

In this study, the value of the missed call as an emotional gift has been compared to the SMS in its ability to recall past thoughts. Again, the British were found to prefer the SMS as an emotional gift and they appreciate its ability in recalling past thoughts. One of the reasons for this appreciation is related to the explicit merit of the SMS and the fact that the SMS is more tangible and significant in comparison to the missed call as one of the interviewees commented:

"SMS are more definite, actual words are put into it. The message you receive has value and meanings and it brings up a memory trigger."

Another element that was regarded as an added value to the SMS is the wider spectrum of emotions and messages that can be transmitted. As one of the interviewees commented:

"No, I can't compare them because the missed call as an emotional gift can't convey any form of emotional reflection, unlike SMS which has some sort of context for you to interpret".

"SMS as an emotional gift are more affectionate as you are putting your emotions in words, whereas the missed call is just a ring, it's not the same. Additionally, with the missed call as an emotional gift, you need to arrange with receivers in advance what sort of message you are intending to send".

One of the reasons British participants expressed their unwillingness to use the missed call as an emotional gift is they feel that as an emotional gift it does not embrace tangible objects or visual contexts that can be shared with friends. According to the British participants, the ring of the missed call is a mystery announcement that is only known to the recipients, therefore they cannot share the emotional thoughts associated with the ring that the sender intended. As one of the interviewees commented:

"Usually, when I get a nice SMS I tend to share it with my friends. How will I share a ring with them even if it is from a loved one?"

On the other hand, although the Sudanese were found to acknowledge the significance of the SMS as an emotional gift in recalling past thoughts they also appreciated the ability of the missed call as an emotional gift in doing so. One of the Sudanese interviewees expressed her appreciation of the emotional gift conveyed in a missed call in the following way:

"Hearing the short ring tone and seeing the caller's name helps me to understand the nature of the missed call and when I realise it is an emotional gift, that is really exciting and amazing. It enables you to evoke feelings and emotions."

Some interviewees went a step further as they appreciated the value of both the SMS and missed call. They actually considered the missed call as a unique feature to convey messages in a cost effective way.

"I grade them the same, both mean you are remembered by the caller and every time I see the caller's number on my log call I enjoy the pleasant feeling, plus the missed call is free."

In addition, Sudanese participants seem to use the missed call as a creative form of conveying a special emotion, especially if it used in the context of romance. As one of the interviewees commented:

"Missed calls as an emotional gift can be extra special if you get them from a known person like your fiancé, for example, because it brings a special shared feeling that has an inspired way of communication".

The mobile phone ring tone is another aspect that the Sudanese seem to identify between the SMS and the missed call as an emotional gift. The shortness of the missed call ring tone is considered to have a negative impact on the merit of the missed call because the sound of the missed call is short in comparison to the SMS ring tones.

In addition, the fact that the ring tone is very short, and that mobile phone ring tones,

in general, tend to start quiet and then escalate louder as it goes on, have increased the chances of not hearing the emotional gift when it is received. Consequently, it may lose its purpose and impact in relation to the specific intention with which it has sent. As several of the interviewees commented:

"Missed calls generally are a short and quick ring that is cut quickly, but with emotional gift it is made even shorter".

"On one occasion, my friend sent me an emotional gift missed call to make sure that 'I arrived home safely'. As I did not hear the ring tone, I did not receive the gift on time, in a way it lost its significance".

4.9.1.4 Differentiation between different types of missed calls

Understanding the meaning of the missed call is an important point that was highlighted in this study. Sudanese mobile phone users who have monthly contracts tend to interpret most of the missed calls as a request for a call back, whereas pre-paid contract users adopted other techniques to understand the meaning of the various missed calls they use. Please see Table 4.12 for a summary of how participants in the UK and the Sudan understand the meaning of the missed call.

In the UK, mobile phone users in general consider most of the missed call as a request for a call back. However, other missed call types can be speculated on based on the circumstances of the call. For example, a missed call ring may mean "hi, or "meet me at the café", and so on.

Table 4.12 Differentiating between different types of missed calls

British	Sudanese
By and large, missed calls are viewed as a request for a call back	For line contract users, most missed calls are interpreted as a request for a call back.
• If it is a reminder, you arranged it and you know it. • If it is before or after sending SMS, then again it is clear, and a communication will follow shortly after. Understanding caller style	• For prepaid contract users the request for a call back is known by frequency of the call. For call me back, it is more than one call from the same person and the tone is a bit longer than Emotional gift • For the missed call that is either before or after sending SMS, a form of communication will follow shortly after. • Timing of the call also helps to understand the meaning of the missed call. Usually, early morning and late night missed calls are more likely to be an emotional gift. But in romance situations, senders may not stick to a set time and emotional gifts can be exchanged at anytime. • Length of the ring tone can determine the meaning of the missed call. Shorter ring tones are emotional gifts; longer ones are call me back. • Caller mobile phone style is another guide to knowing the way the person use his/her mobile phone. • Knowing about the caller mobile phone balance status. If it is low, it means call me back • The last time you met the caller can be an indicator for the meaning of the missed call. If it was within the same day, it is unlikely that it is an emotional gift, but in romance situations missed calls as an emotional gift can be exchanged more often. • By exclusion. If it is not a reminder for an arrangement because the recipient has not arranged any meetings, and it is not a missed call that is sent before/after sending SMS since no communication has followed. Then, using these measures, one would be able to know if the missed call is a request for a call back or an emotional gift. • Context of the caller. If the caller is outside the country or far away, it is more likely it is an emotional gift than a request for a call back. For pre-paid contracts, most missed calls are emotional gift. If it is from someone you were with earlier, then it is probably a call back.

Despite the different techniques developed by users to understand the meaning of the missed calls, they still seem to misinterpret some of the missed calls. As some of the Sudanese interviewees commented:

"Sometimes people ring you by mistake, sometimes you just don't know what the caller means exactly".

"Sometimes it is difficult to understand the missed call as an emotional gift when it is out of expected times".

British mobile phone users also find it difficult sometimes to interpret the meaning of the missed calls they receive, as some of the interviewees commented:

"I misunderstand the meaning of the missed call. If my mobile phone is not located with me in the same room then I do not know if it's a genuine call or an intentional missed call."

"Sometimes you get one of these missed calls by mistake, or the caller just tells you that it is a wrong number".

Generally, participants in both countries found it difficult to understand the meaning the missed calls conveyed to them. They suggested that ways are developed to decrease the ambiguity related to the missed call. Several of the Sudanese interviewees suggested that

"Various types of missed calls should be assigned different icons or symbols so users can understand clearly".

4.9.1.5 Moral obligation to call back

The Sudanese feel more obliged to call back after receiving a missed call that means call me back, or even in the instance of an emotional gift, as expressed by the interviewees. Please see Table 4.13 for a summary of the main findings in relation to this question.

Table 4.13 Moral obligations in replying to missed call

British	Sudanese
No moral obligation	Yes, there is moral obligation
No moral obligation. For example with both the before/after sending an SMS and as a reminder for prior arrangement there is no need to call back. With the missed call that means 'call me back' it depends on the recipients' circumstances at the time of the missed call.	Depends on the meaning the missed calls conveyed, sometimes no action is needed, i.e. before/after SMS. Yes, there is a moral obligation; otherwise people think you have not fulfilled your commitment.
	Yes, moral obligation because if the caller had money he would not request to be called back and even for the emotional gift, you should show that you accept the gift.
	Because of my line contract, I am expected to answer all missed calls even with colleagues on the same level as me, just simply because I have a line contract.
	Like an agreement or turn taking, if you are requested to call back someone, then you are expected to do so. If you don't, you are looked at as not fulfilling your commitment.
	Yes, there is a moral obligation. Usually, I call to make sure my family and contacts are fine and to tell them I am there if they need me.

4.9.1.6 Benefit of missed call for caller and recipient

Another point that was explored in the interviews was the perception of the British and the Sudanese about the benefit of the missed call for the caller and the recipient. Sudanese missed call users seem to emphasise the value of the missed call from both the financial and spiritual perspectives, as it provides the caller with a sense of support from his/her social network. In contrast, the British highlighted the economic benefit for the caller only. Please see table 4.14 for the different views of the British and the Sudanese on the benefit of the missed call for the caller and the recipient.

Table 4.14 Benefits of missed calls for caller and recipient

British Caller	Sudanese Caller	British Recipient	Sudanese Recipient
Making a phone call without bearing cost.	Saves the caller money since he/she is not bearing the cost of the call	Receiving an interesting or important piece of information For example the missed call that is sent after the SMS can draw the attention of the recipient to the SMS that includes information of interest to that person.	Recipient: feel good about answering other's demand. Getting Emotional Gift makes you feel happy and dear.
After sending an SMS it can draw recipient's attention in a more cost effective and quick way	Gets spiritual and moral support from others	Saves time and effort, especially in the case of the missed call as a reminder for a prior arrangement.	For the Senior Doctor use, receiving a missed call from a junior doctor makes him contactable by his team member so it gives him the freedom for moving around the hospital to have some work done, and it also enables him to carry out his work more effectively.
To request call from a DJ in the radio station, then it is beneficial for all parties; the caller would get his request answered in a cheap and quick way.	Pass on messages in an effective way	For the recipient may be informative like the DJ who gets more interaction from the audience to play favourite songs, and consequently a more successful programme	Recipient gets to socialise with others and may be getting interesting news. For call-back, it makes recipient feels happy that they answered someone's needs especially if this person is special to them so it makes them happy
	Sending emotional gift makes the caller feel kind, caring and loving		For: Before/after sending an SMS & as a reminder for a prior arrangement it saves money, time and effort.
	Saves you having to use words, especially if communicating with someone who doesn't have an Arabic keypad, it is difficult to communicate in English		

4.9.2 Balance Transfer

Another interesting theme that emerged from the semi-structured interview is the use of balance transfer, which is also known as 'ME 2 U' in the Sudan. Mobitel (the main mobile phone service provider in the Sudan) developed the service and promoted it by various adverts, for example: "Bestow Saturday, so you can get Sunday" something like "You scratch my back and I will scratch yours".

The nature of the balance transfer is that mobile phone users who are in pre-paid contract can transfer airtime to another user. This transferred airtime can be used to communicate with others or can be exchanged for cash.

There is no higher limit for the amount transferred, and it can be just enough to make one or two phone calls or maybe five text messages. The same practice is not evident in the UK but it can be compared to topping up someone's mobile phone credit using his/her mobile phone swipe card.

Sudanese mobile phone users seem more accustomed to the idea of balance transfer, and it is used with those who are within their close circle of contacts. One of the interviewees stated that:

"I transfer some of my mobile phone balance to my friends and close relatives when they have no mobile credit, and they do the same when I need it".

"It is like whoever has credit on his mobile will support the rest of the group by transferring some of his own mobile phone credit until they top up their mobile phones".

In contrast, the British were found to be more conservative in the request from someone to top up his/her mobile phone, unless it was their parents or a person who is financially responsible for their needs.

4.9.3 SMS

In the following section the interview results about the SMS use in the two countries will be discussed.

4.9.3.1 Uses of SMS

The use of SMS was found to be popular with Sudanese and British participants for different reasons. In both cultures the low cost of the SMS in comparison to making a mobile phone call has added to its popularity. SMS was also found to be useful in these two countries as a technique to avoid long conversations (and it can save time as well). In the UK and the Sudan, the SMS is sometimes chosen as a favoured style of

communication in public places when the participant wants to maintain his/her privacy. The use of SMS to exchange greetings and for spiritual uses such as the praises of the lord is very common amongst Sudanese users. Although British participants have used the SMS for the same purposes, British participants also stressed the use of SMS for safety issues especially with vulnerable groups such as women and children. As one of the interviewees stated:

"I use the SMS to stay in touch with friends and to confirm social gathering, but I use it daily to check that the children got home safely."

Interestingly, in the Sudan, SMS users appear to text each other to invite friends and family to social occasions such as weddings or even to announce bad news, as one of the interviewee commented:

"When my dad passed away, I developed a pre-defined template and sent it to all my contacts informing them of this sad news."

Similarly, one of the British participants stated that she and her family developed an SMS following the London bombing in July 2005 to be used if there is a crisis, to inform each other that they are safe and well.

The British were found to accept SMS on happy occasions such as birthdays from people who are not within their close circle of contact, but they perceived the SMS as inadequate by itself from those who are part of the inner circle group. In addition, the use of SMS as a channel of support and empathy on sad occasions (e.g. death) is not considered to be suitable among the inner and outer circle of British contacts.

In contrast, the Sudanese feel that SMS is not a discrete mode of communication and can be used both on both happy and sad occasions. Both the British and the Sudanese agree that SMS can be useful if you want to avoid confrontation or even long conversations.

4.9.3.2 Style of texting

The style of writing an SMS and the use of abbreviated language was compared between UK and Sudan participants. The British were found to prefer to text using abbreviated words and telegraphic format very short SMS. Some of the reasons given for this preference were as follows:

"When I send SMS I use the abbreviated language, I like using letters instead of the full word because it saves time and a character."

"I write short and abbreviated SMS, I think it saves effort, easier and it's to the point. Better than wordy SMS when you are not sure what is proposed."

On the other hand, the Sudanese seemed to prefer a different style of texting. The result indicated that the Sudanese choose to write a long SMS that has a letter format rather than a telegraphic one, as one of the interviewees commented:

"My SMS looks like a letter where I start with the greeting and the introduction before starting on the purpose of the SMS. Otherwise, if my SMS is short it might sound abrupt".

"The abbreviated language of the SMS is not very clear and understandable for all so I do not prefer using it; I tend to write the full word and detailed SMS."

4.9.3.3 Use of predefined templates

The use of predefined templates was investigated between the two countries. The British and the Sudanese were both against the use of pre-defined templates but for different reasons, as Table 4.15 shows.

Table 4.15 Attitudes of British and Sudanese to predefined templates.

British	Sudanese
Do not use them mainly because : 1. They are so formal, and the defined messages use words expressions that are not appealing to young people who are heavy users. 2. They are not personalised	Do not use them, mainly because: 1. the choice of words in the pre-defined templates does not interest young generations who use SMS intensively 2. Using templates with formal sentences will make people laugh at me. 3. They can be quite abrupt 4. They lack any emotion or expression in them. 5. They do not express what you want to say.

In this study, the British and Sudanese participants agreed that the SMS can be a partial substitute for phone calls. Participants expressed their views on the usefulness of SMS in certain social interactions. For example, to stay in touch, arrange meetings, etc., but they also recognise that phone calls are more personal and expressive. The value of the phone call is more appreciated than the SMS because of the extra cost and effort on the part of the caller.

By the end of the interviews, participants suggested some design issues that could improve their interaction with mobile phone services. Table 4.16 below summarises the design suggestions of the British and the Sudanese participants.

Table 4.16 British and Sudanese mobile phone design suggestions

British	Sudanese
1. Designing a special ring tone for the missed call so it can last longer and be heard, especially if you are not located within the same place as the mobile phone. 2. To be able to send a missed call to different contacts at the same time. 3. Improve the internet functionality of mobile phone. 4. To improve the texting experience. Perhaps have voice recognition to convert voice to text in every hand set.	1. Assign an icon for each one of the missed call types to decrease the ambiguity related to the various missed call uses. 2. For the missed call service: A). provide a louder ring tone so the missed call can be more perceptible. B). Create a way to differentiate between genuine missed calls and the intentional missed calls in which the caller purposely makes a missed call to convey a message. 3. Improve the balance transfer process and the security issues related to it. 4. Make the missed call more clear. Perhaps the meaning of the missed call is announced in words with or instead of the ring tone so if someone wanted to say call me back the mobile phone keep saying call me back when it gets the missed call. 5. Texting to be made easier by embedding an Arabic predictive text function. 6. Increase the capacity of the mobile phone to store more SMS and video clips.

4.10 Discussion of questionnaire results

The result of the questionnaire result will be discussed in the next section.

4.10.1 Use of mobile phone in public places

The results from the British and the Sudanese data were interpreted in the light of the Hofstede (1980) cultural dimensions to gain some insight into the way those cultures may influence the use of mobile phones. It appears from the results that the British are generally more comfortable using mobile phones in public places than the Sudanese, who are more reluctant to use mobile phones in contexts such as public transport and whilst walking in the street.

The collectivistic culture to which the Sudan belongs (using Hofstede's criteria) indicates an inclination toward a tightly-knit social framework (Hofstede, 1980). The priority is for the group needs rather than the individual's wishes. Perhaps the use of mobile phones in public places for private talks can be seen as a self-centred act and quite impertinent for group needs. The group expect the individual to be considerate to the established social etiquette. The mobile phone user in public transport is expected to adhere to the social protocol and to respect other people's privacy.

Another reason for the British comfortable attitude to mobile phone use in public places may be due to bystanders' non-verbal communication attitude. This concept is highlighted by Goffman (1963) where he refers to it as "civil inattention", the ways in which people acknowledge the existence of others without paying them extra attention; he regarded this as a gesture of respect required from strangers. Lasen (2002) found that "civil inattention" is clearly present in UK culture; the British tend to avoid open and straightforward looking at other people and keeping away from paying direct attention to others, especially on public transport, such as the Underground. He suggested that this attitude may encourage British mobile phone users to talk more freely outdoors without being concerned about others watching them.

In contrast, in the Sudan, it was noted that 'civil inattention' is not clearly evident. Sudanese people tend to look at each other directly. Lasen (2002) suggested that a lack of proper gaze in certain cultures where 'civil inattention' does not rule may be

viewed as a lack of respect or ignorance. This lack of civil inattention perhaps justifies the reason behind the Sudanese unwillingness to use mobile phones in public places, as they are influenced by a bystander's non-verbal communication attitude. Perhaps one can say that the more civil inattention paid to others, the more free and relaxed they might feel towards using their mobile phones, and vice versa.

Another justification for not using mobile phones in public places might be due to the high score that the Sudan attained on Hofstede's uncertainly avoidance dimension. According to Hofstede, cultures with high uncertainty avoidance tend to be expressive; people talk with their hands, raise their voices, and show emotions.

These characteristics can play a role in decreasing the need to carry out private conversations in public places, because people in these cultures know that they tend to talk loudly and expressively, which attracts bystanders' attention. Plus, there is a high risk of being known to people round about you.

Another important point is that as Sudanese people in general talk loudly and in an expressive way, this tends to increase the level of external noise for mobile phone users. Therefore, people talking on mobile phones need to raise their voices more to win over competitive speakers. This loud talking may attract bystanders' attention and invite eavesdroppers, which can cause a feeling of embarrassment on the part of the mobile phone user. In addition, mobile phone users may feel bystanders might disrespect them if they discuss their private matters publicly.

Additionally, the Sudanese attitude might be related to the high score obtained on Hofstede's power distance dimension where a tight set of rules is established and people are expected to follow and respect these rules. For example, the social protocol for behaviour in public places is well recognised in the Sudan and people are expected to behave in a certain way and not to speak loudly in front of others (especially older people). Private issues should be kept private and dealt with in a private manner and in private settings. It is considered improper to breach these norms. Although in the UK a social protocol for behaviour in public places also exists, the maturity of the UK mobile phone market may have relaxed or altered people's expectations and acceptance of mobile phone behaviour in public places.

Palen et al., (2000) found that a person's attitude towards public cell phone use changes (becomes more accepting) as his/her mobile phone use increases.
In addition, Palen (2002) predicted that as adoption of mobile phones increases, people will be less disturbed about proper use, but will still prefer to have 'cell free' zones.

Another justification for the British willingness to use mobile phones in public places might be related to their individualistic nature and their appreciation of personal time according to Hofstede's typology. Therefore, the British generally value time greatly and this reflects on their willingness to use mobile phones in public places. For example, they use the mobile phones on public transport to make use of the "time" available. In contrast, the Sudanese perceive 'time' in a more relaxed way and this perhaps decreases the urge to make use of time to carry out private talk in a public domain.

In terms of specific gender differences, Sudanese females were found to be more uncomfortable about using mobile phones in public places in comparison to British females. This attitude fits in with the 'feminine' attribute of the Sudan culture suggested by Hofstede (1980), where the prevailing value is caring for others. The UK, in contrast, is judged by Hofstede to be more masculine-oriented and the dominant values are achievement and success.

Although the Sudanese females practise all their rights in terms of education, work, leisure, and the like, they are looked after and cared for by the whole society. As a result of this caring perception towards females in the Sudanese culture, their attitudes and behaviours are more controlled and guarded and they are expected to follow social protocols more than men. For example, Sudanese females are expected to keep a low profile and deflect attention from themselves by talking quietly and preferably avoid talking in public spaces.

On the other hand, according to the results of this study, British females are more comfortable using mobile phones in public places. In contrast to the Sudanese females, British females can use mobile phones in public places as "symbolic bodyguards" (Lasen, 2002); mobile phones are used as a technique to defend your

private space within areas that are heavily populated with unknown strangers (Cooper, 2000; Haddon, 2000). As Goffman (1963) has remarked, women especially do not like to show themselves alone in public places because this may indicate that they are not in a relationship, a condition which (1) provides a bad impression of their social status, and (2) leaves them in a vulnerable situation which can be acted upon by unknown males. To deal with these situations the mobile phone is quite useful, as it works as a safety net and indicates that this person has social networks and is not isolated (Plant, 2002).

4.10.2 Use of mobile phone in restaurants

No significant results were recorded for using mobile phones in restaurants between the British and the Sudanese. One explanation for this may be because Sudanese tend not to eat in restaurants as it is expensive to eat outside, and it is not appreciated, as roles are set in the society where men are expected to buy food and women are expected to cook it. Also in the Sudan, as a gesture of generosity, you are expected to invite people to eat in your home rather than eating in restaurants, as eating in someone's house is appreciated and valued more. In contrast, in the UK, eating out is clearly popular and inviting someone to a restaurant is as equally appreciated as inviting them to your home.

4.10.3 Use of mobile phones in places of worship

The other significant result reported in this study is that the Sudanese are more likely to switch off their mobile phones in places of worship. Measuring these results against the Hofstede typology, the Sudanese score high on the uncertainty avoidance scale; religion is valued and greatly respected. People's attitude towards switching off mobile phones in places of worship in the Sudan is therefore expected. It is also related to the high scores Sudan has on power distance, as roles are set and religious men are very much valued and respected in the society, so both Muslims and Christians in the Sudan tend to be aware of the importance of switching off their mobile phones in places of worship. This result could also be related to the reduced number of people in the UK attending places of worship.

4.10.4 Use of mobile phones in formal settings (Meetings, Classes)

The Sudanese also appear more willing to switch off their mobile phones during meetings than the UK participants. This attitude may be related to their high score in the power distance dimension, where people are expected to respect the structure, rules and the norms of the setting where they are currently present.

As for the British disinclination to switch off mobile phones during meetings it might be related to the individualistic feature of the British society, where time is valued and there is a push for making good use of it. It may also be related to the maturity of British mobile phone adoption where mobile phones have blurred the borders between business and social rules. In relation to this, Churchill (2001) found that mobile phones in the UK are used to form and maintain both work and leisure relationships.

The Sudanese were also found to be more willing to switch off their mobile phones in schools during classes. This might be due to the fact that in a country with high power distance, variation in hierarchies in organisations is clear and large differences in salary and status are evident. In these countries, there is a great emphasis on qualification and status, learners are expected to work hard to get their qualification and ultimately to obtain a high rank in the organisations' hierarchy structure. Since schools and in particular classes, are seen as the place to get the vital knowledge needed to step up the ladder for further grades and qualification, students are expected only to listen and learn and not worry about their mobile phones.
Teachers are also considered to be a symbol of wisdom and are mechanically well-regarded by students. Learners view themselves as unequal to the teachers and switching off mobile phones in classes is seen as a sign of consideration for teachers and is expected by them. Another reason for the Sudanese being more prepared to switch off their mobile phones during classes may be due to the fact that not many Sudanese children have mobile phones in comparison to their British counterparts.

In contrast, in Britain, as part of the individualistic culture, individual needs are important, the participants felt less willing to dispossess the student from this right just because they are in schools. Thus, schools come under pressure to allow children to use cell phones, because their parents are eager to keep in touch at any time whenever they need to (Mathews, 2001). Furthermore, the low score of the UK in

power distance implies that students, parents and teachers regard themselves as equal, which might have influenced the participants' willingness to switch off their mobile phones in schools during classes. While audio calls may easily be limited because they can be easily observed, it is much harder to prevent pupils from receiving SMS messages during school hours (Ling, 2000). For example, in Norway, researchers concluded that cell phone technology "has become part of the classroom context" (Ling, 2000).

4.10.5 Design features

Another finding from this study is that the Sudanese seem to be more enthusiastic about increasing the capacity of the text message to include more than 160 characters and to improve the mobile phone memory to store more text. This result can be explained clearly, based on the Hofstede uncertainty dimension, where cultures with high uncertainty avoidance expect structure in organisations, institutions, and relationships to help make events clearly understandable and knowable. This feature may have influenced the need to write long text messages to explain things clearly to avoid any confusion. Also, people in these cultures tend to be expressive and emotional, which might have played a role in the need to write and express themselves more than the British. With the cultural background explained above, another reason for the Sudanese need to have more than 160 characters may be related to the applications of text messages. One popular use of the SMS is to exchange jokes, Dowaa (Holy prayers), poems, and sometimes it is even used for wedding invitations. These uses of SMS make it difficult sometimes to abbreviate or take part of the text out, without losing the intended meaning of the message.

Another justification for the Sudanese need to increase the limitation of the SMS characteristics is perhaps related to the fact that the 160 characters are defined in English, equivalent to 78 only characters in Arabic.

Surprisingly, no significant differences were reported between the British and the Sudanese in their preference to have a camera in their mobile phone. This contradicted the low uncertainty avoidance style expected from the British. It was expected that the British with their low uncertainty avoidance would be more interested in owning a mobile phone with a camera, as they have higher tolerance for

new innovations and ambiguous situations than the Sudanese. For that reason, and for the UK being part of the high technology adoption world, it was posited that they would be more interested in getting mobile phones with a camera than the Sudanese who are risk averse. In addition, no significant difference was found between age and the willingness to have a camera on one's mobile. This is surprising, as it was speculated that younger people in both countries will have a lower level of uncertainly avoidance than the older generation. Also, no significant difference was reported between males and females in relation to their choice of using a mobile phone with a camera.

No significant difference was found between the British and the Sudanese in terms of their preference for the mobile phone ID caller display service.

However, surprisingly, the Sudanese were found to be more willing to pay for the mobile phone ID caller display service than British participants. This result does not appear to match the Hofstede framework, as it was expected that the British, with their individualistic approach and appreciation of time, would be more willing to pay for the ID service.

On the other hand, the Sudanese with their collectivistic approach were expected not to have a need for a caller ID service as people are so close and relationships are strong, so the individual would feel the urge to answer all calls.

4.10.6 The practice of missed call

The results obtained from the questionnaire data indicated that there were significant differences in attitude towards missed call use between UK and Sudanese participants. In the UK, mobile phone users prefer not to use the missed call to communicate but yet use the missed call to request a call back (especially among young users).
The British also used the missed call after sending SMS to draw the recipient's attention, or as a reminder for a prior arrangement.

However, they were not in favour of using the missed call as an emotional gift, unlike the Sudanese, who used the missed call to send social and emotional messages such as "I'm thinking of you", or just to say "Hi".

In addition, the Sudanese use the missed call to request a call back from friends and family and they used the missed call for other applications such as before sending SMS to check the status of the recipient's mobile phone and as a reminder for prior arrangements.

The Sudanese were found to be in favour of using the missed call as an emotional gift more than the British, who preferred not to use it. Based on Hofstede's typology, countries which have a low power distance are expected to have higher growth for domestic product per capita and, consequently, individuals are high earners in comparison with the people in a high power distance culture like the Sudan. Therefore, since the British have a high income in comparison to the Sudanese, they could be expected to choose to call or text rather than use missed call (as they can afford to do so). This also echoes what Hall said (1976) where he emphasised cultural differences based on the context of the message conveyed. Hall describes the context as the amount of information that must be stated explicitly for the communication to be successful.

According to Hall (1976) low-context cultures like the UK tend to prefer explicit messages and direct communications. In contrast, people in high-context cultures, (i.e. the Sudanese) appreciate implicit messages, with words used to convey only a limited part of the message. The rest of the meaning of the communication is understood from the personal history, past relationships, the conditions surrounding the event, and the like.

Therefore, understanding the meaning of the missed call is greatly related to the context, relationship, and so on. The missed call can be viewed as an implicit message. This perhaps has influenced the Sudanese approach to use the missed call in general, unlike the British who preferred to use a clearer form of communication especially if they can afford it (e.g. making a mobile phone call).

Another justification for the missed call findings obtained in this study is that the reason Sudanese participants would use missed calls to request a call back more than the British is related to the high score for power distance which the Sudanese attained on Hofstede's framework. Accordingly, people in the Sudan value status and

hierarchical classification and see themselves as unequal. Consequently, people who are placed low in the hierarchical structure ('inferiors') can acceptably request to be called back by their superiors, who are compelled to call them to maintain their prestige and status in the group. This was expressed by Gamos (2003) who suggests that missed call is a practice that adds value to end users by prompting more overall communication (calls), and by effectively redistributing the payment for those calls to those who can afford it.

In contrast, people in the UK have low power distance, where distances between superior and subordinates are suppressed in comparison to the Sudanese culture. Perhaps the slightly suppressed relationships between inferior and superior has influenced their attitude towards requesting a call back.

In relation to this, it was unexpected that British participants would use the missed call to request to be called back. However, from the interview data it was found that the British would only request a call back from a close friend or family member provided this person has 'free' talk time offered by the mobile phone service provider as part of his/her monthly contract. They would not request it from a person who is in a prepaid contract. This too can be interpreted using Hofstede framework where British individuals are expected to look after themselves without depending on support from the group or other individuals. However, in this case, although the individual is expecting support from another person, this request is accepted and expected due to the free minutes provided by the mobile phone service provider, and it does not contradict the British individualistic approach.

The fact that the Sudanese use this type of missed call more than the British corresponds to a great extent to the Sudanese collectivistic attitude where people, as part of this tight knit group, take care of each other and there is a need to keep in touch and call regularly. In addition, as Sudanese are low earners, some of them choose to use the missed call as an emotional gift to balance the need to make a proper phone call.

Generally, since the Sudanese are familiar with various types of missed calls, this may be related to their willingness to pay for the mobile caller ID service. The ritual of

missed call is based mainly on the ID caller service. When a mobile phone user receives a missed call, it is important to know the caller number and then decide on the meaning of the missed call. Another significant association was reported in relation to the type of missed call and the type of mobile phone contract. Mobile phone users who are in pay as you go contracts were more likely to use missed calls than users on monthly contracts. To evaluate this result against the Hofstede framework, it would appear that many British mobile users have free talking allowances in their monthly contract which means they do not need to make a missed call. In addition to that, pre-paid mobile phone users would feel less stressed about using the missed call with monthly contract holders, as it does not put a burden on the receiver of the missed call.

In the Sudan, people use the missed call from a pre-paid deal more than from a monthly contract. This matches the high power distance score in which people are classified based on status and prestige, and those who have monthly contracts are not expected to make a missed call. Even more so, they are expected to answer the need of pre-paid mobile phone callers. Another result reported in this study is that most of the mobile users in the Sudan have prepaid contracts in comparison to British participants. This might be related to the implication of high power distance, people in the Sudan are expected to be low earners and have lower growth for domestic product per capita. The reason they choose to have a mobile phone with a prepaid contract might be related to the low cost and the convenience to maintain the service. In the Sudan, monthly contract users are known to others by their phone prefix numbers. This special designated number is a desirable status symbol; it shows the prestige and status of the mobile phone owner.

In the UK, it was found that most of the participants have monthly contract deals, although this might be greatly related to the implication of the low power distance and the fact that they are high earners and probably can afford to pay for a monthly contract. However, another reason for this increase in the number of British monthly contract might be related to the deals and marketing strategy used in the UK, where it is normal to get the mobile phone free of charge when signing a monthly contract, which encourages users to get this type of contract.

No significant difference was reported between females and males in using missed calls. However, a significant difference was reported between age and type of missed call. Mobile phone users between the ages of 15-24 would use it for a call back and emotional gift type more than any other age group.

4.11 Interpretation of the interview results

The interview results corresponded with the questionnaire data indicating that there is a difference between the British and the Sudanese willingness to use the missed call and the type of missed call they would use. The British are less in favour of using mobile phone missed call in general. But if they do use it, it would mainly be for request for a call back.

4.11.1 Missed call as emotional gifts

One of the prevailing themes that were uncovered from this study was that the teenagers who took part in the questionnaire and in the interview appeared to use their mobile phones to place missed calls that personify certain social and emotional meanings. These missed call messages that encapsulate emotional meanings and are exchanged between mobile phone users can bear a resemblance to the patterns of gift-giving as described by Berking (1999, p.9) who points out that a gift "makes feeling concrete". It symbolises something of ourselves to the recipient. The gift, for example, enables us to arrange our memories into things that can be "grasped and held" and thus becomes associated with "particular histories and bound up with particular individuals" (Berking, 1999, p.5). This concept of gift is also deeply rooted and related to Taylor's and Harper ethnographic study (2003) where he considered short text message as emotional objects with emotional and social values, and the value of the gift is assessed by its material features as well as its contribution to the social exchange. Similarly, missed calls can be considered as an emotional gift where the message encapsulated within it represents a gift that is particularly formed for this recipient and that has emotional significance and most likely affectionate implication. Similar to Taylor's (2003) findings in relation to SMS, the missed call enables its users to participate in social exchange by ordering their thoughts and representing their sentiment in more personal symbolic meanings.

The heavy practice of the missed call as an emotional gift among the Sudanese can be looked at through their collectivistic way of living. They look after each other, and

naturally the individual is expected to stay connected to the group and give them priority over oneself. Apparently the mobile phone with its ubiquitous use facilitates both social and business communication.

The missed call as an emotional gift provides Sudanese users with a means to care for others and to offer recipients special thoughts. These thoughts can be regarded as a "nourishing agent" to the ongoing relationship between the caller and the recipient, where the sender can communicate and offer a gift that is valued by the recipient but yet does not enervate the sender's financial status.

Probably the popularity of the missed call as an emotional gift in the Sudan is closely related to Sudanese financial status. As part of the developing world, a person's earning is low; therefore people developed this missed call practice as a way of making use of natural development and deployment of the free resources available. Donner (2005) found that the missed call reflects and emphasises mutual appreciation of economic and power hierarchies, social reciprocations, as well as the particular circumstances of relationships between two people.

4.11.1.1 Comparing role of missed call and SMS in recalling past thoughts

The results from this study indicated that the British were found not to appreciate the value of the missed call as a conveyer of an emotional feelings in regard to recalling past thoughts. In contrast, the Sudanese participants acknowledged the significance of the SMS as an emotional gift in recalling past thoughts, and appreciated the ability of the missed call to convey an emotional gift in recalling past thoughts.

The British users expressed different reasons for the downgrading of the missed call in recalling past thoughts. One of the reasons given is the implicit nature of the missed call and the fact that it is an empty gift that the British user cannot relate to and therefore does not trigger any memory or thoughts.

In contrast, British users consider the SMS as the representation of personal thoughts and feelings that can be recalled, reminisced and ultimately shared with friends. This relates to Taylor's (2003) findings where he pointed out that the sharing of SMS

provides teenagers with a means for communicating their poignant experience and exchanging personal thoughts and memories.

Taylor (2003) also found that SMS and memories can become closely connected and memories that are represented in a text message have emotional implications that can be used to recall past thoughts and feelings through later access. Clearly, British users cannot visualise the missed call as a means to recall past thoughts as it can not be re-read later.

For the Sudanese, however, utilisation of the mobile phone functions (i.e. ring tone, call register) unites the missed call and the memories together, and memories are symbolised in an emotional gift missed call that evokes feelings and thoughts.

The other theme that was highlighted by British participants is the wider spectrum of emotions and feelings that can be embodied within the SMS in comparison to the missed call where only a few emotions, feelings and memories can be embraced. According to the British participants, the wide array of sentiment encapsulated in the SMS increases the likelihood of these messages triggering memories and recalling past thoughts. This is contrasted with the missed call with its limited set of emotions that need to be agreed upon in advance (which reduces the value of the missed call and the surprise element associated with the gift). On the other hand, Sudanese participants appear to think conveying limited emotions and thoughts through the missed call can be considered as an added value to the missed call (emotional gift). The Sudanese consider the emotions and thoughts that are encompassed in a missed call as coded emotional signals that have a creative and unique coded style which makes the missed call an emotional gift, extra special in certain uses (for example, in a romantic context). This finding relates closely to Donner's (2005) interpretation of the missed call through Bernstein's socio-linguistic theory of language codes (Bernstein, 1971). According to Bernstein (1971), there are two types of language codes. The elaborated code is where everything is spelled out so everyone can understand the meaning of the message. The second is the restricted code where only a few words are spelled out and the rest of the message is understood, depending on background and prior mutual understanding. Along the same line, the missed call can

be viewed as a message full of restricted codes that is only comprehensible to the caller and the recipient.

One interesting point that was highlighted by the Sudanese in relation to reducing the value of the emotional gift of the missed call is the sound of the ring tone and the length of the ringing sound.

The shortness of the missed call ring tone is considered to have a negative impact on the merit of the missed call because the sound of the missed call is short in comparison to the SMS ring tones. In addition, the fact that the ring tone is very short and that mobile phones ring tones in general tend to start quiet and then become louder as they go on has increased the chances of not hearing the emotional gift when received. Consequently, it may lose its purpose and impact in relation to its specific intent by the sender. For this reason, the next study conducted as part of this research has attempted to deal with this problem.

4.11.1.2 Moral obligation to reply call back

A moral obligation surrounding the missed call and the need to reply call back was highlighted in the study. The Sudanese were found to feel more obliged to reply call back to most of the missed calls in comparison to the British participants.

A justification for the Sudanese obligation to call back when they receive a missed call is that call back is related to their high score on Hofstede's power distance dimension. Accordingly, superiors are coerced to call inferiors to keep their prestige in society. Therefore, when a superior receives a missed call from an inferior, especially when this missed call "means call me back" he/she feels obligated to call back. This is particularly true when this request for a call back is made by monthly contract customers who are known to others by their phone prefix numbers. It is different in the UK, where all prefixes on numbers are not indicators of the type of mobile phone contract an individual has.

For the British who score low on Hofstede's power distance dimension, the relationship between superior and subordinates can be suppressed and some sort of

equality can exist. This classification in the work environment has perhaps influenced the attitudes of both superior and inferiors towards bearing their communication costs. Although the British tend to reply to missed calls that mean 'call me back', if they have 'free' talk minutes, they do not feel any moral obligation to do so.

This moral obligation related to the missed call is greatly correlated with the SMS moral obligation explained by Taylor (2003), where he explains the social obligation of exchange: to give, receive and reciprocate. Trust and reciprocity are also important elements in the gift-giving patterns and rituals that emphasise social relationships (Schwartz, 1967). Mauss (1997) found that in response to the gift, the receiver is obliged to accept and in order to show that he/she is participating in the gift-giving ritual, needs to reciprocate.

Interestingly, the unenthusiastic attitude of the British in not replying to a missed call is different from their attitude towards SMS. From the literature, it has been found that there is an established norm indicating that an SMS requires a reply. Taylor and Harper (2003) have identified an "obligation to reciprocate" and Kaseniemi and Rautiainen (2002) pointed that an SMS without a reply is considered as impolite.

4.11.1.3 Understanding missed call types

Although British participants consider most of the missed calls as an appeal for a call, there is also a place for the missed call that means 'reminder for prior arrangement' and 'after sending SMS'. In the Sudan, the missed call is used to request a call back but, equally, the missed call is used as an emotional gift. Other uses for the missed call include reminder for prior arrangement, or sometimes junior doctors use it to call a senior doctor to the A & E. department in the hospital.

Results from this study indicated that understanding the meanings of missed calls is quite a challenging act that faces missed call users in the UK and the Sudan. Users are required to distinguish between various missed calls meanings that are exchanged over the network. Missed call users in the UK and the Sudan have adopted a range of techniques to help them to decode different missed call meanings. They have attempted to develop a protocol or pre-agreed rules that govern the practice of the missed call. The core of these developed techniques is used to understand the

meaning of the missed call mainly depends on guessing the context of the missed call, e.g. the whereabouts of the caller, timing of the missed call, etc. For example, one way to differentiate between different types of missed call is by exclusion, depending on circumstances surrounding the actual missed call. For instance, if the receiver arranged to meet someone and then received a missed call, the assumption is that the caller is telling the recipient that he/she arrived at the agreed destination, but there is also a chance that the caller wants to cancel the arrangement at the last minute.

The location of the caller was also used to clarify the meaning the missed call conveyed. For example, if the caller is outside the country then probably it is an emotional gift, because naturally he will not request to be called back at the international rate; however, it is not always the case. Sometimes, the caller who is away from the recipient place might still make a missed call as a request for an urgent call back. Or perhaps he/she might send a missed call to remind the recipient of a certain agreed action.

Missed call users sometimes use the timing of the missed call to shed light on the meaning conveyed by the missed call. For example, if it is late at night, then perhaps it is a good night message. But again, it could be a request to switch the tv to a certain channel to watch a programme. One of the ways missed call receivers tried to clarify the meaning of the missed call was to evaluate the caller profile. For example, if he/she is not a regular user of missed calls then the missed call is always assumed to be a request for a call back. However, this interpretation rules out the chance that this missed call is made by mistake or perhaps it was an emotional gift. In addition, missed calls that are received from those who are on monthly contract are interpreted as an emotional gift, especially in the Sudan, where monthly contract users are known by their prefix-numbers, whereas many of their received missed calls are treated as a request for a call back. Decoding the missed call in this way restricts mobile phone users who have monthly contracts from making use of other types of missed calls and at the same time oblige them to reply to missed calls that might not be a request for a call back. Missed call users have made use of another element to distinguish between various missed calls. For example, being able to interpret missed calls based on your relationship's classification. Missed calls received from those who are positioned at the outer circle of the missed call receiver's social group are mainly considered an

emotional gift. Broadly, the outer circles of contact are those people you do not meet on a regular basis. These are usually old friends, distant relatives, and ex-work colleagues but yet there is a need to stay in touch. In contrast, contacts within the receiver's inner circle are more likely to send a missed call that means call me back. The inner circle of contacts includes close family members, close friends, and daily work colleagues (Riviere and Licoppe, 2005). But the problem with this approach is that people's classification of their relationships might not match. A person I might consider as a close contact and as part of my inner circle might have classified me as an outsider in his/her circle of contacts. This variation in the grading of the relationship may affect the interpretation of the missed call. For example, receiving a missed call that is sent to a close contact may be interpreted as a request for a call back, whereas the same missed call from a person who is considered an outsider of the inner circle might be understood as an emotional gift. Clearly, the expected reaction for each of these missed call types differs greatly. The former requires an immediate response to call back and involves higher obligation to call back, whereas the latter may only require the recipient to send another missed call or even just appreciate it and do nothing.

Despite efforts made to differentiate and make sense out of missed calls exchanged over the network, users in both countries strive to interpret missed calls correctly. Results from this study have indicated that despite these established protocols to decode meaning of missed calls many missed calls are wrongly interpreted and therefore have an impact on the flow of social interaction.

4.11.1.4 Benefit of missed call for caller and recipient

Exploring the benefit of the missed call for callers and recipients from the British and the Sudanese perspectives demonstrated another clear cultural difference. The British and the Sudanese agreed that missed calls are valuable to both the caller and the recipient from a cost, time and effort perspective. However, the Sudanese participants also added the substantial support the missed call can offer to the caller. The feeling that the caller can unreservedly request a call back from a close friend, family member or anyone in his/her social group who can afford it offers a sense of reassurance and support. This attitude corresponds with the Sudanese collectivistic approach where the individual can rely on the group to care for their needs. Another example that

reflects the Sudanese collectivistic approach is the use of the missed call as an emotional gift in which callers who are in less financially secure situations can still actively participate in their social group interaction. Callers using emotional gifts can experience the sentiment of being able to offer and interact with those members of their social group.

As for the recipients, the fact that members of their network are sending them emotional gifts provides them with a feeling of being valued and treasured, and can offer a sense of belonging. This sense of belonging is explained by Heller (2004) who found that gift receivers' feel less alone and more connected to others. Human beings yearn to feel connected with others, as this feeling reduces the feeling of loneliness that is central to human nature. Heller (2004) described the idea of a 'feeling-bond' when gift givers manage to understand others and represent this understanding by offering others gifts that are needed and yearned for. Hyde (1983) found that gift giving cultivate a feeling–bond unlike any other type of exchange. Hyde (1983, p.56) stated:

"It is the cardinal difference between gift and commodity exchange that a gift establishes a feeling-bond between two people, while the sale of a commodity leaves no necessary connection."

In contrast, British participants were less enthusiastic about the value of the missed call for the recipient, especially in relation to the emotional gift, as they thought the missed call as an emotional gift has not got an economic cost, and therefore this reduces its emotional value. Taylor (2003) echoed the same finding in relation to the decreased of value of SMS sent using one of the free SMS service available on the Internet. According to Taylor's findings (2003), recipients of these types of free SMS have considered them as unsatisfactory in value and thus an affront, especially if they have sent SMS that has financial cost. Schwartz (1967, p.6) discussed the issue of returning a gift of a lesser value.

"One expresses unfriendliness through gift giving by breaking the rule of approximate reciprocity (returning a gift in near, but not exact, value of that

received). Returning "tit for tat" transforms the relationships into an economic one and expresses a refusal to play the role of grateful recipient."

The individualistic society is more materialistic and focuses more on tangible gifts, offerings that have financial connotations. Therefore, they tend to appreciate and recognise a gift that has a cost association. In addition, the individual is mainly responsible for his/her own needs and does not expect support from the social group, there is a less obligation on the person to participate in the group's social interaction. The person is only concerned with a smaller social group, and therefore the missed call as an emotional gift with its wearable value is not perceived as a suitable mode of communication.

Participants in both countries felt that missed calls sometimes have slightly negative connotations, as they put a responsibility or burden on the receiver to call back. As the use of mobile phones is continuously growing, many mobile phone users can request to be called back. In sub-Saharan Africa, Donner (2005) found that some respondents suffer from 'beeping fatigue' because of the growing demands to call back.

4.11.2 Balance transfer

Another interesting theme emerged from this study was the use of balance transfer, which is also known as 'ME 2 U'. This is a very popular practice in the Sudan where any prepaid mobile phone user can transfer some of his/her credit to others. It can be seen as another way of requesting people to pay for your mobile phone calls.

The balance transfer, in a way, is similar to topping up someone's mobile phone credit with a swipe card (as established in the UK). However, the minimum amount required to top up a mobile phone's credit is £5.00, which offers around 25 minutes of voice calls. Taylor (2003) found that teenagers view call credit and mobile phones themselves as gifts which are considered as a symbol of friendship and simply to keep the receiver connected with the donor and the rest of the social network.

The practice of sharing and transferring credit can be related to the Sudanese collectivistic attitude. The Sudanese willingness to use the money in this way enables

them to express their proximity and enhances their relationships, as it keeps people connected. It can also greatly facilitate the ritual of taking care of each other and meeting others' needs. Both the missed call and the balance transfer can be considered as gifts. This finding lends support to Taylor's (2003) findings, where he found that mobile phone credit and SMS are gifts.

As with technology, balance transfer is sometimes used in a way not anticipated by its originator, to make money. Recently, an interesting practice has developed out of the balance transfer service; people in rural areas are exchanging transferred credit for money. A person who lives in Khartoum and supports his relatives financially in rural areas can transfer credit for them; these relatives, in turn, can easily sell the credit in exchange for money, and actually make profit, as topping up mobile phone credit is a not available or accessible in all places, at all times. Obviously, this way of transferring money can be recognised as a confidential and safe way of transference; the swiftness can be an added advantage, as bad weather can make it more difficult to reach banks or to send it with a messenger.

Others have chosen to use the balance transfer service to attract customers to their business. In small shops and news agencies, owners top up their mobile phones with high values and benefit slightly from the sale of transferred credit to students and other people in times of hardship. However, the main gain is to attract customers to their shops to sell their services and goods. Thus, in this case, balance transfer is used as a marketing technique.

4.12 Chapter Summary

Chapter 4 describes the first study that investigated the use of mobile phones in two contrasting cultures, the UK and the Sudan. The study indicated that British participants are more willing to use mobile phones in public places (e.g. public transport) than their Sudanese counterparts. These attitudes were interpreted using Hofstede's cultural typology (Hofstede, 1980) and the results suggest that culture perhaps plays a limited role in the participants' attitudes towards mobile phone use in public places.

Another key result found in this study is the ritual of the missed call. The practice of the missed call provides a clear proof of how users develop their own style of using technologies in a bewildering way. Based on this study, the missed call ritual with its social and practical practices (e.g. to maintain real space relationships with distant friends, or calling a senior doctor to the A & E) appeared to be interconnected with culture.

The results indicated that participants in the two cultures used the missed call for various purposes. For example, the British participants appeared to use the missed call mainly as a request for a call back, after sending a text message, and as a reminder for a prior arrangement. The Sudanese participants, on the other hand, perceived some of the missed calls as emotional gifts. The Sudanese were also found to be more in favour of using the missed call as a request for a call back before sending an SMS.

The increasing popularity of different types of missed calls in different cultures highlights the need for an effective way of understanding and interpreting the meaning of a missed call. Both sets of participants agreed that the meaning of the missed call can be easily misunderstood because of the confusion related to the code developed between users, and also the need to have mutual agreement on the meaning of the missed call in advance.

Until now, the missed call as a form of communication has not been considered in mobile phone design, and developers of mobile phones need to determine the technological choices required to develop mobile phones that meet cultural needs.

Therefore, the aim of the next phase of the research is to propose a new solution that employs an icon-based missed call service (IBMCS) to help users interpret the meaning of missed calls in a more clear and effective way.

Chapter 5

An Icon Based Missed Call Service (IBMCS)

5.1 Introduction

The first experiment reported in the previous chapter attempted to identify the role of cultural differences in the way people use their mobile phones in general and, in particular, in relation to the missed call ritual. In this respect, the study found that mobile phone users in the UK and the Sudan make use of the mobile phones functionalities such as the caller display service, call registry and the address book to exchange social messages over the network.

In the UK, the missed call is mainly used to request a call back, especially from recipients who have free talk time allowances. The British also used the missed call as a reminder for a prior arrangement, or sometimes after sending sms to draw the recipient's attention to the sent sms. In the Sudan (in addition to the British uses), the missed call is commonly used as an emotional gift to convey messages such as "Miss you", "Eid Mubarak", (congratulating each other with Muslims holy festival). The study indicated that the Sudanese also used the missed call before sending sms to ensure that the recipient's mobile phone is connected to the network.

Despite the increasing use of various types of missed calls and the emergent confusion linked to interpreting the meaning of the missed calls, the missed call as a form of communication has not been considered in mobile phone interface design. The aim of this research is to propose a new solution that employs an icon-based missed call service (IBMCS) to help users interpret the meaning of the missed calls more clearly and effectively.

Results from Study 1 indicated that participants yearned for a way to clarify the meaning of the missed call. Participants suggested assigning icons to the various types of missed calls. Two countries were selected for the purpose of the study: the

UK as a representative for the developed world with its mature mobile technology market, and the Sudan as part of Africa with an emerging market for mobile devices.

5.1.1 Study objectives

The specific objectives of this study were:

- To investigate whether an IBMCS will clarify the meaning of the missed call in comparison to the traditional missed call system.
- To investigate the impact of culture on users' perception of an IBMCS.

5.2 Pilot Study

A pilot study was conducted in this study, which involved selecting representative users to ensure that experimental procedure and data recording mechanisms worked effectively (Maguire, 2001). In this pilot study, one participant at a time was required to use the prototype of the IBMCS in realistic mobile contexts (i.e. while walking down the street, or in public places).

Two recording mechanisms were employed to collect the data in this pilot study, questionnaire and interview. For the questionnaire, two sets of questionnaires were used in the pilot study, the first to test users' satisfaction with using the IBMCS to send a missed call and the second to test users' satisfaction with using the IBMCS to receive a missed call see Appendix 9.

The two questionnaires used in the pilot study were developed mainly from a fully revised version of Lewis's (1995) Computer System Usability Questionnaire (CSUQ). The questionnaire in this study consisted of 14 Likert statements on usability with which the respondent indicated the extent they agreed or disagreed with a statement on a seven-point scale, ranging from 1 (Strongly disagree) to –7 (Strongly agree).

The main measures used in the CSUQ are defined below:

- Ease of use: how easy was it to place or receive a missed call using the IBMCS.

- Enjoyability: whether the user found the experience of using the new service enjoyable or not.
- Recovering from mistakes: user's opinion about their ability to recover from mistakes and amend wrong keypad hits.
- Organisation of information on screen: degree to which the user found information provided and screen layout of the screen clear and systematic.
- Likeability: whether the user found the service useful and pleasant, and whether he/she would choose to use it again.
- Expectability: whether the user's conceptual model of the service matched the design of the service, and whether the service met all the expectations of the user.
- Overall satisfaction: degree to which user found the service useful and satisfying to use.

To assess the clarity of the experimental procedure, the length of the questionnaire and the simplicity of the interviews, seven questions were developed:

1. Is it easy to access the icon-based missed call service from the mobile phone main menu?
2. Are the instructions for the experiment understandable?
3. Is the ability to omit the missed call sound when receiving a missed call through the icon-based missed call service needed?
4. Is the length of the questionnaire appropriate?
5. Are the experimental tasks too long for sending and receiving missed calls through the icon-based missed call service?
6. Are the topics covered in the interview appropriate?
7. Is the wording of the interview clear?

5.2.1 Pilot Participants

12 participants took part in the pilot study, 5 British (3 male, 2 female) and 7 Sudanese (3 male and 4 female) ranging in age from 14 to 30 years old, with an average age of 19 years. All participants were mobile phone users. The range of mobile phone use for the Sudanese participants was 2 to 5 years, whereas the British participants had used mobile phones 4 to 9 years.

5.2.2 Pilot Procedure

Participants were asked to use the IBMCS to send the following types of missed calls:

- After sending an sms
- Before sending an sms
- Call me back
- Emotional gift
- Reminder for a prior arrangement

Then participants were also asked to check their log list to find out if the sent missed calls were received. Participants were also asked to find out the following information about each one of the received missed calls:

- Type of missed call received.
- Time missed call was received.
- Date missed call was received.

This was followed by 2 sets of a fully revised version of the computer systems usability questionnaire (CSUQ). The first questionnaire was developed to elicit users' experience when using the IBMCS to send a missed call. The second questionnaire was developed to find out about users' experience when receiving a missed call through the IBMCS. Following this, participants were interviewed, and the semi-structured interview lasted on average for 30 minutes. Participants were informed from the outset that the results of the study would be anonymous and they would be able to get the results of the study from the researcher on request.

5.2.3 Results from pilot study

Lewis (2002) found the reliability of the CSUQ scale to be 0.96, signifying high internal consistency. There were no comments obtained from the pilot respondents upon improving the questionnaire.

Observing participants using the prototype, it was noted that initially they experienced problems finding their way around the application, but once they accessed the IBMCS, participants were comfortable carrying out the experimental tasks successfully. Results obtained from the Computer systems usability questionnaire indicated that participants were relaxed using the prototype. A Mann-Whitney U-test Mann was used to analyse the data. Table 5.1 and 5.2 summarise the main results of the pilot study.

Table 5.1 Pilot respondents' attitudes towards the IBMCS in relation to their sending experience by country

Theme	Country	N	Mean Rank	Asymp sig 2 tailed	Sig level
It was easy to use the icon-based missed call service to send a missed call	Sudan	7	7.21	.413	
	UK	5	5.50		
	Total	12			
I have not enjoyed making a missed call from the icon-based missed call service	Sudan	7	4.00	.001	**
	UK	5	10.00		
	Total	12			
While making a missed call, if I make a mistake I recover quickly	Sudan	7	8.14	.058	
	UK	5	4.20		
	Total	12			
Organization of information related to sending a missed call is not clear on the screen.	Sudan	7	7.21	.210	
	UK	5	5.50		
	Total	12			
I like using the icon-based missed call service to make a missed call	Sudan	7	4.50	.006	**
	UK	5	9.30		
	Total	12			
The icon-based missed call service has not got all the functions I expect it to have to make a missed call	Sudan	7	6.86	.398	
	UK	5	6.00		
	Total	12			
Overall, I am satisfied with the icon-based missed call service in relation to making a missed call	Sudan	7	6.50	1.000	
	UK	5	6.50		
	Total	12			

**P<0.01

Table 5.2 Pilot respondents' attitudes towards the IBMCS in relation to their receiving experience by country

Theme	Country	N	Mean Rank	Asymp sig 2 tailed	Sig level
It was easy to use the icon-based missed call service to receive a missed call	Sudan	7	6.93	.595	NS
	UK	5	5.90		
	Total	12			
I have not enjoyed receiving a missed call from the icon-based missed call service	Sudan	7	7.07	.478	NS
	UK	5	5.70		
	Total	12			
While checking that I have received a missed call, if I make a mistake I recover quickly	Sudan	7	6.29	.804	NS
	UK	5	6.80		
	Total	12			
Organization of information related to receiving a missed call is not clear on the screen.	Sudan	7	7.36	.313	NS
	UK	5	5.30		
	Total	12			
I like using the icon-based missed call service to receive a missed call	Sudan	7	6.71	.792	NS
	UK	5	6.20		
	Total	12			
The icon-based missed call service has not got all the functions I expect it to have.	Sudan	7	7.36	.314	NS
	UK	5	5.30		
	Total	12			
Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call.	Sudan	7	7.29	.349	NS
	UK	5	5.40		
	Total	12			

NS Not Significant

Table 5.3 shows that 6 of 12 respondents (50%) found it easy to access the IBMCS from the mobile phone interface main menu. Of the 12 respondents, 11 (91%) found the instructions for the experiment understandable. All of the 12 respondents agreed that the ability to omit/silence the sound on the IBMCS was a good idea. Of the 12 respondents, 9 (75%) found the length of the questionnaire appropriate. 4 of the 12 (33%) respondents found sending the five missed calls through the IBMCS was a lengthy procedure. Of the 12, 8 (67%) respondents found that receiving five missed call types through the IBMCS was a lengthy procedure. In addition, of the 12, 10 (80%) respondents found that the questions covered in the interview were adequate. 11 of the 12 (91%) respondents found that the wording of the interview questions was clear to navigate through the mobile phone to access the IBMCS was a lengthy process. The responses to the pilot seven questions are summarised in Table 5.3 and Table 5.4.

Table 5.3 Pilot study findings for Experiment 2 (N=12)

Question	Frequency		Percentage	
	Yes	No	Yes	No
Is it easy to access the IBMCS from the mobile phone main menu?	6	6	50%	50%
Are the instructions for the experiment understandable?	11	1	91%	9%
Is ability to omit the missed call sound when receiving a missed call through the IBMCS needed?	12	0	100%	0%
Is the length of the questionnaire appropriate?	9	3	75%	25%

Table 5.4 Pilot study results on experimental tasks and interview questions (N=12)

Question	Frequency		Percentage	
Are the experimental tasks lengthy for sending and receiving missed calls through the IBMCS?	**For sending missed calls**		**For receiving missed calls**	
	4	8	8	4
Are questions covered in the interview appropriate?	10	2	80%	20%
Is the wording of the interview clear?	11	1	91%	9%

Based on the findings from the pilot study, it was decided to take these actions for the main experiment:

1. The pilot study revealed that participants needed more time to find their way around the prototype; therefore it was decided to give participants the chance to have a short guided tour around the application before conducting the main experience.

2. Previously, participants were required to place all types of missed calls and to navigate through the menu to provide information on the five received missed calls. The process of sending the five missed calls appeared to be acceptable to the user but for receiving the missed call, it was decided that receiving two missed calls will be adequate for the purpose of the study.

3. The ability to silence the sound effects when receiving a missed call through the IBMCS was found to be required. Participants found this feature a good design decision because in noisy mobile environments, as well as in quite settings, they preferred to have the ability to omit the sound.

4. Carrying out the experiment and filling in the two CSUQ proved to be a lengthy and "boring" process for the participants. Therefore, in order to get valuable information without exhausting the participant, it was decided to combine the two usability questionnaires into one questionnaire that elicit users' sending and receiving experience, as well as carrying out a semi-structured interview.

5. Although participants felt that navigating through the mobile phone to access the IBMCS can be a quite lengthy procedure, it was decided to apply the same ordering of the menu. This is similar to the existing missed call service, and this was applied to make the design memorable and familiar to users.

For the interview, the pilot study indicated that interviewees found the interview questions to be adequate and the wording to be appropriate and understandable.

Therefore it was decided that the interview questions were appropriate for the main study.

5.3 Main experiment

Results from study 1 indicated that certain missed call types are more popular than others. These calls were used to develop the IBMCS. These missed calls are:

- After sending an sms
- Before sending an sms
- Call me back
- Emotional gift
- Reminder for a prior arrangement
-

Participants who took part in this study were aged between (13-34 years). The reason for selecting this specific age group was related to results obtained from Study 1 where this age group (13-34 years) were found to be more interested in using the missed call than participants who are over 34 years. Results from Study 1 indicated that participants aged between (13-34) years use the missed call service regularly to convey various social messages and they experience problems interpreting the meaning of the sent missed calls.

Whereas older age group were found reluctant to use the missed call service in general and they were found to use phone calls and SMS to communicate. Therefore, on this study it was decided to investigate the perception of participants aged between (13-34) years as they are the heavy users of the service and to temporarily exclude older age group until the perception of the (younger age groups (13-34), who are more keen in using the missed call is investigated. This age range was sub divided into two groups; the first group aged 13-20, and the second 21-34. The reason for this division was mainly based on the understanding acquired from the literature that younger age groups are heavy users of new technology (Ling, 2002; Taylor, 2003). Also these two age groups form two types of mobile phone users: those who are most likely to be dependent on others to pay their mobile phone bills (13-20) and the most likely independent group (21+).

5.3.1 Data Collection Methods

For the main experiment, data were collected using the following two methods:

- Questionnaire
- Interviews

5.3.1.1 Questionnaire

A Likert-type scale (Likert, 1932) was used to ascertain people's perception of using the IBMCS. The questionnaire was a fully revised version of the CSUQ developed for IBM by Lewis (1995). The complete questionnaire for this experiment was also used in the pilot study.

The scale had a 7-point format, with responses ranging from strongly disagree to strongly agree with a neutral mid-point (please see Appendix 2 for a full copy of the questionnaire). An example of the format is given in Figure 5.1

It was easy to learn how to send a missed call using the icon-based missed call service

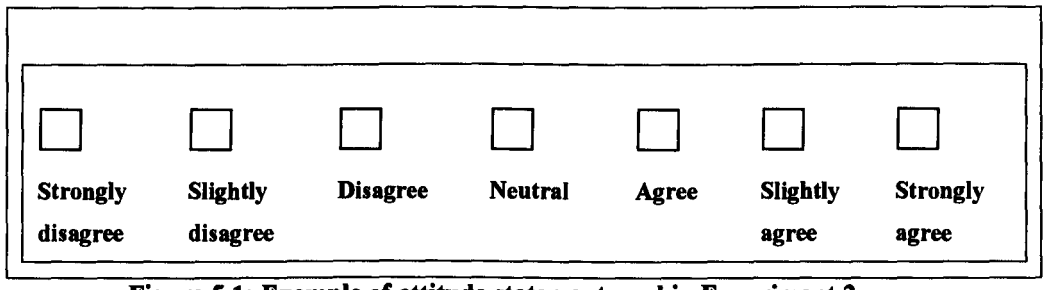


Figure 5.1: Example of attitude statement used in Experiment 2

The attitude scale had a combination of positive and negative statements to control for any possible acquiescence effect from participants when completing the questionnaire. This is a phenomenon whereby participants in a study may unwittingly try to respond positively to every question in order to help the investigators. This type of questionnaire format is one of the most common methods used to elicit attitudes from users in HCI research (Love, 2005).

The questionnaire was administered after each of the experimental testing sessions. Participants responded to the 14 usability statements, with a 7-point response scale

ranging from 'strongly disagree to 'strongly agree'. Scores were recoded so that a high score for a factor indicated a positive attitude and a low score a more negative attitude.

In addition to the Likert scales, open-ended and closed questions were also designed to gather richer data about the users' perception of the IBMCS.

5.3.1.2 Interview

An in-depth interview was also used in this study. The aim of using an in-depth interview was to elicit rich, detailed material that can be used to shed light on the meaning of the data (Lofland and Lofland, 1995). An in-depth, semi-structured interview was undertaken with all participants after they completed the questionnaire; the interview lasted for about 45 minutes. The interview included open-ended questions (please see Appendix 5 for a full copy of the interview questions).

The following shows examples for some of the points covered in the interview:

- *Has IBMCS helped you in any way? How?*
- *Have the icons used in the IBMCS symbolised your message accurately?*
- *How different/similar is the IBMCS to sms/mms*
- *Attitude towards the use of the IBMCS in public places.*
- *Suggestions to improve the design of the IBMCS.*

All interviews were transcribed verbatim. The Sudanese interviews were transcribed in the native language first, and then translated into English. Participants were informed from the outset that the results of the study would be anonymous and they would be able to obtain the results of the study from the researcher on request.

5.3.2 Sampling

The 80 participants who took part in this study were chosen from an opportunistic sample, and came from the UK and the Sudan.

5.3.2.1 Participants

Of the 80 participants 35 were British (16 male, 19 females) and 45 Sudanese (18 males and 27 females), ranging in age from 13-34 years old, with an average age of 20 years. All participants were mobile phone users. Experience of mobile phone use for the Sudanese participants ranged from 2 to 5 years, whereas the British participants had used mobile phones for 4 to 12 years.

5.3.3 Prototype design and development

Flash 8 Macromedia was used to create the prototype used in this study. Flash Player is the virtual machine used to run the Flash files and has support for an embedded ActionScripts which is based on ECMAScript. Flash lite player is a lightweight version of Flash Player optimised for mobile phones. In this experiment, the prototype was developed using Flash 8 player and was then run on mobile phones using Flash lite.

The design of the IBMCS was based on the same metaphor as the old, existing missed call service. The prototype consisted of a set of screens that enable the user to navigate through the menu to the call registry to place/receive icon-based missed calls. The user needs to navigate through the menu to the call registry to get to the Missed call folder. Please see Figure 5.2 for the front pages of the service.

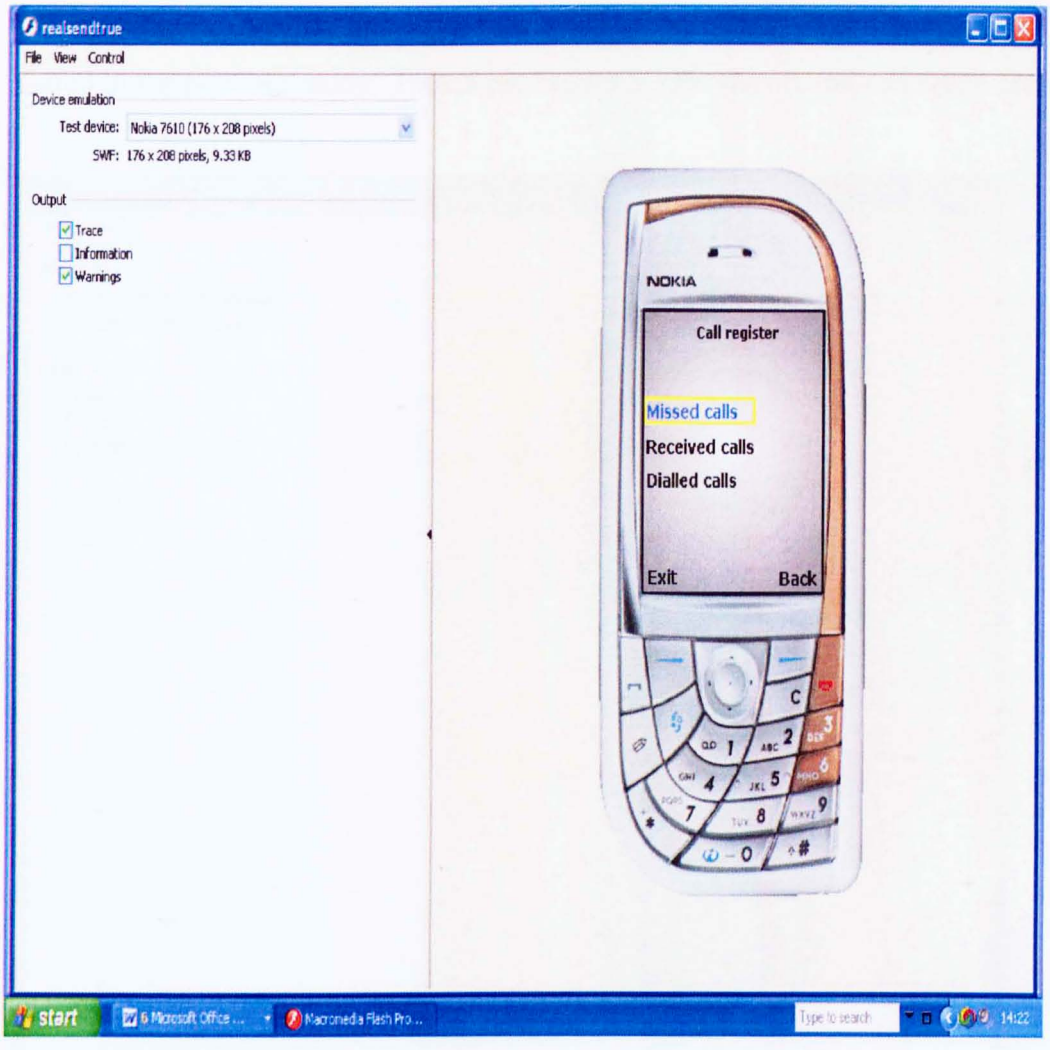


Figure 5.2 Call register screen of the IBMCS

For the user to place a missed call, he/she needs to access the Missed Call Types screen. The missed calls that can be sent/ received using the icon-based missed call service are:

- After sending sms
- Before sending sms
- Call me back
- Emotional gift
- Reminder for prior arrangement

These missed call types that have been used in the IBMCS are the most used types found in the previous study. Please see Figure 5.3 for the missed call types screen.

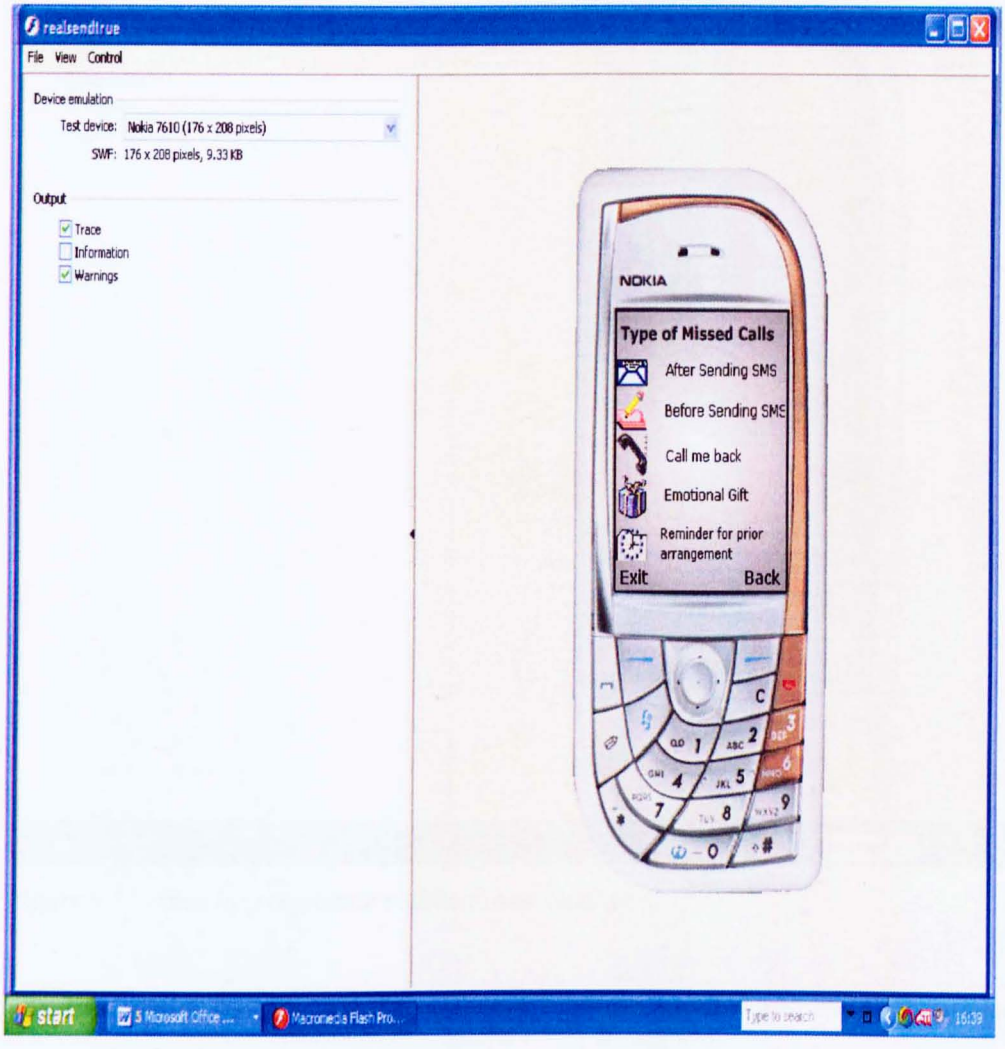


Figure 5.3 Missed call types screen in the IBMCS

After the user selects the required missed call, he/she can enter the recipient's phone number and place the missed call. Please see Figure 5.4 for the screen for the recipient phone number.

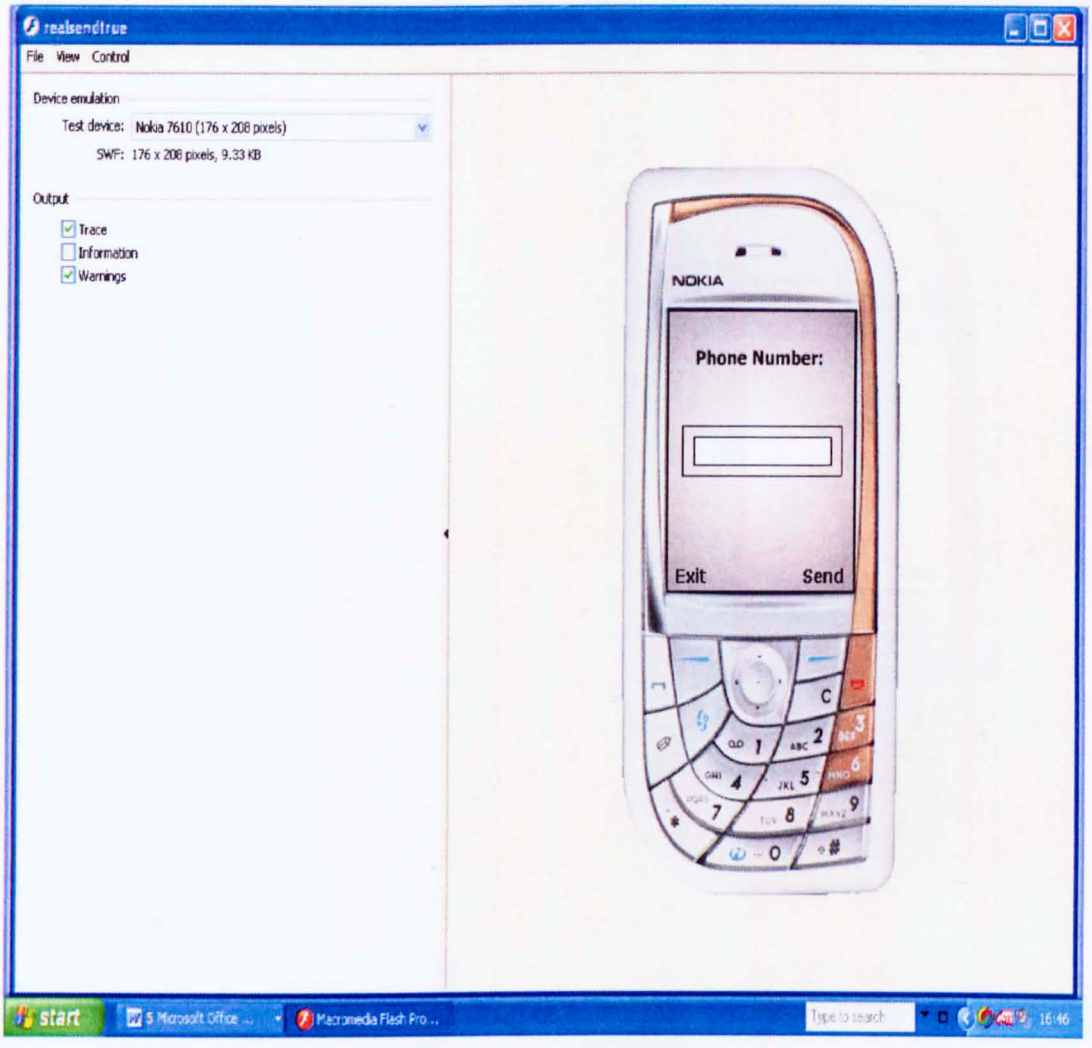


Figure 5.4 Screen for recipient's mobile phone number

Once the caller has entered the recipient's phone number and sends the missed call, a screen shows that the missed call is processing. Figure 5.5 provides an example that the missed call sent has been processed.

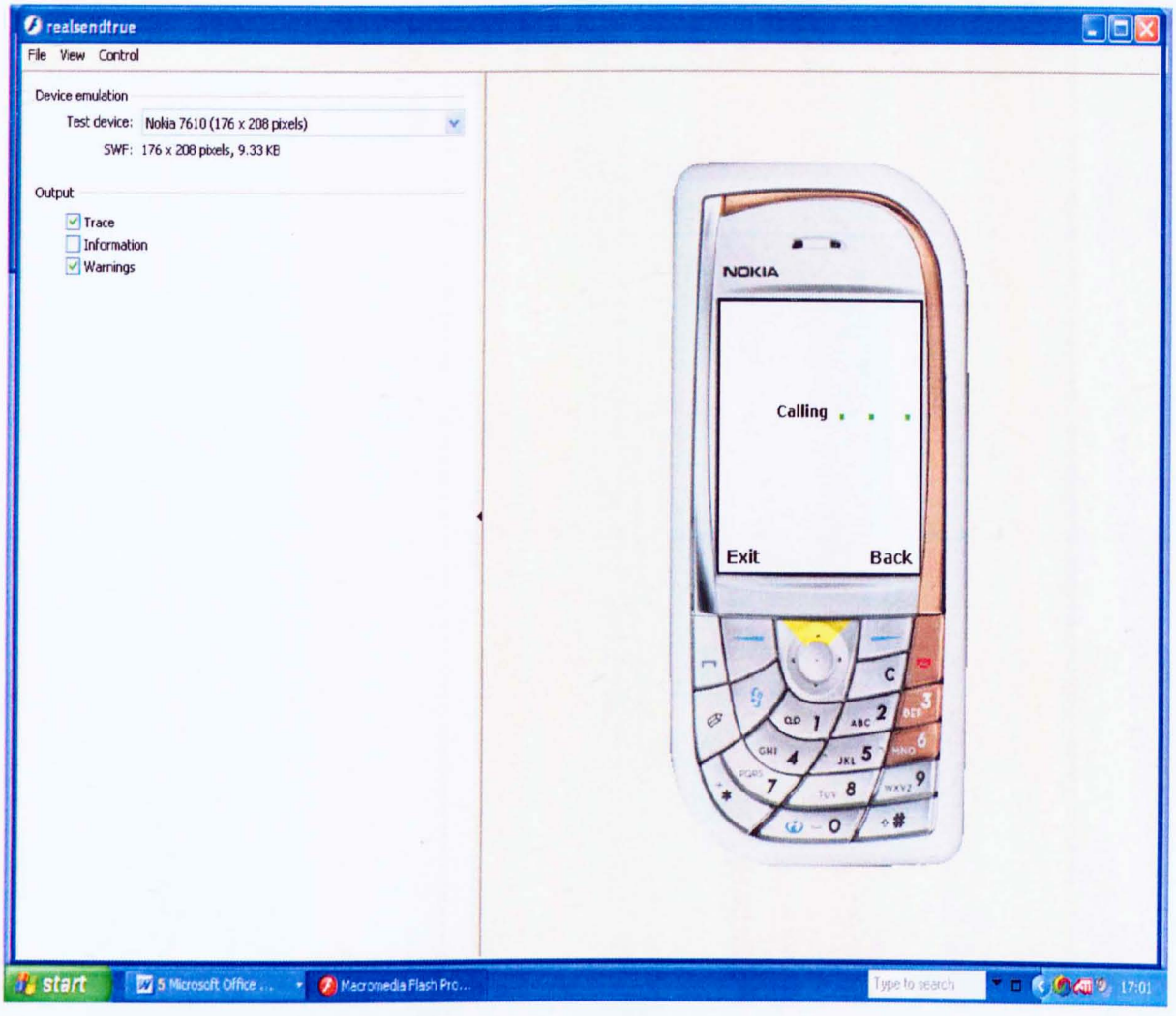


Figure 5.5 The missed call placed is under process

Finally, if the missed call is placed, then the last screen confirms that the missed call is sent as shown in Figure 5.6.

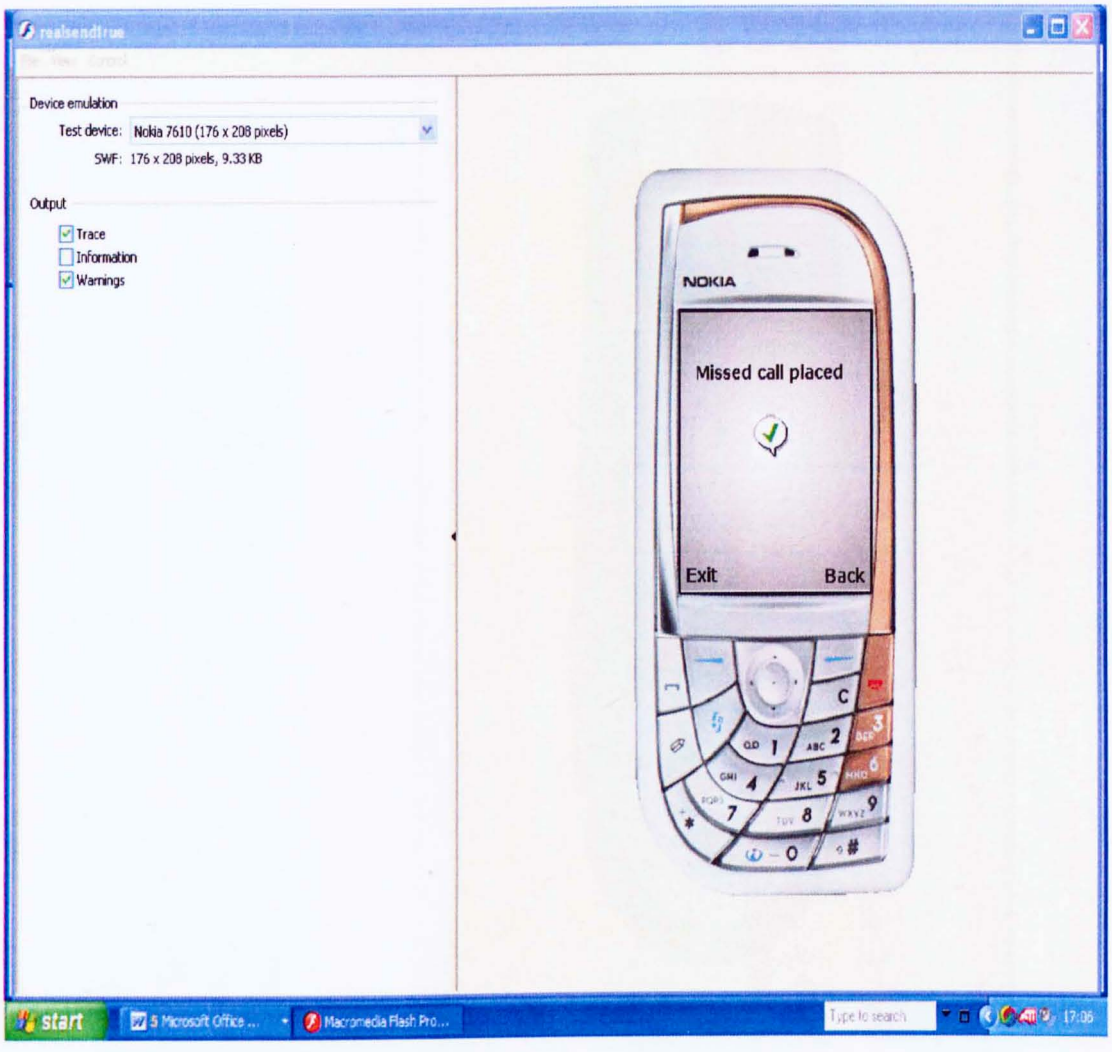


Figure 5.6 Missed call is placed

For receiving, the receiver of the missed call gets a ring tone and an animated icon indicating that a missed call has been received. Please see Figure 5.7.

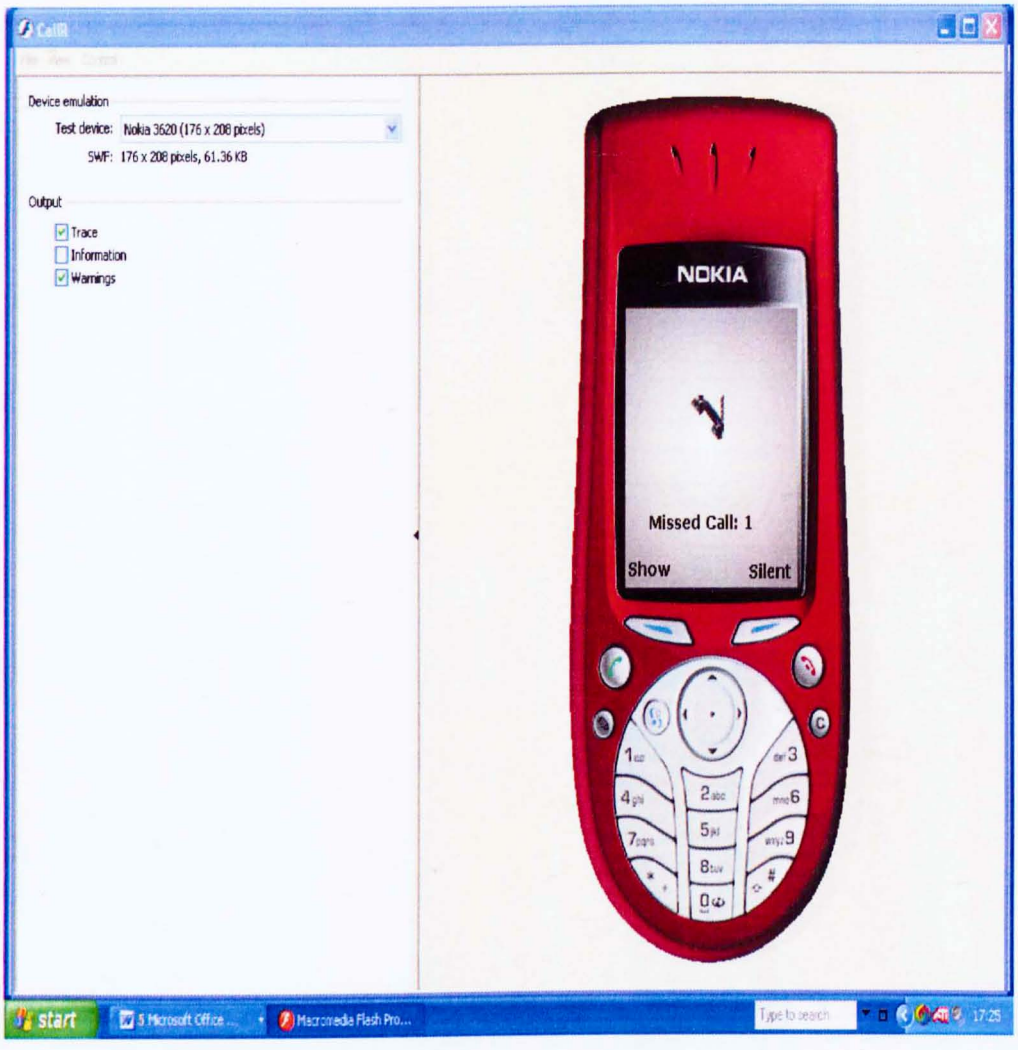


Figure 5.7 A missed call that means 'call me back'

The recipient has the chance to silence the sound and can also click on the 'Show' button to access further details about the received missed call. Please see Figure 5.8 for the received missed calls interface/screen.

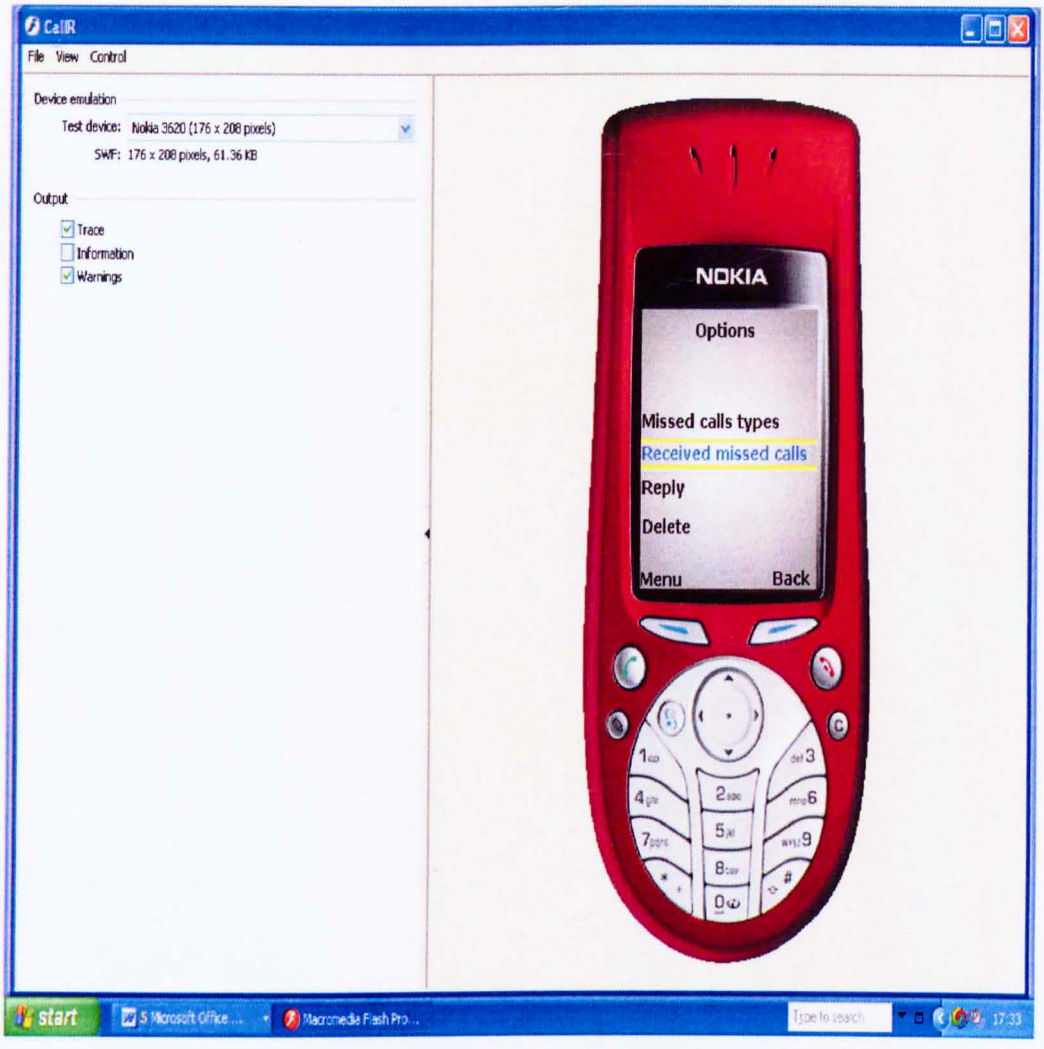


Figure 5.8 Option for accessing "received missed calls"

On the received missed call screen, the recipient view the list of all the received missed calls he/she has. Please see Figure 5.9 for the screen list of the received calls.

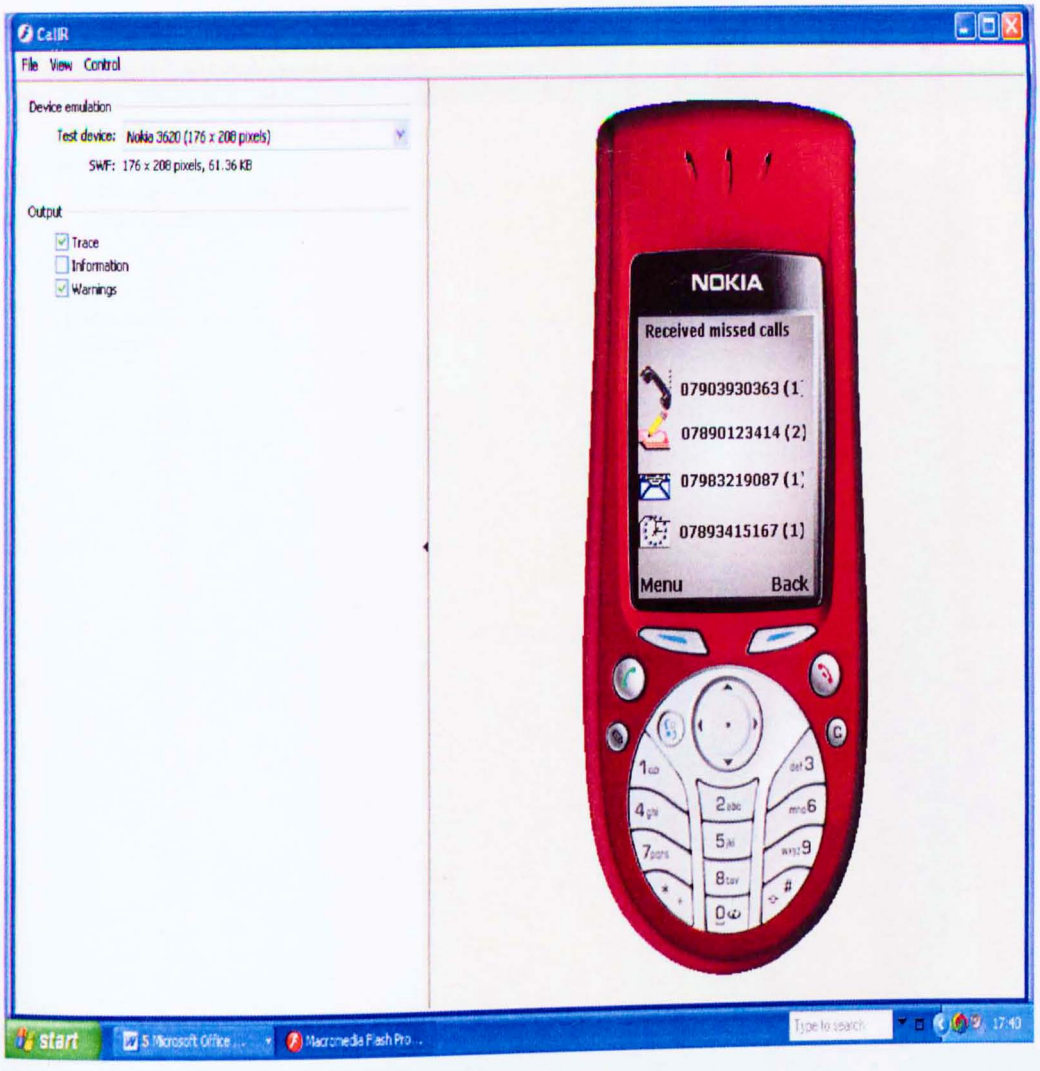


Figure 5.9 List of received missed calls on the IBMCS

The recipient can click on each of the missed calls to obtain more information about the time of receipt and the type of missed call they received. Figures 5.10 and 5.11 show screen shots for timing of missed call received and type of missed call received respectively.

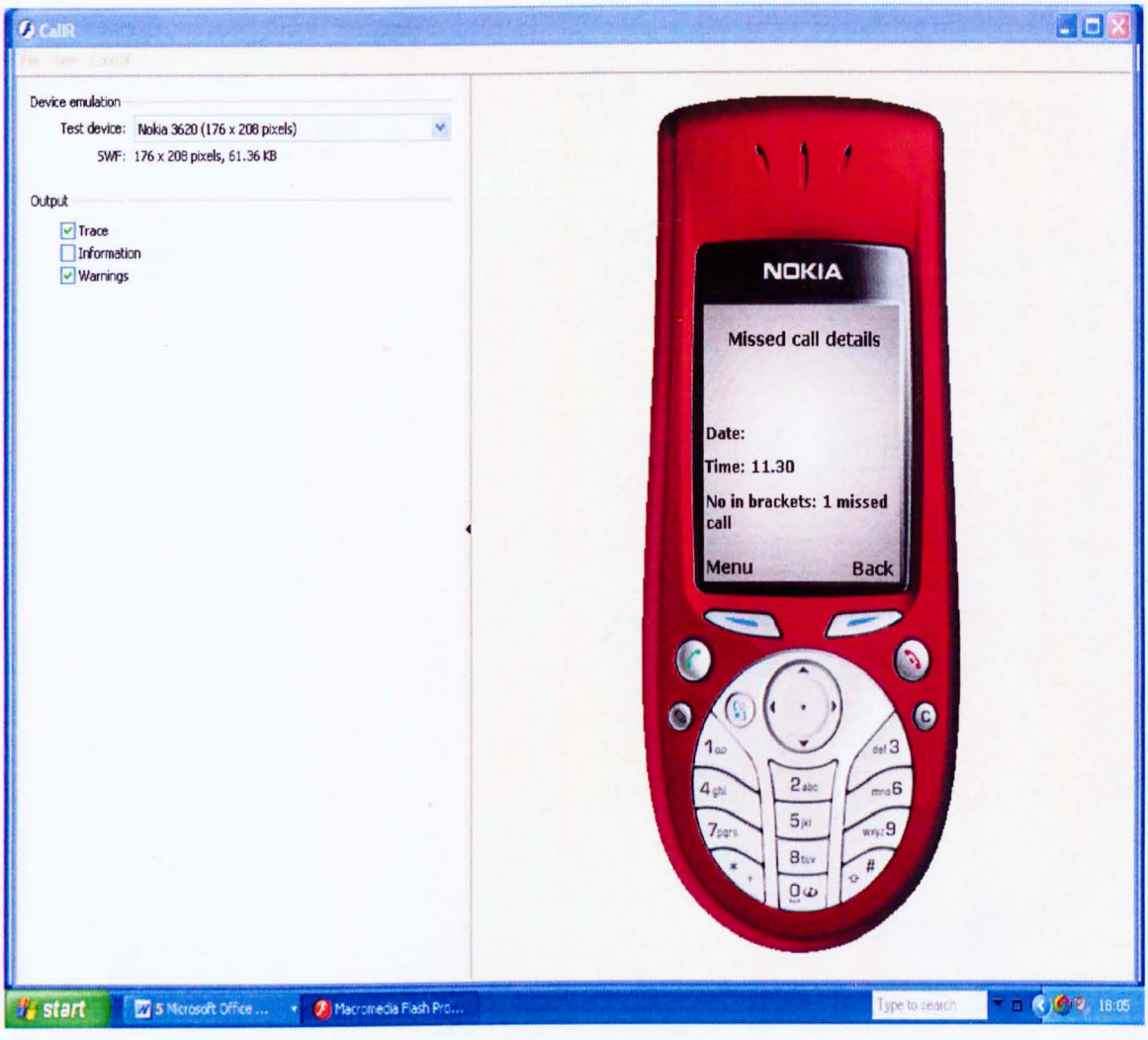


Figure 5.10 Timing of received missed call on IBMCS

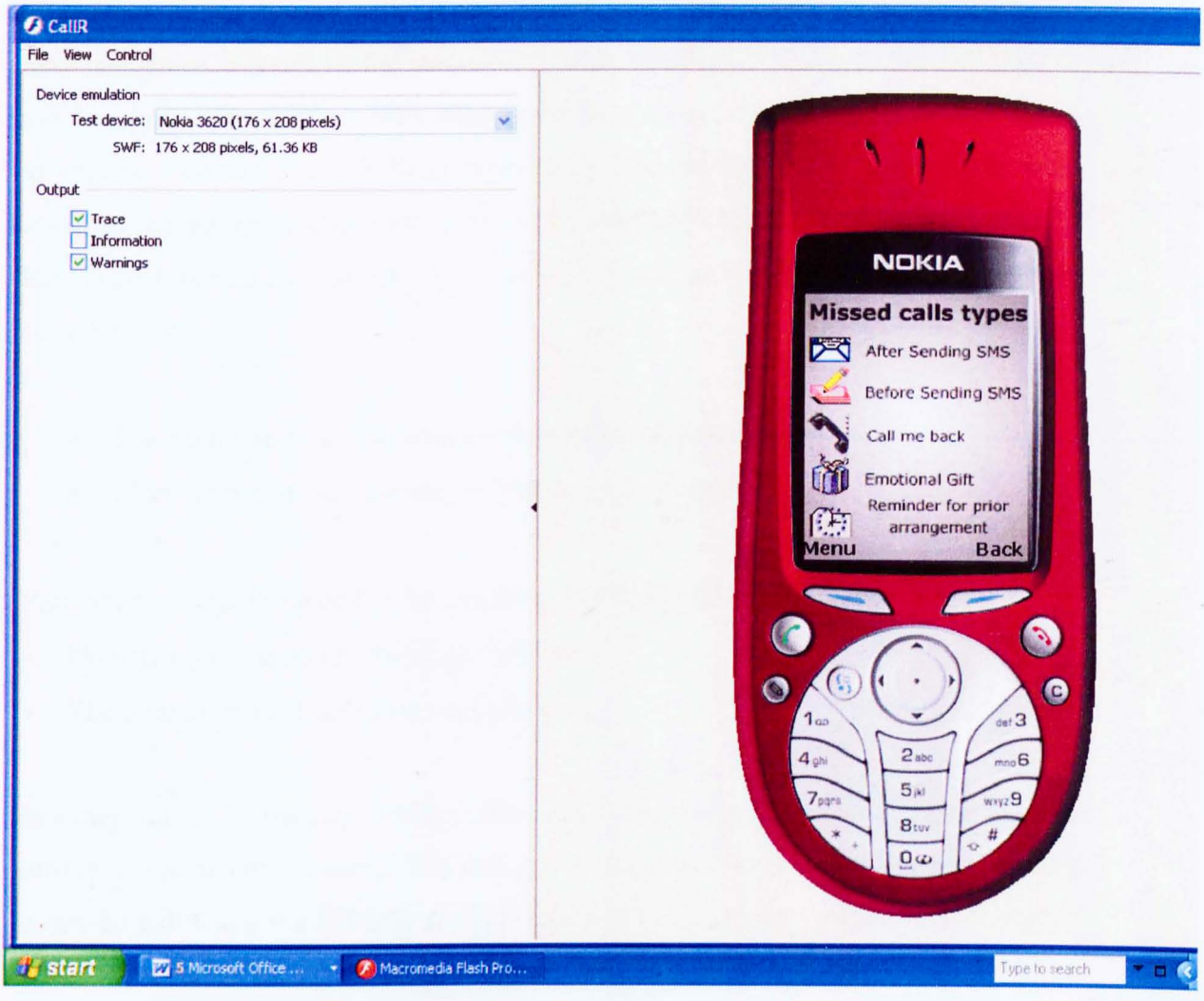


Figure 5.11 Type of missed call on the IBMCS

5.3.4 Procedure

Participants for this study were chosen from an opportunistic sample in both the UK and Sudan. They were briefed about the purpose of the experiment and provided with the task instructions, where each participant was asked to send five types of missed calls. Please (see Appendix 7 for the full list of experimental tasks used in Experiment 2).

The Icon-Based missed call service was developed using Macromedia Flash on a PC then Flash Lite player was installed on the researcher mobile phone to enable the icon-based missed call service to play in the researcher mobile phone. The Icon-Based missed call service was saved in a separate folder and the researcher accessed the icon-based missed call service for each of the participants, then each participant

was given a slide show around the service before taking part in the main experiment these steps were followed with all participants to mitigate for any possible effect that may happen as a result of the participant being familiar with the researcher type of mobile phone. Participants were also shown how to use the researcher mobile phone to receive missed calls. A field experiment was employed and participants were asked to use the researcher mobile phone to send and receive missed calls using the Icon-Based missed call service. Examples of typical tasks participants were asked to complete are:

- Place a missed call that means "Reminder for prior arrangement"
- Place a missed call that means "After sending sms"

Participants were also asked to access their mobile phone log list and find out:

- How many missed calls they had received
- The type of missed calls they had received.

In order to control for any possible order effects participants were randomly divided into two experimental groups. The first group was asked to perform task one (sending a missed call using the IBMCS) and then task two (receiving a missed call using the IBMCS), whereas the second experimental group was asked to perform task two first followed by task one. This is known as a counter balanced order.

Following this, participants were asked to complete the Likert questionnaire after each experimental task. The questionnaire was administered in this way to guarantee that all responses were given immediately after using the service. Finally, participants were interviewed for 45 minutes regarding their experience of using the service.

Participants were informed from the outset that the results of the study would be anonymous and would be able obtainable from the researcher on request.

5.3.5 Data analysis

The statistical tests to be applied to collected data must be decided upon during the planning stage of the study to ensure that the data can be analysed and that this analysis will allow the hypotheses to be either supported or rejected (Breakwell et al., 2000). The primary analysis method used in this study was the Mann-Whitney U-test (using SPSS software).

5.4 Results

In the next section the questionnaire and interview results will be presented.

5.4.1 Questionnaire results

A Mann-Whitney U-test was performed to compare attitudes of the British and the Sudanese towards IBMCS. There was a significant difference found in the attitude of using the new missed call service between the British and the Sudanese in relation to both sending and receiving of missed calls using the IBMCS.

For 'sending', Sudanese participants showed a more positive attitude in many measures in comparison to the British. For example, the likeability measure indicated that Sudanese were more willing to use the IBMCS in comparison to their British counterparts. On the Overall satisfaction measure, the Sudanese also showed more positive attitude towards the service than the British ($U= .000$, $p<0.001$). The result also indicated that Sudanese participants enjoyed using the IBMCS more than their British counterparts ($U=.001$, $p<0.001$).

For 'receiving', the Sudanese were again more enthusiastic about using the IBMCS to receive missed calls than the British. For example, in terms of enjoyability, the Sudanese had a more positive attitudes towards the new service than the British participants ($U=.001$, $p<0.001$). They also had a more positive attitudes than the British in terms of its ease of use ($U=002$, $p<0.001$). Please see Table 5.5 for a summary of the main questionnaire results.

Table 5.5 Users' attitude towards the IBMCS in the UK and Sudan

Theme	Country	N	Mean Rank	Asymp. sig 2-tailed	Sig level
It was easy to use the icon-based missed call service to send a missed call	Sudan	45	45.20	.031	*
	UK	35	34.46		
	Total	80			
I have not enjoyed making a missed call from the icon-based missed call service	Sudan	45	47.87	.001	**
	UK	35	31.03		
	Total	80			
During the process of making a missed call if I make a mistake I recover quickly	Sudan	45	38.64	.408	
	UK	35	42.89		
	Total	80			
Organization of information related to sending a missed call is not clear on the screen.	Sudan	45	44.60	.055	*
	UK	35	35.23		
	Total	80			
I like using the icon-based missed call service to make a missed call	Sudan	45	48.16	.000	***
	UK	35	30.66		
	Total	80			
The icon-based missed call service has not got all the functions I expect it to make a missed call	Sudan	45	45.69	.018	*
	UK	35	33.83		
	Total	80			
Overall, I am satisfied with the icon-based missed call service in relation to making a missed call	Sudan	45	45.73	.008	**
	UK	35	33.77		
	Total	80			
It was easy to use the icon-based missed call service to receive a missed call	Sudan	45	47.01	.002	**
	UK	35	32.13		
	Total	80			
I have not enjoyed receiving a missed call from the icon-based missed call service	Sudan	45	47.17	.001	**
	UK	35	31.93		
	Total	80			
During the process of checking that I have received a missed call if I make a mistake I recover quickly	Sudan	45	43.60	.166	
	UK	35	36.51		
	Total	80			
Organization of information related to receiving a missed call is not clear on the screen.	Sudan	45	43.68	.145	
	UK	35	36.41		
	Total	80			
I like using the icon-based missed call service to receive a missed call	Sudan	45	47.04	.001	**
	UK	35	32.09		
	Total	80			
The icon-based missed call service has not got all the functions I expect it to have.	Sudan	45	42.77	.300	
	UK	35	37.59		
	Total	80			
Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call.	Sudan	45	47.76	.000	***
	UK	35	31.17		
	Total	80			

*P<0.05, **P<0.01, ***P<0.001

The Mann-Whitney U-test also showed a significance difference between type of contract and attitude towards using the IBMCS. Participants on pay as you go contracts indicated a more positive attitude towards the IBMCS in the case of sending and receiving a missed call in comparison with the mobile phone users who have monthly contracts.

For 'sending' missed calls, holders of prepaid contracts enjoyed using the IBMCS more than those with monthly contracts (U=.000, $p < 0.001$). Participants on pay as you go contracts were overall more satisfied 'sending' a missed call through the IBMCS (U=.000, $p<0.001$) than those with monthly contracts. Similarly, mobile phone users on a pay as you go contract were also more satisfied 'receiving' a missed call through the IBMCS than participants with a monthly line contract (U=.000, $p<0.001$).

For 'receiving' missed calls, the results also indicated that those with pay as you go contracts had a more positive attitude towards the IBMCS in the likeability (U= .007, $p<0.01$) and the ease of use measures (U=.017, $p<0.05$) than those with monthly contracts.

It is worth mentioning, though, that most of the Sudanese and the British participants were in pay as you go contracts. Please see Table 5.6 for number of mobile phone users on pay as you go contracts in the UK and the Sudan.

Table 5.6 Sudanese and British mobile phone users in pay as you go and monthly contracts

Group	Pay as you go contract	Monthly contract	Total
British	23	12	35
Sudanese	39	6	45

The Mann-Whitney U-test also indicated that the younger age group (13-20) in the UK enjoyed using the IBMCS more than the other age group (21+). Sudanese participants, however, showed no significant differences between different age groups and their attitudes towards using the IBMCS. Please see Table 5.7 for a summary of results based on age differences.

Table 5.7 Attitudes of different age groups towards the IBMCS

Theme	UK Age Group	N	Mean Rank	Sudan Age Group	N	Mean Rank	Asymp. 2-tailed test	Sig level
It was easy to use the icon-based missed call service to send a missed call	13-20	21	19.88	13-20	30	24.00	.169	
	21+	14	15.18	21+	15	21.00		
	13-20	21	23.10		30	25.27	.000	*** (P<0.001)
I have not enjoyed making a missed call from the icon-based missed call service	21+	14	10.36		15	18.47		
During the process of making a missed call if I make a mistake I recover quickly	13-20	21	19.60		30	22.15	.244	
	21+	14	15.61		15	24.70		
Organization of information related to sending a missed call is not clear on the screen.	13-20	21	20.93		30	22.65	.031	* (P<0.05)
	21+	14	13.61		15	23.70		
I like using the icon-based missed call service to make a missed call	13-20	21	21.36		30	23.15	.014	
The icon-based missed call service has not got all the functions I expect it to have make a missed call	21+	14	12.96		15	22.70		
	21+	14	14.68		15	27.90		
Overall, I am satisfied with the icon-based missed call service in relation to making a missed call	13-20	21	18.88		30	22.68	.512	
	21+	14	16.68		15	23.63		
It was easy to use the icon-based missed call service to receive a missed call	13-20	21	21.60		30	22.40	.008	** (P<0.01)
	21+	14	12.61		15	24.20		
I have not enjoyed receiving a missed call from the icon-based missed call service	13-20	21	21.05		30	22.17	.023	* (P<0.05)
	21+	14	13.43		15	24.67		
During the process of checking if I have received a missed call, if I make a mistake I recover quickly	13-20	21	20.52		30	23.22	.066	
	21+	14	14.21		15	22.57		
Organization of information related to receiving a missed call is not clear on the screen.	13-20	21	20.98		30	22.08	.027	* (P<0.05)
	21+	14	13.54		15	24.83		
I like using the icon-based missed call service to receive a missed call	13-20	21	22.10		30	22.23	.002	** (P<0.01)
	21+	14	11.86		15	24.53		
The icon-based missed call service has not got all the functions I expect it to have.	13-20	21	19.95		30	21.87	.150	
	21+	14	15.07		15	25.27		
Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call.	13-20	21	20.29		30	22.05	.086	
	21+	14	14.57		15	24.90		

The results of this study also indicated no significant differences between the attitudes of British and Sudanese males and females towards the IBMCS.

5.4.1.1 Sudan Results

A Mann-Whitney U-test revealed that Sudanese females had more positive attitude towards the IBMCS than Sudanese males ($U=.007$, $p<0.01$) in the likeability measure. Table 5.8 summarises the main results.

Table 5.8 Differences in attitudes towards the IBMCS between Sudanese males and females

Theme	gender	N	Mean Rank	2 tailed sig level	sig level
It was easy to use the icon-based missed call service to send a missed call	Male	18	19.33	.094	
	Female	27	25.44		
	Total	45			
I have not enjoyed making a missed call using the icon-based missed call service	Male	18	20.22	.163	
	Female	27	24.85		
	Total	45			
During the process of making a missed call if I make a mistake I recover quickly	Male	18	24.14	.628	
	Female	27	22.24		
	Total	45			
Organization of information related to sending a missed call is not clear on the screen.	Male	18	20.33	.212	
	Female	27	24.78		
	Total	45			
I like using the icon-based missed call service to make a missed call	Male	18	18.17	.007	**
	Female	27	26.22		
	Total	45			
The icon-based missed call service has not got all the functions I expect it to make a missed call	Male	18	20.31	.227	
	Female	27	24.80		
	Total	45			
Overall, I am satisfied with the icon-based missed call service in relation to making a missed call	Male	18	20.44	.143	
	Female	27	24.70		
	Total	45			
It was easy to use the icon-based missed call service to receive a missed call	Male	18	23.53	.783	
	Female	27	22.65		
	Total	45			
I have not enjoyed receiving a missed call from the icon-based missed call service	Male	18	19.67	.088	
	Female	27	25.22		
	Total	45			
During the process of checking that I have received a missed call, if I make a mistake I recover quickly	Male	18	24.17	.616	
	Female	27	22.22		
	Total	45			
Organization of information related to receiving a missed call is not clear on the screen.	Male	18	25.64	.235	
	Female	27	21.24		
	Total	45			
I like using the icon-based missed call service to receive a missed call	Male	18	19.72	.078	
	Female	27	25.19		
	Total	45			
The icon-based missed call service has not got all the functions I expect it to have.	Male	18	22.17	.713	
	Female	27	23.56		
	Total	45			
Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call.	Male	18	21.78	.483	
	Female	27	23.81		
	Total	45			

**P<0.01

The results obtained from this study indicated no significant differences between the Sudanese attitudes towards the IBMCS and the type of contract mobile phone users have.

5.4.1.2 UK Results

A Mann-Whitney U-test indicated that British females were more satisfied with using the IBMCS to receive a missed call than British males. Please see Table 5.9 a summary of the main results.

Table 5.9 Differences in attitudes between British males and females towards the IBMCS

Theme	gender	N	Mean Rank	2 tailed sig level	Sig level
It was easy to use the icon-based missed call service to send a missed call	Male	16	17.47	.771	
	Female	19	18.45		
	Total	35			
I have not enjoyed making a missed call using the icon-based missed call service	Male	16	17.38	.733	
	Female	19	18.53		
	Total	35			
During the process of making a missed call if I make a mistake I recover quickly	Male	16	19.84	.312	
	Female	19	16.45		
	Total	35			
Organization of information related to sending a missed call is not clear on the screen.	Male	16	17.91	.959	
	Female	19	18.08		
	Total	35			
I like using the icon-based missed call service to make a missed call	Male	16	15.75	.216	
	Female	19	19.89		
	Total	35			
The icon-based missed call service has not got all the functions I expect it to make a missed call	Male	16	21.06	.093	
	Female	19	15.42		
	Total	35			
Overall, I am satisfied with the icon-based missed call service in relation to making a missed call	Male	16	19.38	.443	
	Female	19	16.84		
	Total	35			
It was easy to use the icon-based missed call service to receive a missed call	Male	16	17.22	.664	
	Female	19	18.66		
	Total	35			
I have not enjoyed receiving a missed call from the icon-based missed call service	Male	16	18.94	.601	
	Female	19	17.21		
	Total	35			
During the process of checking that I have received a missed call if I make a mistake I recover quickly	Male	16	17.53	.798	
	Female	19	18.39		
	Total	35			
Organization of information related to receiving a missed call is not clear on the screen.	Male	16	17.66	.848	
	Female	19	18.29		
	Total	35			
I like using the icon-based missed call service to receive a missed call	Male	16	18.50	.780	
	Female	19	17.58		
	Total	35			
The icon-based missed call service has not got all the functions I expect it to have.	Male	16	21.22	.075	
	Female	19	15.29		
	Total	35			
Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call.	Male	16	19.94	.27	* (P<0.05)
	Female	19	16.37		
	Total	35			

The Mann-Whitney U-test revealed a significance differences between the type of contract and the attitudes of the British participants towards using the IBMCS. British participants on pay as you go contracts were found to be more enthusiastic about the IBMCS than mobile phone users on monthly line contracts in the case of sending and receiving missed calls. For example, in the 'sending' procedure British participants in pre-paid contract indicated a more positive attitude towards the IBMCS on the likeability ($U=.005$, $P<0.01$), expected functions from the service ($U=.008$, $p<0.01$), and overall satisfaction ($U=.007$, $p<0.01$).

For 'receiving', pre-paid users also showed a more positive attitude in relation to the likeability measure and the overall satisfaction ($U=.035$, $p<0.05$) and the overall satisfaction ($U=.26$, $p<0.05$). Table 5.10 summarises the main results.

Table 5.10 Differences in attitude of British mobile phone users towards the IBMCS by type of contract

Theme	Type of contract	N	Mean Rank	Asymp 2 tailed test	Sig level
It was easy to use the icon-based missed call service to send a missed call.	Monthly	12	14.25	.106	
	Pre paid	23	19.96		
	Total	35			
I have not enjoyed making a missed call using the icon-based missed call service.	Monthly	12	13.54	.056	
	Pre paid	23	20.33		
	Total	35			
During the process of making a missed call if I make a mistake I recover quickly.	Monthly	12	15.50	.281	
	Pre paid	23	19.30		
	Total	35			
Organization of information related to sending a missed call is not clear on the screen.	Monthly	12	15.46	.269	
	Pre paid	23	19.33		
	Total	35			
I like using the icon-based missed call service to make a missed call.	Monthly	12	11.54	.005	**
	Pre paid	23	21.37		
	Total	35			
The icon-based missed call service has not got all the functions I expect it to make a missed call.	Monthly	12	11.83	.008	**
	Pre paid	23	21.22		
	Total	35			
Overall, I am satisfied with the icon-based missed call service in relation to making a missed call.	Monthly	12	11.88	.007	**
	Pre paid	23	21.20		
	Total	35			
It was easy to use the icon-based missed call service to receive a missed call.	Monthly	12	15.50	.274	
	Pre paid	23	19.30		
	Total	35			
I have not enjoyed receiving a missed call from the icon-based missed call service.	Monthly	12	15.33	.242	
	Pre paid	23	19.39		
	Total	35			
During the process of checking that I have received a missed call if I make a mistake I recover quickly.	Monthly	12	17.08	.694	
	Pre paid	23	18.48		
	Total	35			
Organizations of information related to receiving a missed call is not clear on the screen.	Monthly	12	13.88	.071	
	Pre paid	23	20.15		
	Total	35			
I like using the icon-based missed call service to receive a missed call.	Monthly	12	13.21	.035	*
	Pre paid	23	20.50		
	Total	35			
The icon-based missed call service has not got all the functions I expect it to have.	Monthly	12	16.29	.457	
	Pre paid	23	18.89		
	Total	35			
Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call.	Monthly	12	15.50	.26	*
	Pre paid	23	19.30		
	Total	35			

*P<0.05)

**P<0.01

Another result obtained from the questionnaire was identifying the most positive and negative aspects of the IBMCS. The most positive value of the service identified by the British and the Sudanese participants is that it enables users to save time, effort, and cost, as well as being precise and expressive. The British found that the most negative aspect of the service was that users cannot block unwanted missed calls and the message received through the IBMCS cannot be personalised for a specific receiver. Table 5.11 gives a summary of the main results.

Table 5.11 British and Sudanese positive and negative aspects of the IBMCS

Aspects of the developed service	British	Frequency	Sudanese	Frequency
Negative	Limited expressions and feelings are included on the new service.	5	Many clicks are needed to get to the list of icons.	9
	The inability to block unknown or unwanted contacts	3	The new missed call service would only be available in limited handsets.	5
	Not personalised, irritating you keep getting them constantly.	3	Nothing negative about the service.	5
Positive	Saves time, cost, expressive and precise	9	Saves time, cost, expressive and precise.	16
	Adds a personality to the missed calls, helps as a reminder	3	Clarify the meaning of the missed calls.	5
	Excitement and creativity makes it more fun.	3	Encapsulate so many feelings and emotions within it especially the emotional gift.	5

5.4.2 Interview results

Eighty participants were interviewed following the experiment to collect feedback about their views on the IBMCS. These were in-depth interviews, 45 minutes on average, exploring the participants' views on the developed service, and ways in which the service can be further developed to meet users' needs. The purpose of using a semi-structured interview was to keep the content of the interview focused and precise. In order to avoid restricting the participants from freely expressing their views about the experiment, they were given a chance at the end of the interview session to add to or comment on any aspect covered during the whole experiment.

The interview results were complemented with the questionnaire results obtained in the study in relation to participants' attitude towards the IBMCS. According to the interview data, the Sudanese have a more positive attitude towards the IBMCS in

comparison to their British counterparts. Differences between the UK and the Sudan respondents are even sharper with respect to the ways the new missed call service has helped them. For example, Sudanese participants believed that the new service helped them to stay connected with each other where British perceived the new missed call as a fun way of communication.

5.4.2.1 Agreed advantages of the IBMCS identified by British and Sudanese participants

1. **Cost effective**

   Clearly, the rationale for using the missed call generally has strong economic connotations; this was mentioned by the interviewees in both countries when describing the advantages of the missed call system. As one of interviewee in the UK commented:

"I use the missed call when I don't want to use the phone or sms because of the cost. For example, earlier today I needed to tell my friend that I arrived at the café and I am waiting for him but I did not want to use my credit, so I decided to send him a missed call and I was not sure whether he understood my message or I have to wait forever. Whereas with the IBMCS, the message sent is clearer and is more cost effective than other similar means."

2. **Saves time and effort**

   Both the British and the Sudanese participants found that the IBMCS helps the caller to save time, since the message can be conveyed in a quick and clear way. The caller only needs to select the pre-defined icon and send it, and at the other end, the recipient can capture the intended meaning of the missed call more effectively.

3. **Decrease memory overload**

   Both the British and the Sudanese participants deemed that the IBMCS will decrease the need to remember the agreed code assigned to each of the missed call meanings. On the old missed call service, users needed to have an agreement on meanings for each of the missed calls conveyed. For

example, 1 ring = call me back, 2 rings= meet me at the café, 3 rings =not coming, etc. Both the caller and the recipient need to remember the code. As one of the British interviewees commented:

"I like the new missed call service, it is a good way of putting your message across without the need to worry about whether the receiver will understand it or not. The difficulty with the old missed call system is obviously the need to remember the number of rings we agreed on beforehand to pass on this specific type of message".

Another Sudanese interviewee commented:

"To communicate using the existing missed call service a great deal of memorisation of the agreed code is needed. For example I would need to remember how many rings for the reminder of prior arrangement where in the new service the icon explains it all".

Participants from both cultures found that the IBMCS is more informative and expressive than the old one. They found that the icons are self-explanatory, and therefore there is no need to have pre-arranged code worked out in advance.

4. **The icon-based missed call is more perceptible**

Using the IBMCS, the receiver sees the animated icon on the screen once the phone rings and can easily understand that it is a missed call. The caller feels more able to relax to allow the phone to ring longer without worrying about the call being answered, whereas users of the old missed call service tend to disconnect the call very quickly so the receiver does not misunderstand it. The fact that the new missed call is easily identified by the receiver encourages the caller to allow the mobile phone to ring longer, which in a way makes the missed call more perceptible.

5.4.2.2 Different perceptions between British and Sudanese of the icon-based missed call service

1 <u>Decrease social pressure on the individual</u>

Sudanese participants appreciated the financial implication of the missed call in general, but they also perceived the value of the IBMCS as a clear and acceptable medium of communication that can release some of the social pressure put on the individual as one of the Sudanese participants commented:

"In my community, there are so many occasions and internal family events that the person needs to keep up with, but sometimes, with the fast way of living and other challenges, it is difficult to physically be part of these social interactions. The mobile phone has helped generally to release this pressure but I think the IBMCS will release the pressure even more, especially that the person now can send a clear definite message and, even better, it is cheaper than sms."

Another Sudanese participant added:

"The emotional gift is a great idea to stay in touch with loved ones in an affordable way".

Another perceived added value of the IBMCS in respect to releasing social pressure on the individual is actually related to stress felt by the receiver of the missed call. In the old missed call service, the receiver of the missed call in a monthly contract is expected to assume that all missed calls received are a request for a call back and he/she is expected to respond to these requests, which can sometimes cause 'missed call fatigue' as termed by (Donner, 2005). In the Sudan monthly contract mobile phone users can be easily identified to others by their phone prefix numbers, this special designated number is a desirable status symbol, it shows the prestige and status of the mobile phone owner.

Therefore, Sudanese participants viewed the IBMCS as a way of releasing social obligation to reply for all missed calls, as one of the Sudanese interviewee commented:

"Line contract users will not be obliged to call back for all received missed calls, as the defined icons will enable them to understand the intended meaning of the missed call"

2 **British differentiate between intended and genuine missed call**

British participants deemed that the IBMCS enables the user to differentiate between the 'intended' missed call (that is when the caller hangs up before the recipient can answer the call) and the 'genuine' missed call (that is when the recipient is not available to answer the call) as one of the British interviewees commented:

"*Sometimes you find a list of missed calls that are sent while you are far from your mobile phone. In this instance, it is difficult to know whether it is a genuine missed call or an intended one."*

5.4.2.3 Differences between sms and IBMCS

Another theme that emerged from the interviews was the differentiation participants from both cultures made between the short text message (sms) and the IBMCS. Clearly, the cost issue was the main theme highlighted by the British and the Sudanese.

Using a missed call to convey social messages is more cost effective than using sms. Another aspect was the speed associated with placing a missed call and clarity of the sent missed call message. Understanding the meaning of the missed call will be much quicker than the sms where the user needs to go through the whole text message, as one of the Sudanese interviewees commented:

"You need to read the entire text to understand the meaning of the message where with the missed call just one quick scan at the screen will be able enough to understand."

The Sudanese and the British teenagers found the missed call with its icons and quick procedure more exciting and fun than the sms.

One of the views expressed by the British interviewees in relation to the differences between the sms and the new missed call service is that the sms is more personal and special. In addition, the sms allows a wider spectrum of emotions and expressions to be included. One of the Sudanese interviewees commented:

"When using the missed call you will only select from pre-set icons but with the sms you can put across unlimited set of meanings and emotions".

British teenagers indicated that the IBMCS is a more fun mode of communication than the sms. However, they appreciated the sms is more informative and valuable medium of communication, as one of the interviewees stated:

"The new missed call is unique and distinctive but I considered it as a fun way of communication. I would prefer to use sms for more formal communication".

"I like the new missed call as it is more fun and different from what is already available out there. I think the new missed call will have the same success as the sms as it brings out another unique feature."

Sudanese participants found that the IBMCS can be useful for those who are illiterate, as the IBMCS is easy to learn and simple to use, unlike the sms which requires users to be literate.

5.4.2.4 Comparing value of sms and icon-based missed call as an emotional gift

The value of the IBMCS as an emotional gift is less appreciated among British participants. They deemed that the value of the missed call as an emotional gift wears away quicker as it costs less, it is not personal and not many emotions can be embraced within it as one of the interviewee commented:

"I think people who use the missed call as an emotional gift are slightly stingy and lazy".

In contrast, Sudanese participants were found to appreciate the value of the missed call as an emotional gift, as it enables them to communicate with a larger group of

people in a more cost effective way. In addition, Sudanese participants deemed that the new missed call will solve the problem of the limited characters related to the sms. As one of the interviewees commented:

"The emotional gift can encapsulate a broad range of feelings and messages. Sometimes, it can be more informative because it saves your having to type so many words and dealing with the limitation of the 160 characters".

Both the British and the Sudanese believe the new missed call can be a substitute for the sms in certain circumstances.

"The new missed call can be very useful if you are driving or even walking down the street".
(UK participant).

"I would choose to send the new missed call to remind a colleague of a lecture or a meeting rather than texting, as it is quicker and requires less attention from the sender"(Sudan participant).

The British and the Sudanese felt that the new missed call can be a substitute for the sms when there is a network congestion as one of the British interviewees commented:

"I think the missed call would be helpful in crisis or busy times. For example, during the London bombing it would have been useful to send a missed call if the sms route was busy".

The Sudanese interviewees identified another reason for using the IBMCS instead of the sms in cases when the caller wants to transmit a quick message but is not interested in starting a chain of text messages with the recipient.

5.4.2.5 Differences between IBMCS and Multimedia messaging Service (MMS)

Both the British and the Sudanese agreed that the MMS is different from the new missed call. The MMS has a vast set of meanings and multi-input methods i.e. text, sound. British participants emphasised the high cost of the MMS, but they also felt that the increased cost of the MMS gives it more valuable effect when received. One of the British interviewees mentioned:

"I will be happy to get MMS as they are not sent out regularly because they are costly, and this makes them special".

Interviewees in both cultures felt that there is no need to share viewing the missed call icons among friends, as the participants felt that everyone would have them and not be excited about receiving them. As one of the Sudanese interviewee commented:

"I will not be excited to share one of the missed call icons with my friends like in sms. Since that, everyone would have the same missed call icons built into their mobile phones."

5.4.2.6 Use of IBMCS in public places

British males and females and Sudanese males were comfortable using the new missed call system in café, public transport, and when walking down the street. One of the Sudanese male interviewees commented:

"The new missed call service is acceptable to be used on public places as it needs less time and attention from the user in comparison with the sms and the phone call."

One of the British females stated:

"I will be happy using the IBMCS to make and receive missed calls while I am in public places, and it will be more useful in public transport where you can use it to kill time."

The Sudanese females however had different views, as one of the interviewees mentioned:

"I do not like using my mobile phone in public places, especially public transport, as it would attract bystanders' attention and it is not safe as well. I think receiving an (emotional gift) in public transport can be uncomfortable when people are sitting so close to you."

"I suggest the number of the sender does not appear automatically in the second screen, as this may invade your privacy."

5.4.2.7 Impact of the IBMCS on communication

The majority of the Sudanese interviewees felt that the IBMCS will enhance communication as it will widen their circle of contacts, since the cost of keeping in contact will decrease. Sudanese participants felt that they could use the IBMCS with groups from their inner and outer social circles. The IBMCS may have a positive impact on the communication as it may encourage a new group of users like older people (who were not part of the missed call ritual before) to feel more confident and relaxed about using the service to convey their messages. Sudanese participants felt that the IBMCS will enhance communication in general as it is considered an activator of communication, whether it is a phone call, sms or face-to-face communication. This was highlighted by one of the participants as follows:

"The new service improves communication generally since it will be followed by further kinds of communication such as phone calls, sms or even, sometimes, you might choose to meet the caller."

In contrast, British participants deemed that they will only use the IBMCS with their close friends and family members. Therefore they felt that the new service will decrease communication, since it embraces less emotion and feeling and does not allow an ongoing dialogue like the sms does. It is not a starter of a conversation; on the contrary, it is a completer of further talks. This was highlighted by one of the British interviewees, as follows:

"I can not send a chain of a missed calls to the same person, as there is nothing much to say on it".

British participants also felt that the IBMCS will not enhance communication because the service will not last for long. They feel it will be a great fun at the beginning, but once it goes beyond the novelty phase it may prove to be of less value. One of the interviewees summarised this as follows:

"I think it will fade away quickly just exactly like the MMS or any one of the developed tools."

5.4.2.8 Assigning ring tone to convey meaning of missed call icon

The British interviewees and some of the Sudanese males were positive about assigning a ring tone that conveys the meaning of the missed call. However, Sudanese females were not comfortable having such a facility as it can be quite invasive and disturbing. One of the Sudanese females commented:

"I will not be happy to receive a missed call with the voice conveying the meaning of the message in public places or even at home. It can be very embarrassing"

5.4.2.9 Perception of icons used by IBMCS

British participants deemed that most of the icons used to represent the missed call meanings in the IBMCS were suitable and there was no need to change any of the icons. However, they were against the use of the emotional gift missed call in particular, as one of the interviewees commented:

"There is no need to have the emotional gift; it is a cheap way of thinking of someone. I think if I get one of them, I will be quite offended".

Sudanese participants however, liked some of the icons but enthusiastically suggested new icons and proposed further icons to be added to the system. Some of the suggestions are summarised in Table 5.12.

Table 5.12 Sudanese suggestions for improvement of IBMCS

Missed call type	Sudanese suggestions
After sending sms	*"I do not think the 'after sending sms' icon is clear. I suggest you replace it with a bird that is carrying an envelope in its beak"*
Before sending sms	*"You can replace the 'before sending sms' icon with an icon that means 'where are you' or 'are you online'? This can be represented by a spider net".*
Emotional gift	*"I like the emotional gift (EG) icon, but I suggest you add another one for a special person and this can be represented by a heart or a red flower".*
Other icons	*"'Call me back urgently', and this can be shown by a red light bulb* *A missed call that requests a' balance transfer', or 'I do not have credit' this can be represented by a begging hand.* *'Happy birthday' can be shown by cake and candle* *'I am thinking of you' can be represented by a cloud over your head and a face inside the cloud* *'Happy religious day' this can be represented by symbols that are associated with each one of the religions* *'I am late for set appointment' represented by a watch or a bus* *'Hello' can be represented by a waving hand* *'Who are you'? Can be represented by a question mark symbol".*

A number of the Sudanese participants would like to have had a blank icon to be able to design their own icons, as there is sometimes a need for new missed call type to be defined, depending on circumstances surrounding them. For example, participants felt that they may need to send a missed call to one of their friends requesting him/her to open the front door since the friend decided to turn up without a prior arrangement. Another example is to give the recipient a positive or negative quick message like "Yes, I have got the job" or "No I have not got it or perhaps, "done it".

5.5 Discussion

The quantitative and qualitative results obtained from this study highlighted the importance of missed call rituals as a developed mode of communication that facilitates social interaction. The IBMCS seems to offer users a unique form of mobile phone interaction, possibly one that is not offered by phone calls or text messages.

Based on the results obtained from this study, the IBMCS appeared to decrease the ambiguity related to the meaning of the missed calls in both cultures. The IBMCS appeared to offer them the prospect of communicating with their social group in a less obscure mode. In addition, the transparency related to the new missed call service has managed, to some extent, to match the intention of the sender and the interpretation of the recipient. In other words, it provides the sender with a clearer idea of how the recipient would perceive the missed call.

The Sudanese were found to be more positive about enjoying and using the new service than the UK participants. Measuring these results against Hofstede's typology (1980), the enthusiasm of the Sudanese towards the new service can be looked at through their collectivistic way of living, where they are expected to look after each other, and naturally the individual is required to stay connected with the group and give them priority over him/herself. Apparently, the IBMCS facilitates this expected communication between the individual and the group. The IBMCS offers users the chance to send recipients special thoughts at festivals and on different social occasions. These messages release some of the pressures on the individual to stay connected with his or her social network without enervating their financial status.

Interestingly, British teenagers were more positive about the IBMCS than older participants. The attitude of British teenagers coincides with teenagers' attitude towards other technical features such as sms. Teenagers are pioneers in the sms practice and they are also still heavy users (Ling, 2004). British teenagers' attitude towards the IBMCS might have financial roots, since that teenagers are financially dependent on their families and they need to budget for their mobile phone communication. Therefore they embrace technical mobile phone communication features that cost less.

Another dimension of Hofstede's model is power distance. Hofstede found that countries which have low power distance are expected to have higher growth for domestic product per capita, and consequently individuals are high earners, this may rationalise British willingness to bear the cost of phone calls or sms. In contrast, people in high power distance cultures like the Sudan are low earners, which perhaps influence Sudanese participants to use a more cost effective mode of communication to support their social interaction.

Female participants in the Sudan appeared to like using the IBMCS more than Sudanese males; British females also had a more significantly positive attitude towards the new service than their male counterparts. This result agreed with females' attitude in general towards a similar service such as sms. For example, in Finland, Rautiainen and Kasesniemi (2000) found women to be heavier users of sms than men. A similar result was reported in Norway by Ling (2004), where women were reported as sending more sms on a daily basis than men.

Ling found that women use sms for immediate practical coordination and for emotional issues. Therefore, female attitudes towards the IBMCS are consistent with female attitudes towards sms. Perhaps the IBMCS enables women to practise their nurturing emotional support as well as the practical coordination aspect of using mobile communication.

5.5.1 Differences between sms/mms and IBMCS

Both the British and the Sudanese identified differences between the sms and the new missed call service. The Sudanese appreciated the ability of the new missed call service in conveying social meanings using the icons. The Sudanese also perceived the new service as a better channel of communication in comparison with the sms in terms of cost, time, effort, as well as the ability of the new service to provide pre-defined messages in a more creative and fun style. Sudanese participants also deemed that the IBMCS can solve the problem they experience when using sms. Based on the previous study reported in this thesis, Sudanese participants were found to prefer writing long text messages that actually exceed the maximum number of characters on sms. For example, the maximum limit of the sms is 160 characters, but in Arabic it is

only the equivalent of around 78 characters. Therefore, a single message might need to be sent in 2-3 different sms.

The other problem Sudanese encounter with texting is related to mobile phones that do not have comprehensive support for the Arabic language, and the Arabic alphabet may be absent on the keypad, or the software may not support it. As a result, writing a text message may require memorisation or a workaround texting, and thus they perceive the new missed call service as more of a simple and clear way of communication.

On the other hand, British users, especially teenagers, perceived the IBMCS as a pleasant and fun mode of interaction, and consider it as an entertaining way to socialise with other teenagers. However, sms was still considered to be a more effective way of transmitting 'proper' messages.

British users appeared to appreciate the value of the sms as an emotional gift more than the value of the IBMCS in respect to the emotional side.

Whereas Sudanese users appeared to appreciate both the sms and the IBMCS, it appeared that British participants' appreciation of the sms as an emotional gift is closely related to the cost element. Sending sms as an emotional gift will probably cost more than sending a missed call. Therefore, the cost encountered augments the value of the sms. In contrast, the Sudanese participants are aware of the cost implication, but due to their financial limitations, they escalated the value of the missed call as an emotional gift to match that of the sms.

Another theme that emerged from the results of this study is that participants from both cultures differentiated between the icon-based missed call and multi media messages (MMS). Although they appreciated that the IBMCS has the ability to use an image to convey certain messages similar to the MMS, it has this unique feature of implicitly explaining the meaning of icons and the purpose of the call in a similar way to the sms, thus eliminating ambiguity levels.

Sudanese participants deemed that the IBMCS is better than both the mms and the sms in respect of the cost, time, effort as well as the ability to provide more defined messages. British participants however, preferred the MMS over the icon-based missed call service in respect to its economic value. They appreciated the MMS more than the icon-based missed call service as it cost more, which adds to its value as a gift (Taylor, 2003). British participants also felt that MMS are more defined and personal than the missed calls icons.

5.5.2 Impact of IBMCS on communication

British and Sudanese participants' views about the impact of the IBMCS in enhancing communication were generally divergent. Sudanese participants deemed the new missed call service to be a communication measure that will enable users to maintain familial and social bonds with their social network. Sudanese participants suggested that they can use the IBMCS with contacts from their inner social circle as well as with those who are from their outer circle. This regular cost-effective communication will certainly have a positive impact on enhancing communication and nurturing social relationships. Sudanese participants believed that in the absence of the IBMCS, perhaps the communication of groups outside an individual's inner circle will not be as often and regular as it would be with the service.

Another justification offered by the Sudanese in relation to the positive impact of the IBMCS on communication was related to the ability of the service to include part of the population that were unintentionally excluded from the sms due to their illiteracy. Sudanese participants also felt that in most of the missed calls sent by the IBMCS a sort of communication will take place; they perceived the IBMCS as an activator for imminent communication. For example, in the case of 'reminder for prior arrangement' it is most likely that a face-to-face meeting will follow. In the instance of 'call me back' the request will probably result in a voice conversation, in the 'emotional gift' case the least expected reply is another missed call, but it can lead to a face-to-face meeting or telephone conversation. In the other two types of missed call 'before sending sms/after sending sms', once again kinds of connection, such as sms, could occur.

In contrast, British participants underlined the negative impact of the IBMCS on communication. They felt that the IBMCS enables people to communicate but in a less emotional, personal and valuable way which ultimately will decrease the overall level of personal communication. Although British teenagers deemed the IBMCS as a fun and entertaining type of interaction that can facilitate an amusing style of social interaction, they felt it was not suitable for ongoing conversations. It can only be useful to transmit fragment of information but not ideal for a proper dialogue.

5.5.3 Use of IBMCS in Public Place

Sudanese females were found to be less comfortable using the IBMCS in public places in comparison to British females and males and Sudanese males. Although Sudanese females appreciated that the new service requires less attention from the user; they were not relaxed about attracting any attention to themselves especially in public places. This attitude may have cultural roots as Sudanese females are expected to keep a low profile and deflect attention from themselves and such a service can attract attention to the individual. Sudanese male participants perceived the IBMCS as a mode of communication that helps to maintain 'real space' relationships with distant friends. At the same time, it is a quick procedure that requires less attention from the user than the sms, therefore the IBMCS enables users to maintain personal communication with their contacts. Users of the IBMCS can communicate swiftly with remote partners and yet sustain their contact with physical partners; therefore they were happy to use the service in public places.

British males were more comfortable using the IBMCS in public places than Sudanese females. In relation to this, British males felt that it can be quite useful mobile phone communication feature to kill empty time and to stay in touch with friends. They deemed that the new service will enable users to communicate in discrete style without disturbing bystanders.

5.5.4 Customisation of IBMCS

The British and the Sudanese males were in favour of personalising the missed call service by assigning ring tones to convey the meaning of the missed call icons. The Sudanese females were less comfortable about adding a ring tone that explains the

meaning of the missed call, as they felt that such a feature could cause them to be embarrassed and attract more attention to themselves, especially in public places.

Sudanese participants were enthusiastic about the IBMCS and they suggested adapting the service to meet their social and cultural needs. For example, Sudanese participants enthusiastically suggested adding further icons for different social occasions such as birthdays, whereas British participants felt that for birthday occasions a missed call will not be acceptable. This attitude reflects clear cultural differences between two countries. In the Sudan, birthday occasions are not as popular and as widely celebrated as in the UK therefore British participants felt that a missed call will not be acceptable in the UK. However, Sudanese felt that the missed call icon will be enough and valued for such an uncommonly celebrated occasion.

Sudanese participants also suggested adding further icons to the emotional gift missed call as it helps the individual to maintain social ties with their social groups. British participants, however, suggested removing the emotional gift icon from the service, since it is not a valuable way of communication. Sudanese participants suggested replacing the before sending sms icon and after sending sms with more emotional gift icons.

Interestingly, the Sudanese participants suggested having a blank box for missed calls that are not defined on the IBMCS. This blank box can be used to convey different meanings, depending on the social relationship and the context of the missed call. Having the blank box undefined returns the missed call to its previous definition as a message of restricted code (Donner, 2005).

5.6 Chapter summary

The rationale for using the missed call has unmistaken economic and financial connotations. Perhaps it is also linked with poor telecommunications infrastructure in countries such as Sudan. However, diversity in the practice of the missed call and differences in users' perception of the icon-based missed call between the two cultures imply that the conventions of the missed call are perhaps shaped by cultural differences. For example, the British perceived the IBMCS as an entertaining mode

of communication to fill empty times, whereas the Sudanese, with their limited financial resources tied in with their social and cultural obligations, perceived the new missed call service as an appealing channel of communication that supports their personal and business communication needs. The Sudanese actually sought further solutions to maximise their communication opportunities and to develop a more sophisticated missed call service that satisfies more personal communication needs. This aspect will be explored in more detail in the next phase of the research work reported in this thesis.

Chapter 6

Personalization (Customisation) of the Icon-Based Missed call Service (IBMCS) in the Sudan

6.1 Introduction

Experiments 1 and 2 have indicated that the use of the mobile phone missed calls phenomena is evident in the two contrasting cultures of the UK and the Sudan. The two previous experiments indicated that in these countries there are clear differences in the uses and the applications of missed calls which perhaps can be related to cultural differences. In Experiment 2, the results indicated that the IBMCS has improved the clarity and the interpretation of missed calls conveyed, especially in comparison with the old missed call service.

Sudanese participants were found to be more positive about the IBMCS than their British counterparts. However, Sudanese participants suggested that further changes and modifications needed to be added to the IBMCS so it can tie in with users' personal needs.

Results from Experiment 2 also indicated that certain missed call types are more popular than others. For example, the most popular missed calls are those that mean 'call me back', 'reminder for a prior arrangement', and serve as an 'emotional gift'. Participants suggested substituting the less used missed call types such as 'before sending sms' and 'after sending sms' with more needed missed call types such as 'I do not have credit', ' I am late'. The results also indicated that participants wanted a missed call type that is blank or empty and has no message assigned to it so the user can use it for personal uses.

In addition, the results obtained from Sudanese participants in Experiment 2 suggested that the success of the IBMCS may be dependent on its ability to meet

users' personal needs. Participants in Experiment 2 suggested changes and ways to personalise the IBMCS as follows:

- In the 'sending state', offer the user the chance to select the desired icon from a list of icons for each one of the missed call types. Previously, the user has had only one option for each.
- Replace some of the missed call types in the IBMCS. For example the 'before' and 'after sending sms' are replaced with 'I am late' and 'I do not have credit' in the personalised service.
- Provide the user with a blank box that is not defined on the system, to enable them to customise it for personal missed call messages.

It was for this reason that Experiment 3, reported in this chapter, sought to customise the IBMCS so it can attempt to match the Sudanese personal needs.

6.1.1 Study Objectives

The main objectives of this study were:

1. To investigate users' perception of the personalised IBMCS.
2. To investigate if there is any gender differences towards the personalised IBMCS.

6.2 Pilot Study

Before the prototype of the personalised icon based missed call service was used for the actual experiment, a pilot study was conducted which involved assigning one participant at a time to use the personalised IBMCS. The pilot study was mainly performed to identify any changes required to the prototype before carrying out the experiment.

The questionnaire that was used in this pilot study to assess users' satisfaction towards the personalised IBMCS is similar to that employed in Experiment 2. This is based on a fully revised version of the Computer System Usability Questionnaire (CSUQ) (Lewis, 1995).

To assess the clarity of the experimental procedure, the length of the questionnaire and the simplicity of the interviews, five other questions were developed:

1. Is it easy to access the icon-based missed call service from the mobile phone main menu?
2. Are the instructions for the experiment understandable?
3. Are the experimental tasks lengthy for sending and receiving missed calls through the personalised icon-based missed call service?
4. Are questions covered in the interview appropriate?
5. Is the wording of the interview clear?

6.2.1 Pilot Participants

10 (5 male and 5 female) Sudanese participants took part in the pilot study, ranging in age from 13 to 33 years old, with average age 20 years. All participants were mobile phone users for 2-7 years.

6.2.2 Pilot Procedure

To make participants familiar with the personalised IBMCS, pilot participants were given a tour around the personalised IBMCS before undertaking the pilot experimental tasks. They were then asked to use the personalised IBMCS to send missed calls that represented:

- Call me back
- Emotional gift

Participants were then asked to use the blank box icon to send a missed call not defined by the personalised IBMCS.

For the receiving of the missed call through the personalised icon-based missed call service, participants were asked to check their log list to find out about the type of missed calls they had received.

Participants were expected to provide information about three types of missed calls (Call me back, Emotional gift, I am late) in regard to the time of the missed call was received and the type of missed call received.

Once participants checked their received missed calls, they were asked to fill in a revised version of the Computer Systems Usability Questionnaire (CSUQ) developed by Lewis (1995) please see Appendix 2. Following this, participants were interviewed, and the semi-structured interview lasted on average for 30 minutes.

6.2.3 Results from the pilot study

Observing participants using the prototype, it was noted that participants were comfortable performing the experimental tasks and used the prototype easily. Data gathered using the fully revised version of the CSUQ indicated that participants were at ease using the personalised IBMCS. Table 6.1 gives a summary of the pilot study main results of the pilot study.

Table 6.1 Pilot respondents' attitudes towards personalised IBMCS

Theme	N	Mean	Std. Deviation
It was easy to use the icon-based missed call service to send a missed call	10	15.00	12.737
I have not enjoyed making a missed call from the icon-based missed call service	10	21.50	6.042
During the process of making a missed call if I make a mistake I recover quickly	10	1.50	.527
Organisation of information related to sending a missed call is not clear on the screen.	10	1.50	.527
I like using the icon-based missed call service to make a missed call	10	1.60	1.897
The icon-based missed call service has not got all the functions I expect it to make a missed call	10	1.80	.422
Overall, I am satisfied with the icon-based missed call service in relation to making a missed call	10	5.80	.789
It was easy to use the icon-based missed call service to receive a missed call	10	4.70	1.567
I have not enjoyed receiving a missed call from the icon-based missed call service	10	6.30	.823
During the process of checking that I have received a missed call if I make a mistake I recover quickly	10	4.80	1.619
Organisation of information related to sending a missed call is not clear on the screen	10	6.60	.699
I like using the icon-based missed call service to receive a missed call	10	2.50	1.269
The icon-based missed call service has not got all the functions I expect it to have.	10	5.70	4.877
Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call.	10	6.30	1.337

Table 6.2 illustrates that 8 of the 10 pilot respondents (80%) found it easy to find their way around the prototype. 9 (90%) respondents found the instructions of the experiment understandable, 8 (80%) found the length of the questionnaire appropriate, and 2 (20%) indicated that 'the sending tasks' were lengthy, while 6 (60%) found that 'the receiving tasks' were lengthy. The responses on the five pilot questions are summarised in Table 6.2 and 6.3.

Table 6.2 Pilot study findings for Experiment 3 (N=10)

Question	Frequency		Percent	
	Yes	No	Yes	No
Is it easy to access the personalised icon-based missed call service from the mobile phone main menu?	8	2	80%	20%
Are the instructions for the experiment understandable?	9	1	%90	10%

Table 6.3 Pilot study results on experimental tasks and interview questions (N=10)

Question	Frequency		Percent	
Are the experimental tasks lengthy for sending and receiving missed calls through the personalised icon-based missed call service?	**For sending missed calls**		**For receiving missed calls**	
	2	8	6	3
Are questions covered in the interview appropriate?	11	1	90%	10%
Is the wording of the interview clear?	11	1	90%	10%

Based on the finding of the pilot study it was decided to make changes for the main experiment:

1. Previously, participants were required to select the desired icons to place only two types of the five defined missed calls. However, it was found that participants were excited about the service and exploring the application, so it was decided to get participants to send all five missed call types in the experiment.

2. Previously, participants were required to receive three missed calls using the personalised IBMCS. But it was found that participants tended to lose interest after viewing the 1-2 received missed call files. Therefore, it was decided that receiving two missed calls was adequate for the purpose of the study.

3. For the sixth type of missed call ("choose your own missed call"), participants were required to use the blank square to convey a missed call message not defined on the personalised IBMCS. The pilot study indicated that participants were excited about using the blank box icon and enthusiastically proposed examples of missed call messages that can be sent using that icon. For example, "Where are you"?

4. Participants found the personalised IBMCS easy to access from the mobile phone main menu, particularly after the initial tour around the service was given. Therefore, no changes were needed.

5. Participants found the instructions for the experimental tasks and the wording of the interview to be clear and easy to understand. Therefore it was decided that interview questions were appropriate for the main study.

6.3 Main experiment

The aim of conducting the main experiment was to examine users' views on the personalised IBMCS, the design of which was based on results obtained from Experiment 2 of this research.

In the personalised IBMCS, the design of the icons used was greatly influenced by users' suggestions in Experiment 2. The missed call that means "create your own missed call" was also one of the main findings in Experiment 2 results.

Sudanese participants in Experiment 2 had a more positive attitude towards the IBMCS than their British counterparts. Sudanese participants enthusiastically proposed ways to personalise the IBMCS which was applied in the design of the personalised version. Therefore, it was decided that the personalised version would be tested only with Sudanese participants.

In this experiment, it was also decided to keep the selection of the same age group that was used in Experiment 2 since they were enthusiastic about the missed call service. The age group used in this experiment was 13-34. This age range was also divided into two groups, the first aged 13-20, and 21-34. The reason for this division was similar to reasons explained in Experiment 2.

6.3.1 Data Collection Methods

For the main experiment, data were collected using the following two methods:

1. Questionnaire
2. Interviews

6.3.1.1 Questionnaire

To collect users' satisfaction towards the personalised IBMCS, the questionnaire used was the same that was used in Experiment 2 which was a fully revised version of the Computer System Usability Questionnaire (CSUQ) developed for IBM by Lewis (1995) the scale of which had a 7-point format with responses ranging from strongly disagree to strongly agree with a neutral mid-point please (see Appendix 2). An example of the format is given in Figure 6.1

I have not enjoyed receiving a missed call from the personalised icon-based missed call service

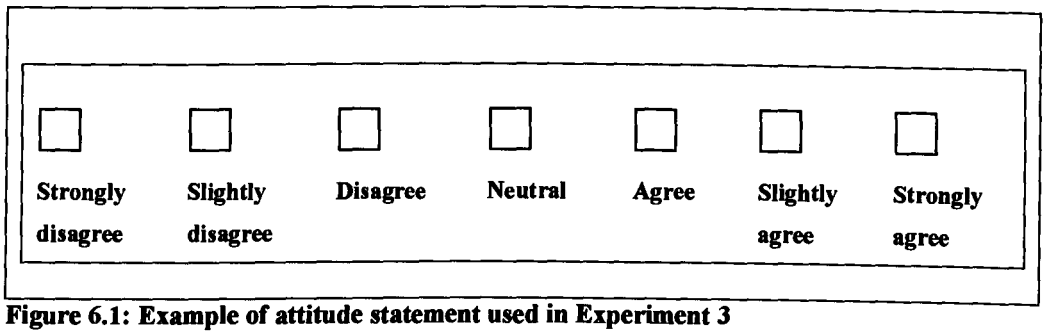


Figure 6.1: Example of attitude statement used in Experiment 3

The aim of using the questionnaire in this study was to ascertain people's perception of using the personalised IBMCS.

The attitude scale had a combination of positive and negative statements in order to control for any possible acquiescence effect from participants when they were completing the questionnaire. The questionnaire was administered at the end of the experimental tasks in relation to sending and receiving missed calls from the personalised IBMCS. Participants responded to the 14 usability statements, with a 7-point response scale ranging from 'strongly disagree to 'strongly agree'. Scores were recoded so that a high score for a factor indicated a positive attitude and a low score a more negative attitude. In order to control for any possible order effects participants were randomly divided into two experimental groups. The first group was asked to perform task one (sending a missed call using the personalised IBMCS) and then task two (receiving a missed call using the personalised IBMCS), whereas the second experimental group was asked to perform task two first followed by task one. This is known as a counter balanced order. Table 6.4 provides a description of each factor.

Table 6.4 Attitude measures for Experiment 3

Measure	Description
Ease of use	How easy it was to use the service to place or receive missed call.
Enjoyability	Whether user found experience of using the new service enjoyable
Recovering from mistakes	Users' opinion about ability to recover from mistakes and amend wrong keypad hits.
Organisation of information on the screen	Degree to which user found information provided and layout of screen clear and systematic.
Likeability	Whether user found service useful and pleasant and whether user would choose to use it again
Expectability	Whether users' conceptual model of service has matched design of service, and whether service has met all expectations of user.
Overall satisfaction	Degree to which user found service useful and satisfying.

In addition to the attitude questionnaire, open-ended and closed questions were also designed to get deeper understanding of richer data about the users' perception of the personalised IBMCS.

6.3.1.2 Interview

The aim of using interviews in this work was to collect information that could shed light on the meaning of the questionnaire data, and to offer the participants the option of explicitly expressing their views about the personalised IBMCS. A semi-structured interview was undertaken with all participants after they completed the questionnaire. The interview lasted for about half an hour (please (see Appendix 6 for the interview questions used in Experiment 3). The main points covered in the interview were:

- Which icon did you choose to send a missed call that means 'call me back'?
- What is your basis for choosing this icon over the others?
- Will the selection of a specific icon be fixed or will you change it from one contact to another?
- If the missed call costs the same as the sms, will you choose to use it and why?
- What suggestions have you to further personalising the application?

All 35 interviews were transcribed verbatim. The interviews transcripts were transcribed in the native language first, and then translated into English. Participants were informed from the outset that the results of the study would be anonymous and that they would be able to obtain the results from the researcher on request.

6.3.2 Sampling

The participants in this study were chosen from an opportunistic sample of Sudanese mobile phone users.

6.3.2.1 Participants

35 Sudanese participants (19 males, 16 females) were recruited from the opportunistic sample to take part in this study, had an age range of 13-34 years old, with an average age of 18 years. All participants were mobile phone users. Experience of mobile phone use ranged from 2 to 5 years. Participants were drawn from a range of educational (graduate and non-graduate) and vocational (professional and non-professional) backgrounds.

6.4 Prototype design and development

Flash 8 Macromedia was used to develop the prototype in a computer-based environment; the application was then run on a mobile phone device using Flash lite, which is a lightweight version of Flash.

6.4.1 Types of missed call used in the personalized IBMCS

The personalised IBMCS was a personalised version of that used in Experiment 2. In the new design, six types of missed calls were defined. Five of the missed call types had a choice of 4 or 5 icons to allow the users to select their preferred icon for each of the missed call types. For the sixth missed call type "choose your own missed call", one blank box icon was displayed: the missed call message is not pre-defined and the user can use the blank icon to send personal missed call messages.

To place a new missed call, the user needs to navigate to the missed call folder; once this folder is accessed, the user can click on the new missed call button to get the six types of missed calls defined on the personalised IBMCS. Figure 6.2 shows missed call types available in the personalised IBMCS.

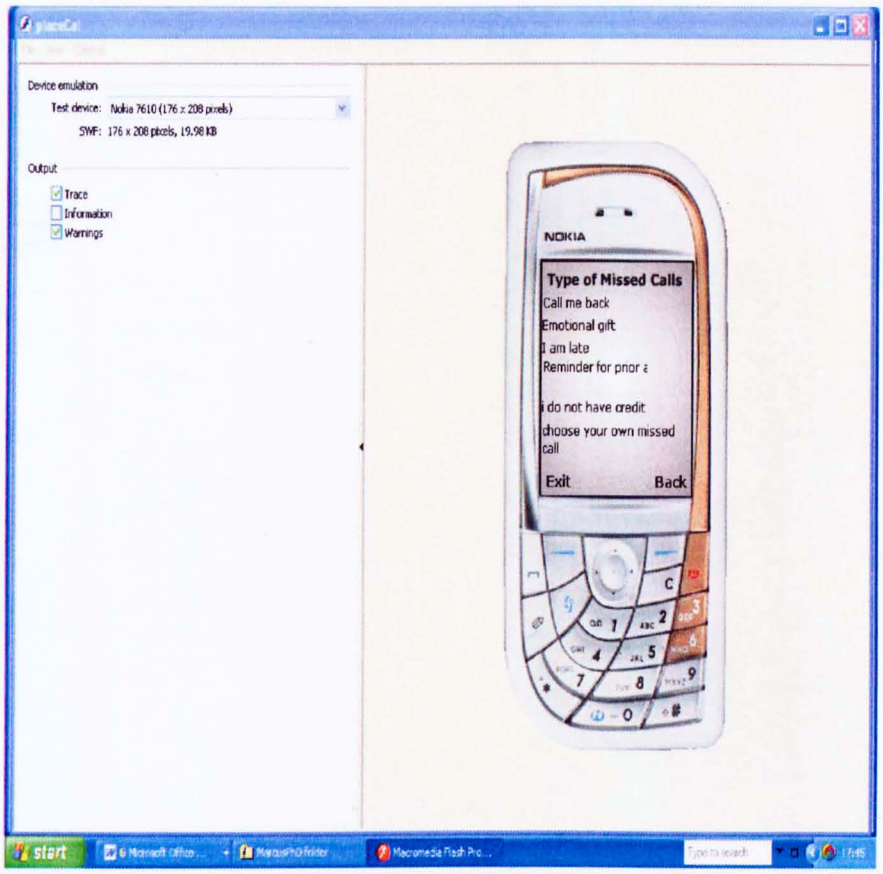


Figure 6.2 Missed call types in personalised IBMCS

6.4.1.1 'Call me back' icons

For each one of the first five missed call types, the user had a choice of icons to choose from to send a missed call. For example, for sending a missed call meaning 'call me back', the sender can select one of the five icons provided by the service. Please see Figure 6.3 for the choices of icons for the missed call meaning 'call me back'.

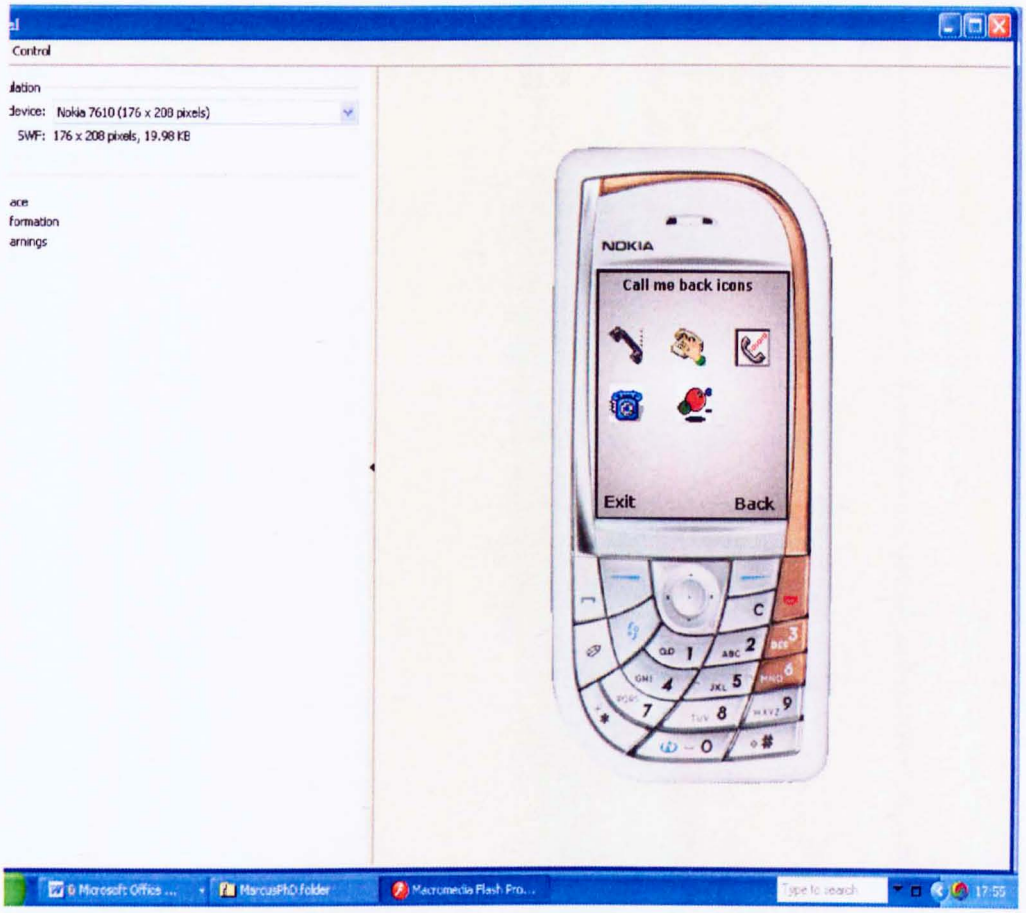


Figure 6.3 Selection of icons for missed calls meaning 'call me back'

6.4.1.2 'Emotional gift' icons

The options available for the user to choose from for the missed call meaning 'emotional gift' can be seen in Figure 6.4.

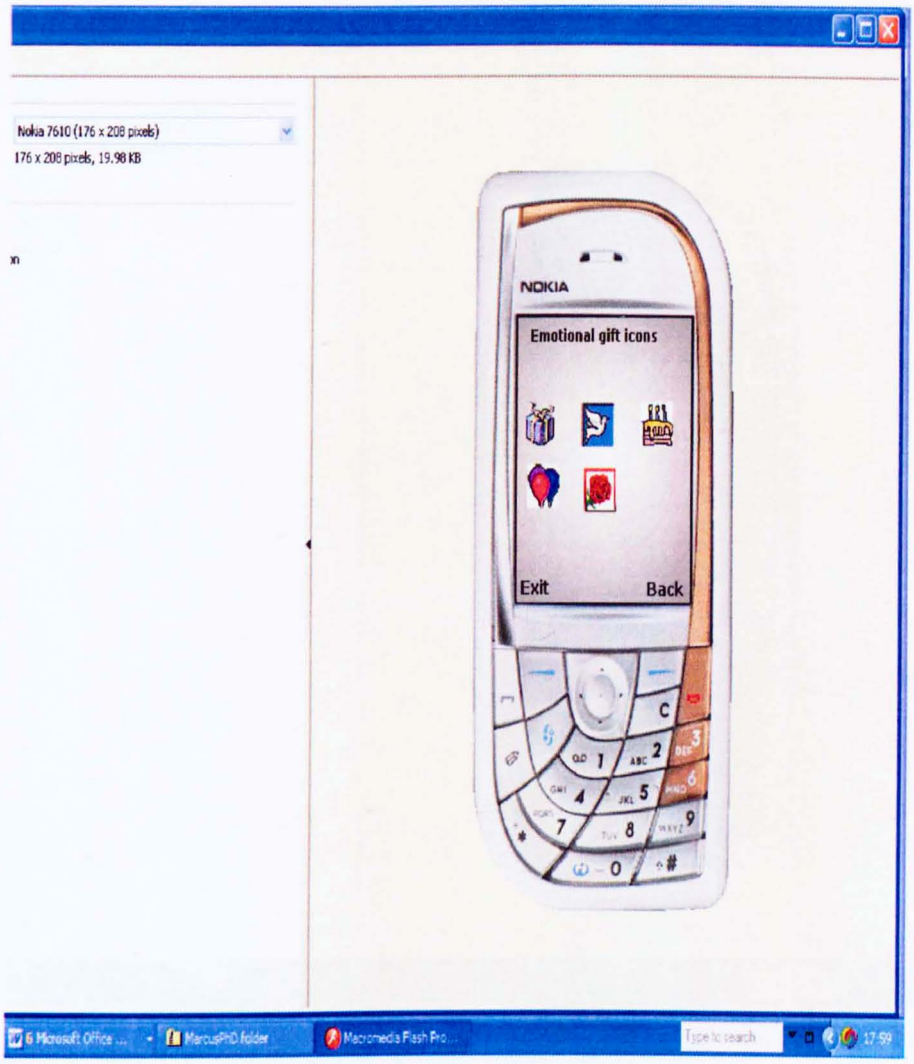


Figure 6.4 Choices of icons for missed call meaning 'emotional gift'

6.4.1.3 'I do not have credit'

For the choice of icons available for the missed call meaning 'I do not have credit', please see Figure 6.5.

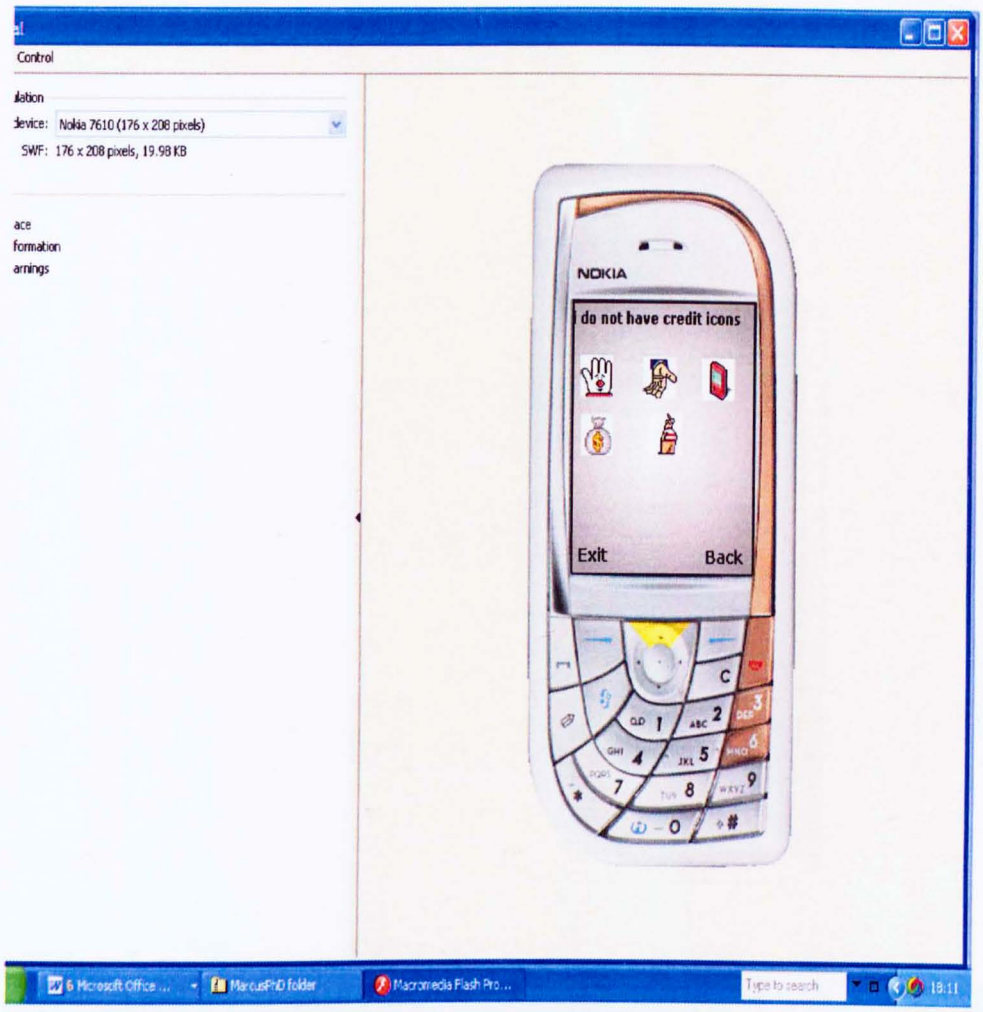


Figure 6.5 choices of icons for missed call that means 'I do not have credit'

6.4.1.4 'Choose your own missed call'

Among the personalised icon-based missed call types, the user has the option of sending a personalised missed call not defined by the missed call service by selecting the type that meaning 'choose your own missed call'. Please see Figure 6.6.

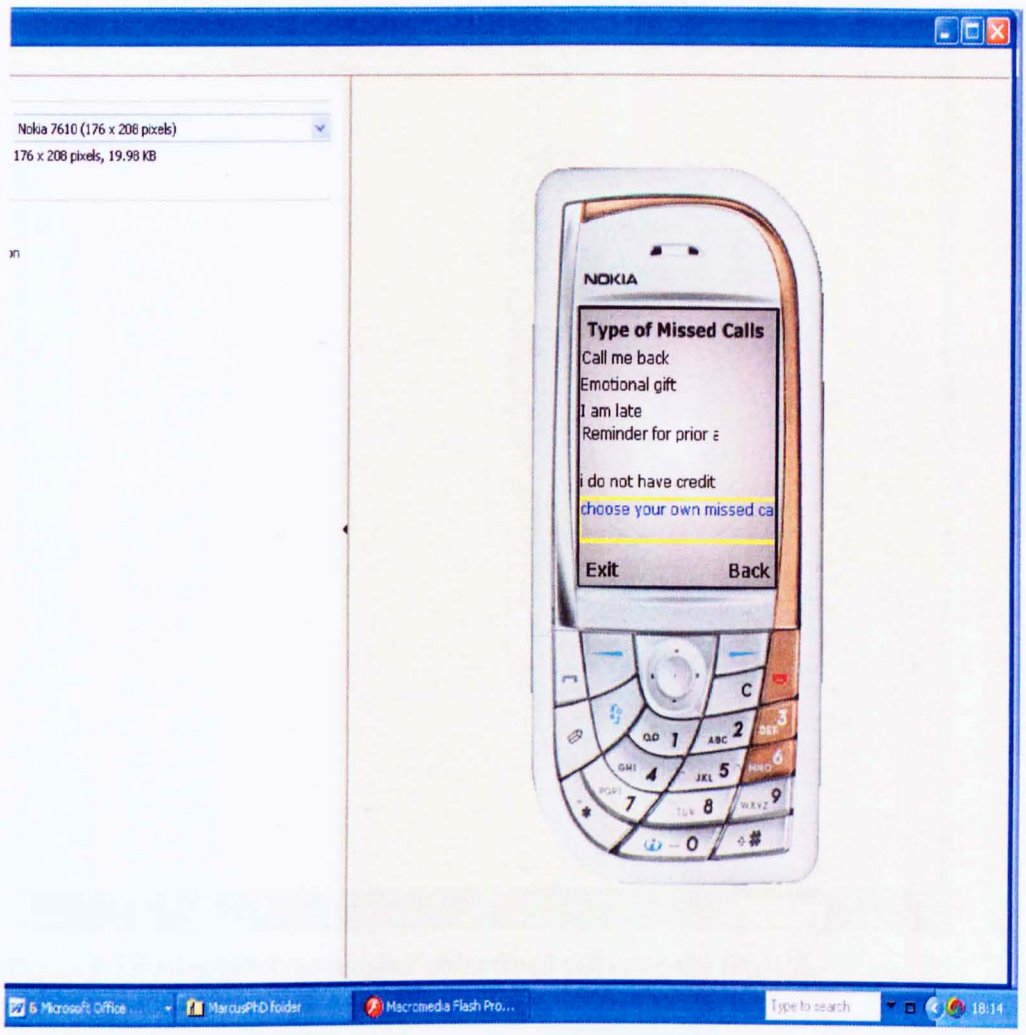


Figure 6.6 Missed call type meaning 'choose your own missed call'

Following this, the user can then click on the blank square icon to convey any missed call message that was not defined on the IBMCS. Please see Figure 6.7 for details of this procedure.

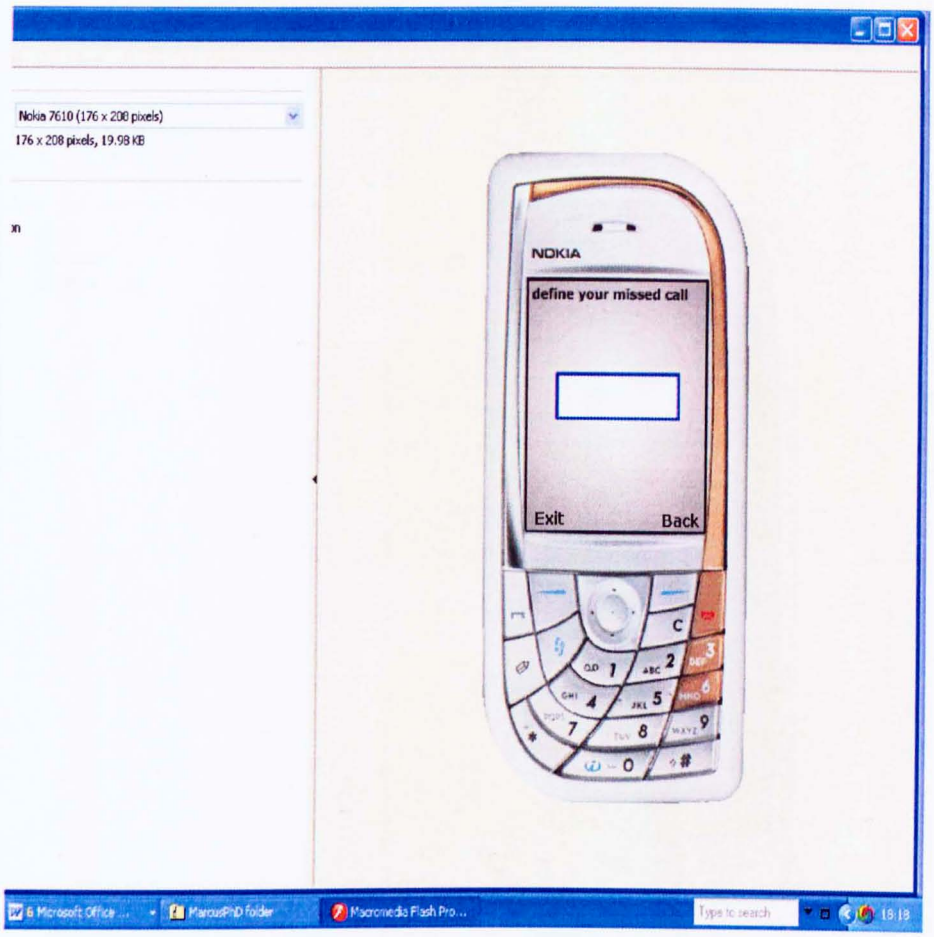


Figure 6.7 Option for choosing your own missed call using the IBMCS

6.4.2 Further step to send a missed call through the personalised IBMCS

For the user to proceed with sending the missed call he/she needs to enter the recipient's phone number.

6.4.2.1 Entering recipient's phone number and sending missed call

Once the caller has decided on the icon for the missed call he/she wants to send he/she has to enter the receiver's contact number and click on send to confirm the selection. Please see Figure 6.8 for details of processing a missed call using the personalised IBMCS.

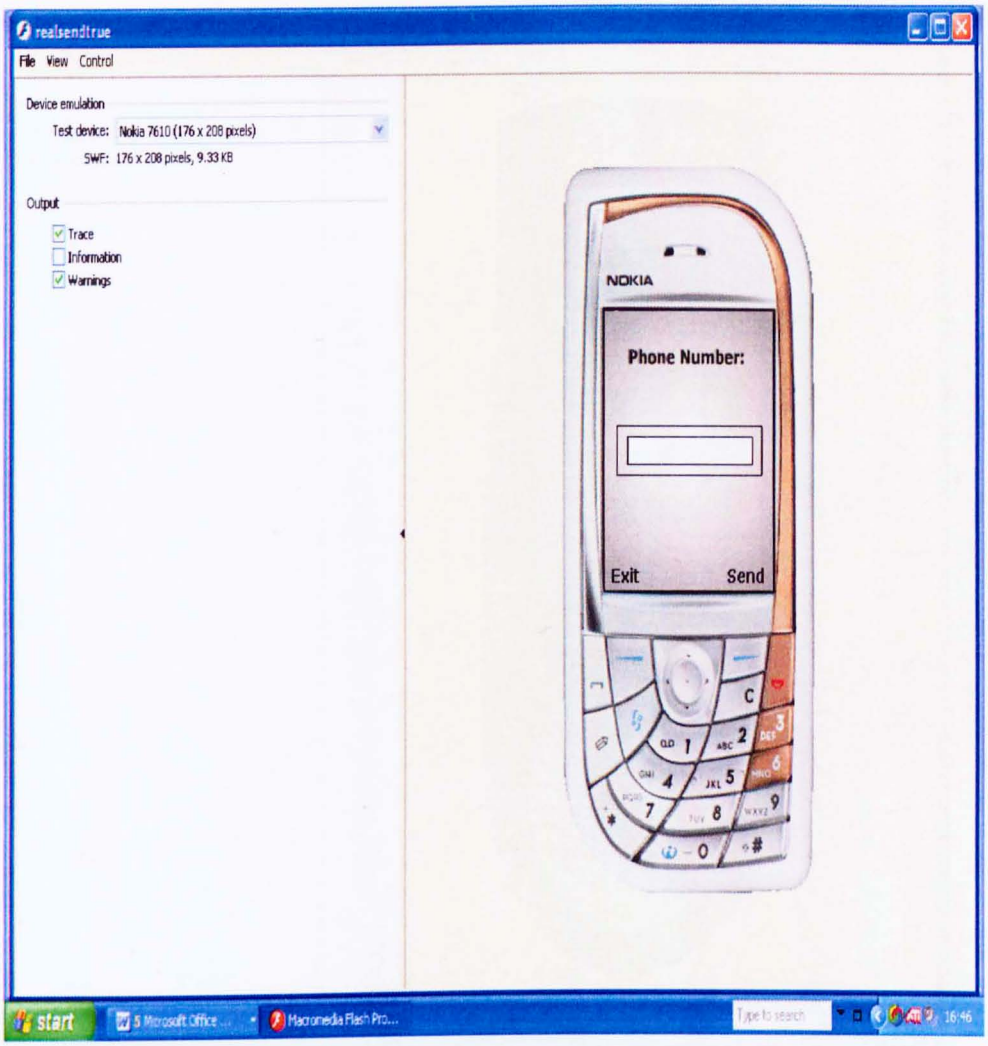


Figure 6.8 Recipient's phone number on IBMCS

6.4.3 Receiving a missed call

Once the missed call is sent using the personalised IBMCS, the recipient of the missed call hears a proper phone call ring and sees an animated icon representing the type of missed call sent. Please see Figure 6.9.

Figure 6.9 Missed call meaning 'emotional gift' received using personalised IBMCS

6.4.3.1 Receiving further information on received missed call

The receiver can click on the 'option' button to access further information about the received missed call. Figure 6.10 shows the received missed calls interface/screen shot.

Figure 6.10 Option for accessing received missed calls on personalised IBMCS

6.4.3.2 Listing all received missed calls

On the received missed calls screen, the recipient can view the list of all of the received missed calls. Figure 6.11 shows the screen shot of the received missed call lists.

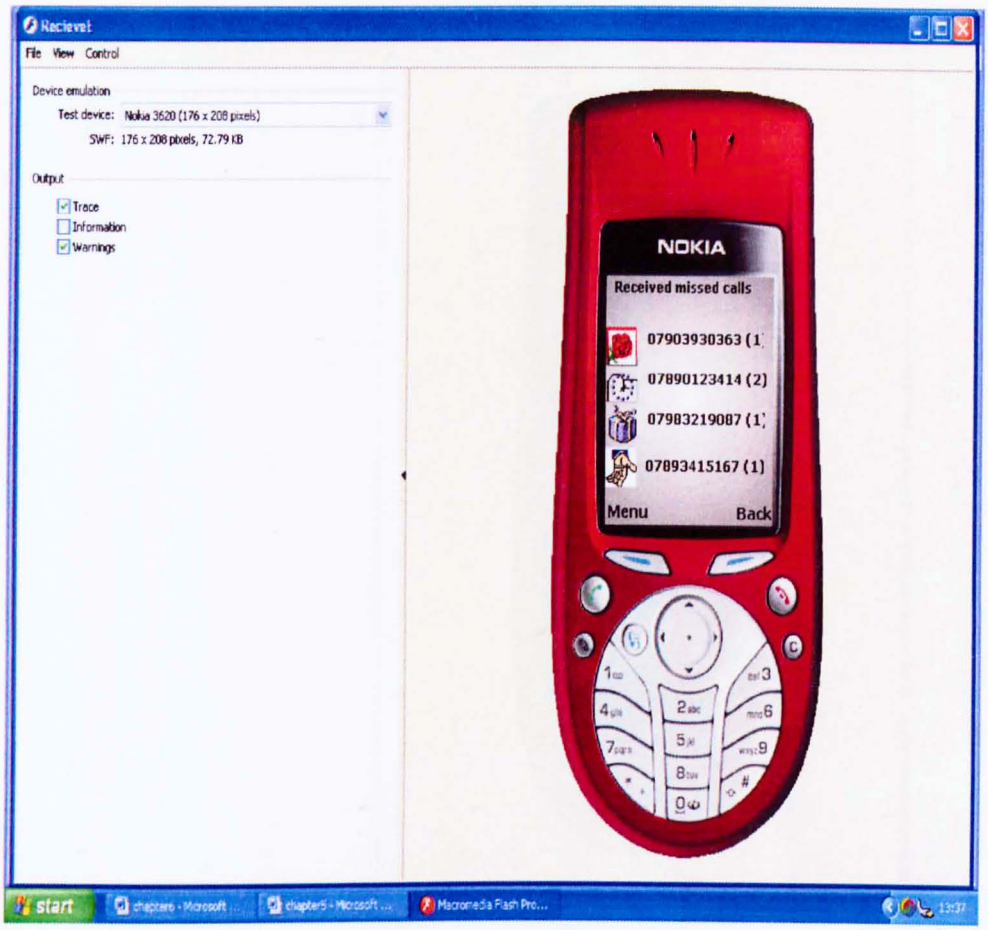


Figure 6.11 list of received missed calls on personalised IBMCS

6.4.3.3 Missed call time and type

To obtain more information about the received missed calls, the recipient needs to click on the missed call received to get details about the time of receipt and the type of the missed call received. Figure 6.12 shows the relevant screen with missed call details.

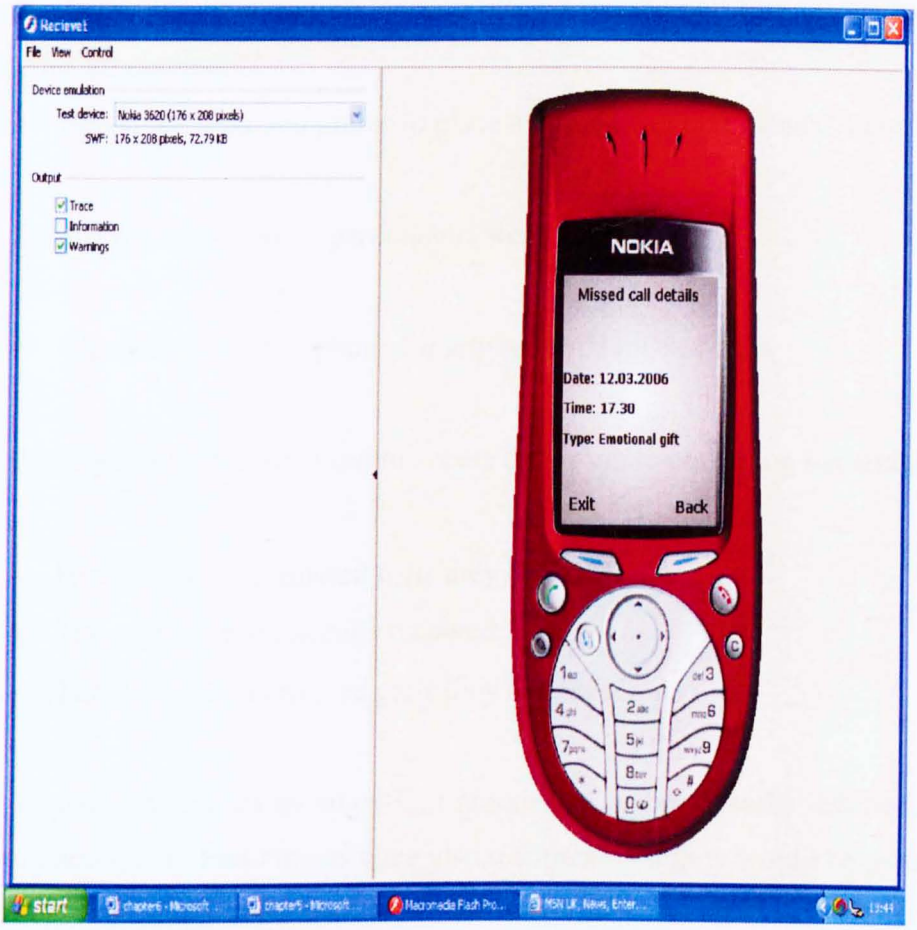


Figure 6.12 Timing and type of received missed call on personalised IBMCS

6.5 Procedure

The study was conducted with each participant individually in 35 separate experimental sessions lasting for one hour each. First, a slide show was shown to introduce the participants to the personalised IBMCS. This slide show was a scenario of how a missed call user sends and receives a missed call that means "call me back", using the personalised IBMCS. Then, users were given some introductory tasks to familiarise themselves with the application. After this training session, each of the participants was required to perform tasks for placing and for receiving a missed call (please see Appendix 8 for a full list of experimental tasks). Examples of typical tasks for the sending mode were:

- Select the icon you prefer, and place a missed call that means "Call me back".
- Select the icon you prefer, and place a missed call that means "Emotional gift".
- Select the icon you prefer, and place a missed call that means "I do not have credit".

- Select the icon you prefer, and place a missed call that means "Reminder for prior arrangement".
- Select the icon you prefer to place a missed call that means "I am late".

For the receiving mode, participants were asked to:

- Check their mobile phone for any received missed calls

Participants were also asked to access their mobile phone log list and find out:

- How many other missed calls they had received.
- The types of missed calls received.
- The times of any missed calls they had received.

The sequence of correct menu options required to complete tasks successfully was left to the participant. Participants were also informed that they would be given a practice task before the experiment started.

On completion of the experimental tasks, participants were asked to complete the Likert questionnaire statements by referring to the 7-point response scale. The Likert questionnaire was administered in this way to guarantee that all responses were given immediately after using the service. Finally, participants were interviewed for half an hour regarding their experience of using the service.

6.5.1 Data analysis

Breakwell et al. (2000) emphasise the need to decide on the statistical tests that will be employed to analyse the data during the planning stage. The main analysis test used in this study was the Mann-Whitney U-test (using SPSS software).

6.6 Results

In this section the questionnaire and interview results will be presented.

6.6.1 Questionnaire results

One of the aims of this study is to explore gender differences in respect to the personalised IBMCS. A descriptive analysis exploring the means of males and females participants indicated that broadly, females appeared to be more enthusiastic about using the personalised IBMCS than their male counterparts. Table 6.5 summarises of the main results.

Table 6.5 Gender differences in terms of mean attitude scores towards the personalised icon-based missed call service

Theme	Measure	Sudan participants	
		Male	Female
Placing missed call from personalised icon based missed call service.	Ease of use	5.79	6.50
	Enjoyability	5.11	5.94
	Recovering from mistakes	5.47	5.81
	Organisation of information on screen	4.68	5.94
	Likeability	5.47	6.81
	Expectability of all functions	3.68	6.06
	Overall satisfaction with service	6.42	6.94
Receiving missed call from personalised icon based missed call service	Ease of use	6.53	6.31
	Enjoyability	4.37	5.88
	Recovering from mistakes	4.84	6.06
	Organisation of information on screen	4.74	6.19
	Likeability	6.42	6.38
	Expectability of all functions	4.53	5.06
	Overall satisfaction with service	6.53	6.50

For further exploration of the data, a Mann-Whitney U-test was applied. The results indicated that Sudanese females appeared to like using the new missed call service to place a missed call more than their male counterparts. Please see Table 6.6 for a summary of the main results.

Table 6.6 Attitude differences between Sudanese males and females towards the personlised IBMCS

Theme	gender	N	Mean Rank	2 tailed sig level	Sig level
It was easy to use the personalised icon-based missed call service to send a missed call	Male	19	14.11	.009	**
	Female	16	22.63		
	Total	35			
I have not enjoyed making a missed call from the personalised icon-based missed call service	Male	19	14.74	.032	*
	Female	16	21.88		
	Total	35			
During the process of making a missed call if I make a mistake I recover quickly	Male	19	16.11	.217	
	Female	16	20.25		
	Total	35			
Organisation of information related to sending a missed call is not clear on the screen.	Male	19	13.18	.002	**
	Female	16	23.72		
	Total	35			
I like using the personalised icon-based missed call service to make a missed call	Male	19	11.55	.000	***
	Female	16	25.66		
	Total	35			
The personalised icon-based missed call service has not got all the functions I expect it to have.	Male	19	11.05	.000	***
	Female	16	26.25		
	Total	35			
Overall, I am satisfied with the personalised icon-based missed call service in relation to making a missed call	Male	19	15.08	.016	
	Female	16	21.47		
	Total	35			
It was easy to use the personalised icon-based missed call service to receive a missed call	Male	19	19.11	.396	
	Female	16	16.69		
	Total	35			
I have not enjoyed receiving a missed call from the personalised icon-based missed call service	Male	19	13.34	.003	**
	Female	16	23.53		
	Total	35			
During the process of checking that I have received a missed call, if I make a mistake I recover quickly	Male	19	15.58	.115	
	Female	16	20.88		
	Total	35			
Organisation of information related to receiving a missed call is not clear on the screen.	Male	19	12.63	.000	***
	Female	16	24.38		
	Total	35			
I like using the personalised icon-based missed call service to receive a missed call	Male	19	17.50	.709	
	Female	16	18.59		
	Total	35			
The personalised icon-based missed call service has not got all the functions I expect it to have.	Male	19	15.21	.069	
	Female	16	21.31		
	Total	35			
Overall, I am satisfied with the personalised icon-based missed call service in relation to receiving a missed call.	Male	19	17.47	.652	
	Female	16	18.63		
	Total	35			

*P<0.05,
**P<0.01,
***P<0.001

A Mann-Whitney U-test was performed to explore age differences in relation to users' perception of the personalised IBMCS The analysis of the data indicated some significant differences between the different age groups in the Sudan and their attitudes towards the personalised IBMCS. Younger participants indicated a more positive attitude towards the personalised IBMCS. Please see Table 6.7 for a summary of the main results.

Table 6.7 Attitude of different age group towards the personalised icon-based missed call service

Theme	Age group	N	Mean Rank	2 tailed sig level	sig level
It was easy to use the personalised icon-based missed call service to send a missed call	13-20	24	20.50	.023	*
	21+	11	12.55		
	Total	35			
I have not enjoyed making a missed call from the personalised icon-based missed call service	13-20	24	21.50	.002	**
	21+	11	10.36		
	Total	35			
During the process of making a missed call if I make a mistake I recover quickly	13-20	24	19.38	.224	
	21+	11	15.00		
	Total	35			
Organisation of information related to sending a missed call is not clear on the screen.	13-20	24	21.63	.001	**
	21+	11	10.09		
	Total	35			
I like using the personalised icon-based missed call service to make a missed call	13-20	24	18.77	.485	
	21+	11	16.32		
	Total	35			
The personalised icon-based missed call service has not got all the functions I expect it to make a missed call	13-20	24	17.46	.637	
	21+	11	19.18		
	Total	35			
Overall, I am satisfied with the personalised icon-based missed call service in relation to making a missed call	13-20	24	16.63	.124	
	21+	11	21.00		
	Total	35			
It was easy to use the personalised icon-based missed call service to receive a missed call	13-20	24	17.44	.558	
	21+	11	19.23		
	Total	35			
I have not enjoyed receiving a missed call from the personalised icon-based missed call service	13-20	24	20.23	.052	
	21+	11	13.14		
	Total	35			
During the process of checking that I have received a missed call if I make a mistake I recover quickly	13-20	24	18.69	.544	
	21+	11	16.50		
	Total	35			
Organisation of information related to receiving a missed call is not clear on the screen.	13-20	24	21.54	.002	**
	21+	11	10.27		
	Total	35			
I like using the personalised icon-based missed call service to receive a missed call	13-20	24	17.29	.473	
	21+	11	19.55		
	Total	35			
The personalised icon-based missed call service has not got all the functions I expect it to have.	13-20	24	18.40	.726	
	21+	11	17.14		
	Total	35			
Overall, I am satisfied with the personalised icon-based missed call service in relation to receiving a missed call.	13-20	24	16.17	.033	*
	21+	11	22.00		
	Total	35			

*P<0.05,
**P<0.01

Another result obtained from the questionnaire identified the most positive and negative aspects of the personalised IBMCS. The most positive value of the service was identified by participants was that it enables users to save time, as it is quick and easy to place. The most negative aspect of the service was the limitation of the personalised IBMCS to convey non-verbal signals such as facial expression, body language, or mood of the sender. Please see Table 6.8 for a summary of the main results.

6.8 Positive and negative aspects of the missed call services

Aspects of the developed service	Sudanese participants' views of personalised IBMCS	Frequency
Negative	1. Lack of non verbal language that is found in phone calls and face-face meetings.	10
	2. Use in public places may be a bit embarrassing.	9
	3. Decrease communication through sms and phone calls	5
Positive	1. Saves time as it is easy to use, quick to place and understand.	9
	2. More personal	8
	3. Clarity in meaning of missed calls.	5

6.6.2 Interview results

Thirty-five participants were interviewed following the experiment to collect richer feedback about their views on the personalised IBMCS. A semi-structured interview was employed for this study to keep the content of the interview focused and precise as well as to offer participants the chance to add to and comment on ways to personalise the service.

The results from the interview coincided with the questionnaire results in respect to different attitudes towards the personalised IBMCS in relation to gender and age. The interview results indicated that females have a more positive attitude towards the personalised IBMCS in comparison to their male counterparts. In addition, younger aged participants were also more positive about the service than the older age group.

A thematic analysis of the interview data was performed, and results are presented in the next section.

6.6.2.1 How did users perceive the design of the icons library and were the icons expressive enough?

In order to get some feeling of the usefulness of the icons, each user was asked about their preferred icon for each of the missed call types, and the context and social group in which the icons would be used. Overall, users liked the icons used in the personalised IBMCS and found them varied enough for their message needs. However, certain icons were less popular than others. Please see table 6.9 for a summary of the main results for popular and unpopular icons.

Table 6.9 The most and least popular icons used on the personalised icon-based missed call service

Missed call type	Most popular icons	Frequency	Least popular icons	Frequency
Call me back		28		22
Emotional gift		30		18
I am late		20		19
Reminder for prior arrangement		20		21
I do not have credit		33		17

Participants found the popular icons expressive and effective in conveying their messages. They also provided valuable feedback on the least popular icons. For example, participants found the least popular icons as less expressive and unclear, sometimes, in the meaning they were trying to convey. For example, the gift box icon was found to be the least liked and wanted icon since it conveys an unclear set of sentiments.

6.6.2.2 Rationale for choosing certain icons over others

Participants appeared to have different reasons for choosing certain icons over others. For example, some participants based their choices on the groups that make up their social network. This was reflected in some of the female interviewees' comments:

"I will choose the black phone to send a missed call that means 'call me back' to my extended family and other mates at the university; I will select the blue phone landline phone for my family; and I will choose the red bulb for close friends".(19 years)

"For the 'Emotional gift' missed call I will use the flying bird for my relatives who I do not meet often and perhaps other colleagues who are not within my close circle. I will keep the red flower for my close friends and perhaps a special person". (20 years)

"For a request for a credit, I will choose the begging hand with my close friends and family, perhaps I will also send the man with the empty pocket to other friends who requested a call back to tell them that I do not have credit".(16 years).

Other participants had different views. They preferred to change the selection of an icon based on the content of the message. This view was mainly echoed by males. For example, for the missed call that means 'I am late', males thought that the selection of the icon would relate to the content of the missed call message. As some of the males interviewees commented:

"I will send the bus/car icon to all of my contacts to tell them that I am on my way but if I am going to be really late, I will send the watch icon. (17 years)

"The use of the cake and candle icon will be limited to birthdays and perhaps celebrations. But it will not be suitable for greetings" (19 years)

Participants also based their selection of specific icons on the context in which the missed call is used. For example, situational context: the location of the sender. This was clear in female's attitudes, as one of the interviewees commented:

"If I am on public transport, I will not choose to send a red flower to anyone I would rather send the flying bird". (21 years)

"I do not think I will send a request for credit if I am surrounded by people. I will be embarrassed to do so. I will feel more relaxed sending a missed call to request a call back or perhaps delay the request to when I am alone". (18 years)

The basis for choosing one icon over another was also related to participants liking of an icon and user preference in respect to the way he/she perceived and visualised the icon. For example, some participants felt that the 'flying bird' is the emotional gift missed call type can convey their emotions and communication needs better than the gift box, as some of the male interviewees commented:

"I will choose to send the flying bird to almost any of my contacts to greet them, but I will be quite tentative about sending a closed gift box to a friend, as I think it is difficult to interpret" (19 years)

"I like the yellow bell. I think it is a good way of reminding people about a prior arrangement. The small bell is ok, but not as clear as the yellow bell."(18 years)

Participants felt that the selection of a certain icon over others might be influenced by the urgency of the missed call message as some of the female interviewees commented:

"I will select the yellow bell to tell my friends that I have arrived at the agreed place at the agreed time, but I will choose the red clock to remind them about our arrangement that will take place soon."(22 years)

"I will prefer to use the black phone for a request for a call back, but I will select the red phone for an urgent request for a call back."(19 years)

Participants also suggested that they might choose to change the icon just for fun and to use a new icon, as one of the female interviewees commented:

"I will change each of the icons every now and then, as I get bored. It's just like changing your mobile phone ring tone or changing your screensaver."(17 years).

The rationales behind using certain missed call types over others are summarised in Table 6.10.

Table 6.10 Rationales for selection of one icon over others

Theme	Examples
Social network	Close friends and family get different icons from those outside your circle. A begging hand can be sent to your inner circle However; the man with the empty pocket is for extended family and mates only.
Content of message	The icon that has cake and candles on it is not suitable for a greeting, whereas the gift box is.
Situational context	Your selection is influenced by where you are For example both males and females felt embarrassed sending an emotional gift missed call to a receiver who is in a public place.
Individual taste sender's vision	Preference of sender for one icon over another. For example, preference for using yellow bell over small grey one as reminder for prior arrangements.
Context/urgency of message	Urgent call back will be represented by red bulb whereas black phone will represent normal call back. Another example is how some interviewees view yellow bell as reminder for arrangement that is about to take place and use clock for arrangements that are going to happen soon
Fun	For sake of a change. You get bored and you decide to change from one icon to another.

6.6.2.3 What missed call messages can be conveyed using missed call that means "choose your own missed call"?

Teenage participants were found to be enthusiastic about the undefined missed call icon. They proposed different missed call messages for this icon. Some of the participants went a step further by suggesting adding a sub-menu of icons to the blank box icon. Interestingly, participants were not keen on defining any missed call messages. However, they proposed adding a list of icons that had no meanings attached to allow the user to define the meaning after negotiation with his or her social network. This was reflected in one of the interviewee comments:

"I will prefer to have a list of icons that is not defined and has no meaning attached. This icon can be displayed as a submenu for 'choose your own missed calls'. Some of the icons that can be added are:

- *"A question mark symbol may mean 'Where are you'?, whereas the same question mark symbol can be sent to another contact meaning 'what is up?', depending on the context of use".*
- *"Another icon that can be added is a building icon, meaning 'I am at home', or' at the class', etc."*
- *"An 'OK' icon, like a tick sign"*
- *"'No' icon, like a cross sign."*

6.6.2.4 Use of personalised IBMCS public places

Similar to the results obtained from Experiment 2, males were more comfortable using the personalised IBMCS in public transport, restaurants and when walking down the street, in comparison to females. In this study, females were found to be generally not interested in using mobile phones on public transport. If they have to use them, then they will prefer to use the personalised IBMCS over the mobile phone call, and even the sms, as it is quick to place and therefore will attract less attention from people in close proximity to them.

On public transport, Sudanese females were extra cautious about using missed calls in general, but sometimes they suggested that they may use the service, but definitely excluded certain types of missed calls such as the emotional gift and the request for a call back. This view was echoed by one of the female interviewees as follows:

"I do not like to use my mobile phone on public transport, but if I have to use it I will certainly not send a missed call that means send me credit represented by the begging hand, or the emotional gift."

Females were found to be more comfortable about using the personalised IBMCS in restaurants and when walking down the street than in public transport. As one of the interviewees commented:

"I will be happy to communicate through the personalised missed call if I am in a restaurant, as usually I will be accompanied by my friends or close family members. I will feel more comfortable using it whilst walking down the street because you have more space to yourself"

6.6.2.5 Location of receiver may have an influence on the type of icon he/she receives

From the results, it appears that the types of missed calls conveyed to the recipient were influenced by their situational context. For example, both males and females felt embarrassed about sending an emotional gift missed call to a receiver who is in a public place. The same attitude was found in relation to the use of the "I do not have credit" missed call, where callers preferred to delay sending the missed call until the recipient is in a more personal, private setting. As one female interviewee commented:

"If I know that the receiver is in a public place, especially public transport, I will delay sending a missed call that means emotional gift until his/her location changes."(19 years).

6.6.2.6 Attitude of interviewees if missed call has similar price as sms

Many participants expressed their enthusiasm about the personalised IBMCS even if it incurs a cost that is similar to the sms. This was expressed in the following males and females comments:

"I would prefer to use the personalised icon-based missed call service over the sms because it is more brief and concise, especially if I want to say "I am late", or as a "Reminder for prior arrangement.".(20 years)

"I would choose to the use the personalised icon-based missed call service, even if its cost is similar to the sms because it can be expressive and embrace many meanings and emotions that deal well with the limitation of the characters on the sms." (21 years)

"I like the missed call more as it is more creative and expressive at the same time. A picture is better than 1000 words, especially with the emotional gift." (18 years)

6.6.2.7 Locations and circumstances where missed call will be preferred over sms

According to the interviewees, there are specific situational contexts in which they would prefer to use the personalised IBMCS over the sms. For example, if the caller is in a public setting, then the use of the personalised IBMCS is preferred over sms.

Participants found that missed calls sent from the personalised IBMCS requires less time and effort to place in comparison to sms, and therefore it attracts less attention from bystanders, as one of the interviewees commented:

"I will choose to use the new missed call when I am in public transport as it takes less time to place in comparison with the sms, thereby it does not attract the attention of the people around you"(female, 21 years).

"If I am in a meeting or a lecture, or even if I am surrounded with friends, the missed call will be more ideal than the sms as it takes less attention from me to place the missed call."(female 22 years).

The content of the message appeared to be related to the type of communication mode used. For example, to send certain messages such as 'I am late', participants were found to be in favour of using the personalised IBMCS over sms, as one of the interviewees commented:

"I would prefer to send a missed call as a reminder or 'I am late', rather than sending sms, as it is quicker and to the point."(male, 23 years)

Some of the participants perceived the personalised IBMCS as a fun vehicle of communication that has new interesting features in comparison to the sms. In addition, the personalised IBMCS was perceived to be useful to embrace different emotions in a quick creative style. As some interviewees commented:

"Texting is boring, if these icons represent what I want to say then I will use choose to use them, especially for the emotional gift, as it includes various emotions and meanings within it".(female 18 years)

"A missed call that is sent using the personalised IBMCS is better than the sms, especially as an emotional gift, in holy festivals, or to say 'hi' to people outside your close circle of friends, as it is quick and does not require time or effort."(female, 19 years)

Certainly, most of the participants were positive about the value of sms in ongoing conversations unlike the missed call that can only be used for quick brief messages, as one of the interviewees commented:

"I would prefer to use the missed call to start up a conversation with someone, especially the emotional gift, but to continue chatting, I think the sms will be more suitable".(male 22 years)

6.7 Discussion

This research sought to investigate Sudanese perception of a personalised IBMCS and whether or not the service assisted in personalising the missed call practice. The findings demonstrate that, overall, the participants were positive about the service. Females appeared to be more enthusiastic than males. The variation in psychological characteristic of males and females in communication is evident in the literature. Sattle (1976) found that females tend to use various conversational techniques to facilitate conversation in comparison to males. Women also seem to have better interaction skills and conversational skills than men (Fishman, 1978; Treichler and Krammarae, 1983).

In the mobile phone context, Laughlin (2001) found that males concentrate on technical functions and when communicating through sms they tend to describe events rather than emotions, whereas females focus more on emotions and expressions in their sms. Oksman et, al. (2001) also found that females pay more attention to the actual communication rather than technical features, and they were found to send more sms than males.

Ling (2004) found that females extended their good conversational skills to mobile communication, especially text messaging, where females were found to send longer text messages of a more complex structure. Along the same lines, female attitudes towards the personalised missed call is not widely divergent, their positive attitude towards the usability of the service and the enjoyability and other measures reflected their preference for the service. The interview data showed that females were found to be more willing to use a wider spectrum of icons for different group of contacts, unlike males, who preferred to use the same icon for all of their contacts but to change the icon if the nature or the urgency of the message changed. The females' attitude to exploring and use various icons may be related to the ability of the icons to provide a range of meanings that facilitate females in accomplishing their social activities to organise parties, to circulate familial news, and to provide supportive communication (Ling, 1998b; Moyal, 1992; Rakow and Navarro, 1993; Rosenthal, 1985;Tannen, 1991).

In this study, although females chose not to use the missed call in public transport, it was preferred as a medium that allows distant interaction in public transport in comparison with voice/written communication. In the Sudanese culture, females are looked after and cared for by the whole society, but the rules that embrace their attitudes and behaviours are more controlled and guarded than males. Females are expected to adhere to the set social protocols more than men and to keep a low profile. The missed call seems to allow females to engage in interpersonal communication if they require to, without drawing any attention or violating any code of behaviour.

Interestingly, both males and females agreed that they would not send a missed call that means "Emotional gift for a special one" or "I do not have credit" if they know that the recipient is in a public place. Analysing this result in the light of the Sudanese collectivistic feature pointed out by Hofstede, the Sudanese senders would be sensitive to the receiver's whereabouts and surroundings, and they would not want to cause the receiver any embarrassment.

Both genders expressed their willingness to use the personalised IBMCS even if it is charged at the same price as the sms. Participants also expressed their willingness to

bear the cost of the service. In addition, missed calls can be useful in a situation when the user can not focus directly on the mobile communication, either because he or she is busy or does not want to attract the attention of people around, e.g. it can be used in lectures and meetings.

Younger participants indicated a more positive attitude towards the personalised IBMCS than older users. Ling (2000) found that as teens grown older, they become more socially active and their need to communicate with their peers increases. Oksman et al. (2001) found that youngsters in Finland are the most heavy users of the sms. They tend to make use of different channels of communication, especially cost-effective ones such as chat rooms, sms and missed calls. The attitude of younger participants towards the personalised IBMCS coincided with the attitude of younger people towards mobile phone technology, generally found in the literature.

Naturally, the selection of icons for each of the missed calls types in the personalised IBMCS has varied from one individual to the other. Each of the participants based their selection on certain elements. From the result, it appeared that their basis for selection is related to the context of the message. King (2000) identified four components of context:

1. ***Psychological context*** - who you are and what you bring to the interaction. Your needs, desires, values, personality, etc., all form the psychological context.

2. ***Relational context*** - your reactions to the other person-the 'mix'.

3. ***Situational context*** - the psycho-social 'where' you are communicating. An interaction that takes place in a classroom will be very different from one that takes place in a bar.

4. ***Environmental context*** - the physical 'where' you are communicating. Furniture, location, noise level, temperature, season, time of day, all are examples of factors in the environmental context.

Based on the results of this study, participants based the selection of the icons on the type of relationships they have with intended recipients. This can be looked at in relation to the relational context where the selection of certain icon over others closely related to the sender's relationship with the recipient. Another basis for the selection

is related to environmental context; the whereabouts of the sender of the missed call might affect choices of certain missed call icons. For example, the user of the personalised IBMCS may choose to use a certain icon if the recipient is known to be in a public setting. Participants sometimes based their selection on their individual taste and their desires to choose certain icons over others can be related to psychological context. For example, the preference and the needs of the user of the personalised IBMCS can affect the selection of an icon over others.

Although participants appreciated the value of sms in mobile phone communication, they also identified some positive features for the personalised IBMCS that might encourage them to use the service, even if it has a similar price to the sms. For example, they found that the missed call, especially the emotional gift, can be more expressive than other types of mobile phone communication. In other words, it includes various meanings and emotions within it which makes it more communicative. It allows users to transmit quick and short memos effectively such as 'reminder for prior arrangement'.

The missed call is quicker and more useful especially icons such as "I am late", and the "reminder for prior arrangement". It saves the sender having to write the message and it saves the recipient the necessity to read it, as it can recognised easily just by a quick look at the mobile phone screen.

6.7.1 Choose your own missed call

Participants were found to be enthusiastic about the undefined missed call and suggested different uses for this icon. Some of the participants went a step further by suggesting adding a sub-menu of icons to the blank box icon. The meaning of the added icons could then be defined by users, depending on the context of the missed call. They proposed some icons to be added to the service such as "where are you?", "OK".

Offering the caller the chance to define his/her own missed call enables the user to send a coded message to intimate contacts. This can viewed through the restricted code theory highlighted by Donner (2005). The message conveyed through this personalised missed call is different from the other defined missed call types where

the meaning of the message is almost clear for everyone as the code is more elaborated. Understanding the meaning of the personalised missed call is restricted to those who negotiated the meaning of the code with the caller. Offering the user the chance to select the icon preferred to send a missed call type that is either defined by the personalised IBMCS or by the user in the case of the choose your own missed call icon, gives them an opportunity to customise the service to cater to their individual tastes, thereby enhancing their user experience.

Sennett (1992) argued that the personalisation and emotionalisation of interaction facilitate socialisation. Ling (2005) found that mobile phone users always seek to individualise their phones and to integrate them into their own cultures. Swartz (2003) found that mobile phones are an extension of their user's identity. Oksman and Rautiainen (2003) highlighted that mobile phone users consciously pursue ways of styling their mobile phones. Mobile phone developers became aware of mobile phone personal needs as Alastair Curtis, director of Nokia's design group quoted in Katz and Sugiyama (2005) stated "Our primary concern is to tailor products as much to the individual as possible".

In relation to this, participants in this study appeared to like the personalisation offered by the personalised missed call icon based application. Users felt that the personalised IBMCS offered them the chance to personalise their missed calls. Users of the personalised IBMCS were able to convey more personal and clearer messages, as well as engaging in a more interactive process. It appears that users personalised their missed calls based on their situational context, their whereabouts, the meaning of the message conveyed, and the nature of the relationship with their specific social network.

6.8 Chapter summary

In conclusion, in this study, ways in which a missed call service can be most effectively personalised was explored. The personalised IBMCS provided users with different types of missed calls, each one of which had different icons which could be chosen by the caller to represent the missed call message. In this service, the six missed call types that mean "create your own missed call" provided useful tools for creating missed call content.

The results indicated that personalising the IBMCS enabled users to create customised experiences that are dynamically tailored to their individual needs. The results also indicated that the personalised IBMCS call appeared to offer users the chance to communicate messages that are more prevalent than in other media of communication such as sms. Findings from this experiment revealed that participants preferred using the personalised IBMCS in certain circumstances over sms, for example, for quick messages such as "I am late".

Work in this study focused mainly on ways to personalise the IBMCS from the caller perspective. For future work, there is a need to consider the receiver's perspective and the physical environment in which the missed call is received. For example, whether the receiver is in a public or private place, time of day (afternoon, morning), and physical locations (meeting room, cafeteria). Based on the receiver's physical environment can we adapt the missed call service so the receiver has more control over when to receive the missed call and what type of icon can be displayed? Future work can also investigate ways of enabling the icons to communicate different and complex social emotions such as "What's up" or "Where are you".

Chapter Seven

Conclusion

7.1 Introduction

The purpose of this thesis has been to establish and better understand the impact of cultural differences on the way people use their mobile phones. Alongside this rationale, this thesis has attempted to explore cultural aspects that should be taken into account when designing mobile phone applications. This chapter provides a brief summary of the thesis findings and their contribution, identifies its limitations, and suggests potential future research directions.

7.2 Main Findings

This section describes the most important findings of the thesis. The first stage of the research reported was to investigate mobile phone usage patterns in both the UK and the Sudan.

7.2.1 Mobile phones in public places

Findings from the first study indicated that British participants were more willing to use mobile phones in public places (e.g. public transport) than their Sudanese counterparts. British females were found to be more comfortable using mobile phones in public transport and when walking down the street than Sudanese females. These attitudes were interpreted using Hofstede's cultural typology (Hofstede, 1980) and the results suggest that culture perhaps plays a role in participants' attitudes towards mobile phone use in public places.

7.2.2 Missed calls

Another key result found in the first study is the ritual of the missed call. The missed call is an intentional action whereby a person places a call and disconnects the call before the recipient at the other end answers. The main findings from the first study in relation to this ritual are as follows:

1. **Use of the mobile phone functions and the network.** The practice of the missed call provides clear proof of how users develop their own style of using technologies to transmit social messages.

2. **Various missed call types are exchanged over the network.** The results also indicated that users exchange different social meanings through the missed call service. The missed call is used to maintain real relationships with distant friends. It can also be used to request from the DJ on a radio station rewind of a favourite song. This study identified the most used types of missed calls in the UK and the Sudan. However, it appeared that certain types of missed calls are more popular in one culture than the other. For example, the reminder for a prior arrangement and after sending sms are more popular in the UK whereas the missed call that means emotional gift and before sending sms are more popular in the Sudan.

3. **Preferred missed call types in the UK and the Sudan.** The finding from the first study indicated that British participants appeared to use the missed call mainly as a request for a call back, after sending a text message, and as a reminder for a prior arrangement. The Sudanese participants, on the other hand, perceived some of the missed calls as emotional gifts. The Sudanese were also found to be more in favour of using the missed call as a request for a call back before sending sms than their British counterparts.

4. **User problems with current missed call service.** The first study also revealed that despite the popularity of the missed call in both cultures, users experience problems when using the current missed call service. These problems are:

    - ***Confusion in understanding the meaning of the missed call sent.*** Participants from both cultures indicated that understanding and interpretation of missed calls meanings is a challenging task.
    - ***Uncertainty about receiving a missed call.*** The results from this study indicated that users are often unaware about receiving a missed call.

This is related to the short time allowed for the missed call to ring before the caller disconnects. Therefore the recipient sometimes does not hear the missed call ring and does not know that a missed call has been received.

- ***Differentiation between genuine and intended missed call.*** Participants from both cultures explained that with the current missed call service it was difficult to differentiate between genuine and intended missed calls. A genuine missed call means that the recipient has not taken the call because he/she was not available to answer, whereas an intended missed call suggests the call was disconnected before the recipient had the chance to answer it. In relation to this, Sudanese participants explained that it is also difficult to differentiate between a missed call that means an emotional gift and accidental mobile phone calls (when a mobile phone caller places a call accidentally and disconnects quickly).

7.2.2.1 Missed call and sms as emotional gift in recalling past thoughts. One of the main findings that was also highlighted in Study 1 was the distinction British and Sudanese participants made between the value of both the missed call and the sms as an emotional gift in recalling past thoughts. Generally, British participants were not interested in using the missed call as an emotional gift, and thus downgraded its role in recalling past thoughts. In contrast, although Sudanese participants appeared to appreciate the role of sms in recalling past thoughts, they also acknowledged the ability of the missed call to act as a conveyer of emotional gifts.

According to British participants, the reason they were in favour of valuing the sms over the missed call as an emotional gift in recalling past thoughts was related to the ability of sms to embrace a wide array of sentiments, and various social and emotional messages can be conveyed through sms. This increases the likelihood of these messages triggering memories and recalling past thoughts (Taylor et al., 2003). This is contrasted with the missed call that can only convey a limited set of emotional messages that need to be agreed upon in advance. This limitation associated with the current missed call service in its ability to convey social and emotional messages reduces the value of the missed call and its ability to recall past thoughts.

On the other hand, Sudanese participants found the use of freely available resources (e.g. ID caller display service and call register) coupled with their desire to communicate and stay connected with personal networks, engendered a new path in which the missed call as an emotional gift has acquired an emotional significance. Taylor (2003) found that memories are represented in things such as sms that have emotional significance, and can be used to recall past thoughts through being read later. Similarly, it appeared that Sudanese participants considered the missed call as an emotional gift that offers a way of representing memories, and these missed calls can evoke feelings and thoughts through later access. Sudanese participants also appreciated the ability of the missed call as an emotional gift in conveying coded emotional signals that have a unique style which makes the missed call as an emotional gift extra special in certain uses (for example in a romantic context).

7.2.3 Improved decoding and representation of missed calls by IBMCS

Based on findings from Study 1, the purpose of the next study was to assist missed call users' to better decode the meaning of missed call messages conveyed over the network, and to represent missed call types especially the missed call that means emotional gift, in a more concrete way. To support this, an IBMCS was developed. Five types of missed calls were represented with five different icons. Each of the icons represents a social message, and the social messages covered by the IBMCS were:

- After sending sms
- Before sending sms
- Call me back
- Emotional gift
- Reminder for a prior arrangement

7.2.3.1 Users' perception of IBMCS

In Experiment 2, users' perception of the IBMCS was investigated in the UK and the Sudan. Findings from the experiment revealed differences in users' perception of the icon-based missed call service between the two cultures. These results imply that the conventions of the missed call are perhaps shaped by cultural differences. For example, the British perceived the IBMCS as an entertaining mode of communication to fill empty time, whereas the Sudanese, with their limited financial resources, tied with their social and cultural obligation, viewed the new missed call service as an

appealing channel of communication that supports their personal and business communication needs.

7.2.3.2 Sudanese desire for customisation

Despite the Sudanese enthusiastic attitude towards the IBMCS, they also suggested further modification to customise the service to meet individual's needs. These suggestions to personalise the IBMCS were as follows:

1. ***Provide more icons for each one of the missed call types.*** Findings from Experiment 2 revealed that Sudanese participants wanted to have a set of choices for each of the missed call types so the user can have control to select their preferred icon. For example, for the missed call that means 'call me back', the user can select the preferred icon from set of various icons that represents the same meaning. For example, sets of different phone shapes and colours.

2. Increase the number of missed call types defined on the service. The interview results of Experiment 2 indicated that participants were interested in adding more missed call types that are popular among Sudanese missed call users. For example, adding missed call types that means "I am late", "I do not have mobile phone credit"

3. *Take out certain missed call types.* Interview results also indicated that participants wanted to remove some of the missed call types that were used on the IBMCS. For example, the missed call that means "Before sending sms" and "After sending sms".

4. Provide blank icon not defined by the service to be used for personal messages: Experiment 2 revealed that for further customisation of the IBMCS, participants suggested having an icon that has no specific social meaning attached to it to enable users' to personalise their messages.

7.2.3.3 Differentiation between sms and IBMCS

Another theme that emerged from Experiment 2 was the clear differentiation participants from both cultures made between the sms and the IBMCS. The Sudanese appreciated the ability of the IBMCS in conveying social meanings. They also perceived the new service as a better channel of communication in comparison with the sms, in terms of cost, time and effort, as well as its ability to provide pre-defined messages in a more creative and fun style. In relation to cost, it is not clear if service

providers would offer this service for free. Sudanese participants also deemed that the IBMCS can solve the problems they experience when texting from mobile phones that do not have comprehensive support for Arabic language.
On the other hand, British users, especially teenagers, appreciated the IBMCS as a pleasant and fun mode of interaction. However, sms was still considered to be a more effective way of transmitting 'proper' messages.

It appeared that British participants' positive attitude towards the sms as an emotional gift is linked to the value of sms in terms of cost when sending it. Sending sms as an emotional gift will probably cost more than sending a missed call. Therefore, from the British perspective, the cost augments the value of the sms, whereas the message that is sent through the IBMCS is considered to be of less value, as it costs less to send. In contrast, the Sudanese participants were aware of the cost implication but due to their financial limitations they escalated the value of the missed call as an emotional gift to match that of the sms.

7.2.4 Personalised IBMCS for Sudanese users

Based on findings from Study 2, the objective of the next study was to offer Sudanese missed call users a personalised missed call service that helps them to maximise their communication cultural needs. To support this, a personalised IBMCS was developed, which covered six types of missed call. For each one of the first five missed call types, the participant was presented with five icons that represent the same missed call message. For the sixth missed call type the user was given a blank box icon not defined by the personalised IBMCS and they could use the icon to convey the desired missed call message. The social messages that can be conveyed using the personalised IBMCS were:

- Call me back
- Emotional gift
- I am late
- I do not have credit
- Reminder for a prior arrangement
- "Create your own missed call message"

In Experiment 3, Sudanese's perception of the personalised IBMCS was investigated. The main findings from this study can be summarised as follows:

- **Well designed icons that consider individuals' needs can be an effective medium of communication.** Personalised icons, taking users' needs into account can provide users with the chance to communicate messages that are more prevalent than with other popular communication media such as sms.

- **Conveying social messages using the personalised IBMCS is preferred to sms for many reasons.** Results of this research revealed that a message sent through the personalised IBMCS is sometimes preferred over the sms in certain circumstances. Messages sent through the personlised IBMCS is considered as a fun way of communication that is more expressive and time and effort saving.

- **Use in public places.** For example, if Sudanese users are in public places, the message sent through the personalised IBMCS is quick to place, and requires less attention from both the caller and the recipient.

- **Texting problems**. Results in this thesis also indicated that the personalised IBMCS can be considered as a way out of the texting problem. The maximum limit of the sms is 160 characters, but in Arabic it is equivalent to only around 78 characters. Therefore, a single message might need to be sent in 2-3 different sms, whereas sending social messages through the personalised IBMCS offers users the chance to express various social messages in a condensed way.

- **Positive features to encourage use.** Although Sudanese participants appreciated the value of sms in mobile phone communication, they also identified some positive features for the personalised IBMCS that might encourage them to use the service, even if it has a similar price as the sms. For example, they found that a missed call, especially the emotional gift, can be more expressive than other types of mobile phone communication. In other words, it includes various meanings and emotions within it which makes it more communicative. It allows users to transmit quick and short memos effectively, such as "reminder for prior arrangement".

7.3 Originality of research

One important aspect of the research, which makes it distinct from others in the Literature is that it has investigated mobile phone usage style from a cultural perspective. In this thesis, mobile phone users in two contrasting cultures (the UK and the Sudan) were compared. The UK and the Sudan differ considerably in respect to their geographical location, culture, development and market maturity, which offered a unique opportunity to examine and explore mobile phone users' needs outside mobile phone developers' regions.

The findings of this thesis illustrate that there is a need to consider mobile phone users' cultural needs when designing mobile phones in order to support the users in their communication activities. The impact of culture on mobile phone service design has not been adequately addressed in previous research.

7.4 Limitation of research

This thesis has used methods that are multi-disciplinary; as a result, the limitations of this research are related to the methods used. However, a process of methodological triangulation was employed, which refers to the use of more than one method for gathering data in order to enhance confidence in the ensuing findings (Denzin, 1970). The use of methodological triangulation has gone some way to lessen the individual limitations of specific methods and techniques. For work reported in this thesis three forms of data were used questionnaire, interview and field experiment. For example, the purpose of using a questionnaire was because it is more natural to complete and maintains the respondents' direct involvement (Coolican, 2004). However, as a questionnaire may not provide rich enough feedback from participants, interviews were therefore used to capture more thorough user comments.

It could be argued that laboratory experiments might have been employed in Experiments 2 and 3 instead of the field experiments. For example, to examine the effectiveness of the IBMCS and the personalised IBMCS. However, since the focus of the research was on the impact of culture on the way people use their mobile phones, this makes it highly unlikely that rich enough data could materialise under laboratory conditions.

Another limitation for this research is the sample size used in this research is not large. A small sample size has a probability that the result happened by chance

alone. A bigger sample size would have provided more data. In addition, participants who took part in this research were from the two main cities (London and Khartoum) the attitude of participants from rural areas was not captured in this thesis.
Participants who took part in Study 2 and 3 were aged between (13-34) years, the perception of older age group was not documented and their perception may be different. Future work need to examine the perception of this age group towards the developed services.

The IBMCS and the personalised IBMCS was only emulated using Flash Macromedia, a full implementation of the services and a real trial service with one of the mobile phone operators would serve to investigate users' perception of the fully implemented services.

To access the IBMCS and the Personalised IBMCS in Study 2 and 3, participants were asked to use the researcher's mobile phone. Although a slide show for the service was offered to all participants at the beginning of the experiment but future work could investigate the perception of users' towards the services if the prototype is installed in participants' devices.

7.5 Implications for future design of mobile phones

As mobile phones and their applications are used more and more outside the countries where they have been developed and designed, there is a growing challenge that faces mobile phone developers to offer mobile phone users more cultural-specific applications and services. To meet such a target, the focus should be on designing mobile phones that integrate cultural specific needs such as the ones highlighted in this thesis. Some of the key implications for the design of mobile phone services revealed in this research are:

1. Mobile phone developers should seek to support mobile phone users to communicate in public places by offering different means of interaction.
Study 1 indicated that Sudanese appeared to be less prepared to carry out private/business communication in the public domain. Mobile phone developers need to accommodate for these attitudes by perhaps offering an assortment of affordable services that combine the use of text and photographs.

2. *Mobile technologies should seek to support mobile users in managing their mobile phone communication in public places through context-aware technology.* Mobile phone developers should seek to construct devices and interfaces that automatically adjust themselves to accommodate users' situational context. This type of recognition of context and device adaptation is related to the work of Hinckley et al. (2000). A device could sense environmental factors such as ambient noise or even users' attention and distraction levels and adjust itself accordingly. For example, the mobile phone could turn to silent mode but turn on its backlight and enlarge its icons, indicating that a missed call has been received. Mobile phone developers need to acquire better understanding of situational context and users' cultural needs in order to provide better user models and adaptive user interfaces.

3. *Mobile phone developers should seek ways to increase the capability of the sms to include more than 160 characters.* Sudanese participants explained that the limited number of characters allowed in sms message impedes their desire to exchange rich detailed interactions. It appeared that the 160 characters defined in the English language are equivalent only to 78 characters in Arabic.

Mobile phone developers should seek to improve services available such as the missed call as a back-up support for the sms. The interview results indicated that Sudanese participants used the missed call to convey social messages. Although the missed call practice has economic connotations, it was also influenced by problems related to texting. For example, texting from mobile phones that have no Arabic support or dealing with the limitation of the sms characters.

4. *Mobile applications should be flexible and easily adaptable to individual and community needs*: From the second experiment, it was apparent that mobile phone users preferred mobile phone services that support them in maintaining their community bonds and social obligations, as well as offering them the chance to personalise services. These issues need to be supported by mobile phone developers to accommodate a whole range of users and their individual needs. For example, developing a personalised IBMCS.

5. *Mobile phone developers should seek to develop service that support cultural-specific needs (for example, Me2U).* Results from this thesis and the literature revealed that mobile phone providers in Africa have been trying to provide a set of services that meet their customers' needs. For example, in the Sudan, the mobile phone service provider (Mobitel) developed the Me2U service, where pre-paid users can transfer airtime to one another. This transferred airtime can be used to communicate with others or can be exchanged for cash. Despite the mobile phone service providers' effort, users are experiencing a great deal of usability problems with such a service. For example, users have to go through various steps and data entry such as the sender's mobile phone serial number, the intended transferred airtime, and the recipient's mobile phone number before being able to transfer the airtime to the recipient. Mobile phone developers should seek to develop mobile phone services that support such communication needs.

6. *Mobile phone developers should seek to provide mobile computing capabilities for mobile phone users in the developing world.* The research literature indicated that mobile phones are by far the prevailing mobile proxy, especially in Africa, where there is almost one land line for every 33 people (The New York Times, 2005). With the lack of financial resources to obtain PCs and the poor connectivity of the Internet, mobile phones can easily replace PCs in areas of education, e-commerce, and medical and health information. Mobile phone developers should develop mobile phone-based applications that support these activities.

7.6 Future research directions

In keeping with the nature of PhD research, the work of this thesis was restricted by its initial scope. Ideas for future research directions extend beyond this to look at broader issues of mobile phone design.

An obvious first step to pursue would be to expose the re-design of the IBMCS to a wider corpus of mobile users. Similarly, a more extensive implementation of the IBMCS and the personalised IBMCS followed by an in-depth field trial may offer even richer insights into the adoption of the missed call service, and how it can support users' cultural communication needs.

The use of location-aware mobile phones that identify the recipients' physical context would be an interesting avenue to pursue to support missed call users in their communication needs. Mobile phone developers can modify the missed call service to enable to identify recipients' physical contexts and acts accordingly.

So far in this research, the focus was to personalise the missed call service from the caller perspective. Future research in this area could explore ways to customise the missed call service from the receiver and how to integrate such a concept into the missed call service.

7.7 Concluding remarks

The increased use of mobile phones by people from different cultural backgrounds is becoming an integral part of our world phenomena, yet to date, the impact of cultural differences on the way people use their mobile phones and its implications on mobile phone design have failed to be investigated comprehensively. As this thesis illustrates, the prevasiveness of mobile phone use by people from various cultural backgrounds offers immense possibilities in which further research into mobile phone design can be explored. A useful remark made by a user in this thesis is that mobile phone designers need to develop a rich understanding of culture so they can develop mobile phones that satisify cultual-specific needs and thus support mobile phone users in their current and potential future communication activities.

Reference

Africa and Middle East Telecom (2006) retrieved January (2006) from http://www.africantelecomsnews.com/free_news.html#17_August_2006-Sudan

Agar, J. (2003). *Constant Touch: a Global History of the Mobile Phone.* UK: Icon Books.

Anandarejen, M., Igbaria, M. and Anakwe, U.P. (2002). IT acceptance in a less-developed country: a motivational factor perspective. *International Journal of Information Management 22*, 47-65.

Andreasen, A. R. (1970). *Personalizing mail questionnaire correspondence.* Public Opinion Quarterly, 34, 273–277.

Aronson, E., Carlsmith, J.M., 1986, Experimentation in social psychology. In: *Handbook of Social Psychology,* edited by G. Lindzey, and E. Aronson (Reading, Mass: Addison-Wesley).

Ashkanini, Mohammed G. A.(1984) 'A cross-cultural perspective on work related values'. Unpublished Ph.D dissertation, International University, San Diego.

Atherton, J. (2002). http://www.doceo.co.uk/language_codes.htm

Banai, Moshe (1982) 'Geert Hofstede: "Culture's consequences : international differences in work-related values" 'Journ.al of Management Studies 351-354.

Barron, G., & Yechiam, E. (2002). *Private e-mail requests and the diffusion of responsibility.* Computers in Human Behavior, 18, 507–520.

Baumgartel, Howard, and Thomas Hill (1982) 'Geert Hofstede: "Culture's consequences : international differences in work-related values" '. *Personnel Psychology* 35/1: 192-196.

BBC News. (2007) Reid targets illegal immigrants. Published March 7, 2007. http://news.bbc.co.uk/1/hi/uk/6424377.stm

BBC News. (2007) African unity still a dream. Published January 1, 2007. http://news.bbc.co.uk/1/hi/world/africa/6177287.stm

BBC News. (2006) New phone parking scheme launched. Published October 1, 2006. http://news.bbc.co.uk/1/hi/england/london/5397076.stm

BBC News (2004). Africans rush for mobile phones. BBC News. Published May 5, 2004.http://news.bbc.co.uk/1/hi/world/africa/3686463.stm

BBC News. (2001) Can the web save democracy. Published April 2, 2001. http://news.bbc.co.uk/1/hi/talking_point/1234234.stm

Bernstein, B. (1971). *Class, codes and control: Vol. 1, theoretical studies toward a sociology of education.* London: Paladin.

Berking, H. (1999): *Sociology of Giving.* London: Sage.

Bijker, W.E. and Law, J.(1992), "General introduction" in *Shaping technology/Building society: Studies in sociotechnical change*, edited by Bijker, W.E. and Law, J. Cambridge, MA: MIT Press.

Bijker, W.E., et al. (1987), *The social construction of technological systems: New directions in the sociology and technology of history.* Cambridge: MIT Press.

Blankenberg, E. (1983) 'Geert Hofstede: "Culture's consequences: international differences in work-related values" '. Organization Studies 4/4: 390-391.

Bluedorn, Allen C., Carol J. Kaufman, and Paul M. Lane (1992), "How Many Things Do You Like to Do at Once? An Introduction to Monochronic and Polychronic Time," *The Academy of Management Executive*, 17-26.

Bond, M. and Hofstede G. (1989), The cash value of Confucian values, *Human Systems Management*, 8, PP. 195-200.

Boudreau, M.-C., Gefen, D. and Straub, D. (2001), Validation in IS Research: A State-of-the-Art Assessment, *MIS Quarterly*, 25, (1) , PP. 1-16.

Bourges-Waldegg, P. and Scrivener, S.A.R. 1998. Meaning, the central issue in cross-cultural HCI design. *Interacting with Computers*, (9)3: 287-309.

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3, 77-101

Bray, J. (2005). *International companies and post-conflict reconstruction* (Social Development Papers No. 79). Washington, DC: The World Bank.

Breakwell GM. (1995) Interviewing. In *Research Methods in Psychology*, Breakwell

Briggs, P., de Angeli, A., Simpson, B., (2004). Personalisation and trust: a reciprocal relationship? In: Karat, M.C., Blom, J., Karat, J. (Eds.), Designing Personalized User Experiences for E-Commerce. Kluwer Academic Publishers, Dordrecht.

Bruckman, A. (1993). Gender swapping on the internet. Paper presented at the The Internet Society (INET '93) Conference, San Fransisco, CA.

Burns, T. (1992), *Erving Goffman.* London: Routledge

Castells. , Fernandez-Ardevol. Qiu, M. Sey, J. (2004), A research report prepared for the.International Workshop on Wireless Communication Policies and Prospects: A Global Perspective, held at the Annenberg School for Communication, University of Southern California, Los Angeles.

Charkraborty, D. (2004) *The case of mobile phones in Sitakund.* Retrieved April 21, 2005, from http://www.i4donline.net/issue/may04/sitakund_full.htm

Chew, Irene K. H., and Joseph Putti (1993) 'A comparative study of workrelated values of Singaporean and Japanese managers in Singapore'.Working Paper, Nanyang Technological University.

Chin, JP, et al. (1988) Development of an instrument measuring user satisfaction of the human-computer interface. In Proceedings of ACM CHI'88, Washington, DC.

Choi, B. Lee, I., Kim, J. Jeon, Y. (2005), A Qualitative Cross-National Study of Cultural Influences on Mobile Data Service Design. In Proceedings of CHI 2005, (Portland, Oregon, USA), pp.. 661-670.

Churchill. E. (2001), Getting About a Bit: Mobile Technologies & Mobile Conversations in the UK. *FXPL.International Technical report*, FXPAL.TR.01-009.

Christensen, L., (1997), Experimental Methodology. 7th edition USA: Allan and Bacon.

Chow, Chee W., Michael D. Shields, and Yoke Kai Chan (1991) 'The effects of management controls and national culture on manufacturing performance'. Accounting, Organizations and S:ociety 209-226.

Christian Lindholm, Turkka keinonen, Harri Kiljander,(2003) Mobile Usability, McGraw-Hill.

Ciborowski, T.J. (1979), Cross-Cultural aspects of Cognitive Functioning: Culture and Knowledge. In A.J. Marsella,R.G. Tharp, and T.J. Ciborowski (Eds), *Perspectives on Cross-Cultural Psychology.* New York, NY: Academic Press Inc.

Cohill, A. M. and Kavanaugh, A., editors (1997) *Community Networks: Lessons learned from Blacksburg, Virginia.*Cambridge: Artech

Cole, J. I., Suman, M., Schramm, P., Van Bel, D., Lunn, B., Maguire, P., Hanson, K., Singh, R. and Aquino, J. S. (2000). *The UCLA Internet Report: Surveying the Digital Future.* Los Angeles: UCLA Center for Communication Policy.

Coolican, H. (2004) Research Methods and Statistics in Psychology (4th edition) London: Hodder & Stoughton.

Cooper, G. (2000) *The Mutable Mobile: Social Theory in the Wireless World.* Paper presented at the 'Wireless World' workshop, University of Surrey, April 7th.

Cummings, J., Sproull, L., & Kiesler, S. B. (2001). Beyond hearing: Where real world and online support meet. forthcoming in.

Davis, A. David, R. (2002), The Experimental Methodology in Psychology. In: *Research Methods in Psychology* edited by Breakwell, Glynis.M./Hammond, Sean, London: Sage Publications, pp..

Davidson, K., Dickerson, J., & Dickerson, S. (2000). Who Talks: The social psychology of illness support groups. American Psychologists, 55(2), 205-217.

De Figueiredo, J. M. (2000). Finding sustainable profitability in electronic commerce. Sloan Management Review, 41(4), 41-52.

Denzin, N.K. (1970). *The Research Act in Sociology*, Aldine: Chicago.

Dix, A., Finlay, J., Abowd, G. and Beale, R. (1998). *Human-computer interaction.* Hemel Hempstead, UK: Prentice Hall.

Dix, A., Finlay, J., Abowd, G., and Beale, R., (2004), *Human-Computer Interaction*, 3rd edition (Prentice Hall).

Donner, J. (2005) *The Rules of Beeping: Exchanging Messages using Missed Calls on Mobile Phones in Sub-Saharan Africa.* Paper presented at the 55th Annual Conference of the International Communication Association: Questioning the Dialogue, New York.

Donner, J. (2005) 'The Social and Economic Implications of Mobile Telephony in Rwanda: An Ownership/Access Typology', in Glotz, P., Bertschi, S. and Locke, C. (eds.) *Thumb Culture. The Meaning of Mobile Phones in Society*, Transcript, Bielefeld, pp.89-100.

Ducheneaut, N. (2002). The social impacts of electronic mail in organizations: A case study of electronic power games using communication genres. *Information Communication and Society*, 5 (2), 153-188.

Dumas, J.S., and Redish, J.C., 1999, *A practical guide to usability testing*, 2nd edition (Intellect).

Dunphy, Dexter, and Jeannette Shi (1986) 'A comparison of enterprise management in Japan and the People's Republic of China'. Working Paper 86/016, Australian Graduate School of Management

Dwivedi, Y. (2005), 'Adoption, Usage and Impact of Broadband: UK Households', PHD Thesis, Brunel University. Retrieved December 20, 2005, from Brunel University Thesis.

Ellis, C. A., Gibbs, S. J., & Rein, G. L. (1991). Groupware: Some issues and experiences. Communications of the ACM, 34(1), 38-58.

Elwood-Clayton, B. (2005) 'The Lord is my Textmate. Folk Catholicism in the Cyber-Philippines', in Nyíri, K. (Ed.) *A Sense of Place. The Global and the Local in Mobile Communication*, Passagen Verlag, Vienna, pp.251-66.

Evers, V. and Day, D. 1997. The Role of Culture in Interface Acceptance.In Mende S. Howard, J. Hammond and G. Lindgaard, Proceedings of the Human Computer Interaction INTERACT'97 Conference (pp 260 – 267). Sydney: Chapman and Hall.

Goffman E. (1963) *Behaviour in Public Places. Notes on the Social Organization of Gatherings*. New York: Free Press.

Goodman, J. (2005). *Linking mobile phone ownership and use to social capital in rural South Africa and Tanzania*. Retrieved March 9, 2005, from http://www.vodafone.com/assets/files/en/AIMP_09032005.pdf

Graves, Desmond (1986) Corporate culture diagnosis and change: auditing and changing the culture of organizations. London: Frances Pinter.

Feenberg, A. (1993). Building a global network: The WBSI executive education experience. In L. Harasim (Ed.), *Global Networks: Computers and International Communication*. Cambridge, MA: MIT Press.

Fife-Schaw.,C (2002). *Introduction to Structural Equation Modelling*. (In: Breakwell, Glynis.M./Hammond, Sean. (eds.) *Research Methods in Psychology*. London: Sage Publications,. pp 158-174

Fidalgo, António José Silva dc Correia (1993) 'Comparative study in work-related values between Portuguese managcrs using the value survey module (VSM) designed by Hofstede (1980)'. Unpublished M. A. thesis, Fairleigh Dickinson University.

Fishman, J.A. 1978. "Interaction: The work women do." *Social Problems* 25:397 - 406.

Fitzgerald, W. (2004). Models for cross cultural communications for cross-cultural website design. NRC/ERB-1108. April 6,. 11 pages. NRC Publication Number: NRC 46563. http://iit-iti.nrc-cnrc.gc.ca/publications/nrc-46563_e.html.

Ford, G., Kotzé, P: Designing Usable Interfaces with Cultural Dimensions. INTERACT 2005: 713-726.

Forer, D. and Ford, G. 2003. User performance and user interface design: Usability heuristics versus cultural dimensions, in *Proceedings of the South African Computer Lecturer's Association*, June- July 2003.

Forss, Kim (1989) Comparative management in public administration, a pilot study of values and attitudes in two organizations. The Central Bureau of Statistics, The National Institute for Civil Service Training and Development and the National Tax Board.

Fortunati, L. (2000) *The Mobile Phone: New Social Categories and Relations*, Paper presented at the seminar 'Sosiale Konsekvenser av Mobiltelefoni', organised by Telenor, 16th June, 2000, Oslo.

Fox, S., Fallows, D., (2003). Internet Health Resources: Health searches and email have become more commonplace, but there is room for improvement in searches and overall Internet access. Pew Internet Research. Available at: http://www.pewinternet.org

Friedman, E. & Resnick, P. (2001) The Social Cost of Cheap Pseudonyms. *Journal of Economics and Management Strategy 10*, 2 pp. 173-199.

Gamos. (2003). *Innovative demand models for telecommunications services.* Retrieved December 23, 2004, from www.teafrica.org

Geser, H. (2005) 'Towards a Sociological Theory of the Mobile Phone', in Zerdick, A., Picot, A, Scrape. K., Burgleman, J-C, Silverstone, R., Feldmann, V., Wernick, C. and Wolff, C. (eds.) *E-Merging Media: Communication and the Media Economy of the Future*, Springer, Berling, pp.235-60. Also available at http://socio.ch/mobile/t_geser1.pdf

GrammePhone:http://www.gfusa.org/technology_center/village_phone/

Greif, I. (1988) *Computer-Supported Cooperative Work*, San Mateo, CA: Morgan-Kaufmann.

Grinter, R. E.; Eldridge, M. Y do tngrs lv 2 txt msg? Why "texting" became popular with teenagers. Proceedings of the Seventh European Conference on Computer Supported Cooperative Work (ECSCW); 2001 September 18-20; Bonn, Germany. Kluwer; 2001; 219-238.

Haddon, L. (2000) *The Social Consequences of Mobile Telephony: Framing Questions*, Paper presented at the seminar 'Sosiale Konsekvenser av Mobiltelefoni', organised by Telenor, 16th June, 2000, Oslo.

Hagel, J. I., & Armstrong, A. G. (1997). NetGain: Expanding markets through virtual communities. Boston: MA: Harvard Business School Press.

Hall,E.T (1976) *Beyond Culture.* Anchor Doubleday Press, Garden City, NY.

Hall, E. T. (1966). *The Hidden Dimension: Mens Use of Space in Public and Private.* London, Bodley Head.

Hall, E. T. (1959). *The Silent Language.* New York, Doubleday.

Hall, P., Lawson, C. and Minocha, S. (2003). Design Patterns as a Guide to the Cultural Localisation of Software, in Proceedings of the IWIPS 2003 conference, Berlin.

Han, Sung H. and S. W. Hong, "A systematic approach for coupling user satisfaction with product design", *Ergonomics*, Vol. 46(13/14), pp. 1441-1461, October 2003.

Hampton, K. N., and Wellman, B. (1999). Netville On-Line and Off-Line, American *Behavioral Scientist*, 43(3) p. 478-495.

Harris, M. (1987) *Cultural Anthropology*, Harper and Ross, 2nd edition.

Heerwegh, D., Vanhove, T., Matthijs, K., & Loosveldt, G., (2005). The effect of personalization on response rates and data quality in web surveys. International Journal of Social Research Methodology:Theory and Practice,8(2), pp.85-99.

Heller, L. (2004) Gift Giving in the Quiltmaking Community, *The Surfacing Journal, Spring* 2004, Canada

Hermeking, M. (2005). Culture and Internet consumption: Contributions from cross-cultural marketing and advertising research. *Journal of Computer-Mediated Communication, 11*(1), article 10.

Herring, S. (1992). Gender and participation in computer-mediated linguistic discourse. : ERIC Clearinghouse on Languages and linguistics (October).

Hickson, D. (1996) The ASQ Years Then and Now through the Eyes of a Euro-Brit. *Administrative Science Quarterly* 41, 2, 217-228.

Hiltz, S. R. (1998). Collaborative learning in asynchronous learning environments: Building learning communities. Paper presented at the WebNet 98 World Conference of the WWW, Internet and Intranet Proceedings, Orlando, Florida.

Hinckley, K., Pierce, J., Sinclair, M., Horwitz, E., (2000). Sensing techniques for mobile interaction. Symposium on User Interface Software and Technology (UIST), ACM, 91–100.

Hinton H. (1993) Reliability and validity of student evaluations: testing models versus survey research models. *PS: Polit. Sci. Polit.*;26:562–569.

Hinton, V.J., De Vivo, D.C., Fee, R., Goldstein, E., & Stern, Y.(2004). Investigation of poor academic achievement in children with Duchenne muscular dystrophy. Learning Disabilities Research and Practice, 19, 146–154.

Hoft, N. (1996). Developing a Cultural Model. In E del Galdo and J. Nielson (Eds.), *International User Interfaces*. New York: John Wiley and Sons.

Hofstede, G. (2001). 'Culture's Consequences'. Thousand Oaks: Sage Publications Second edition.

Hofstede, G. (1996) Riding the Waves of Commerce: A test of Trompenaars' 'Model' of National Cultural Differences. *International Journal of Intercultural Relations* 20, 2, 189-198.

Hofstede, Geert. 1994. *Cultures and organisations: software of the mind.* London. Harper-Collins Business. (paperback edition).

Hoftsede, G. (1991) Cultures and Organizations Software of the Mind intercultural Cooperation and its Importance for Survival. McGraw-Hill International. UK

Hofstede, G. (1980). 'Culture's Consequences: International Differences in Work-Related Values'.Beverly Hills, California: SAGE Publications.

Hong, S.W. Han, S. H., , Chan. A, (2002). Optimal balancing of product design features: a case study on mobile phones. Proceedings of the Human Factors and Ergonomics Society 46th(13/14), 1441-1461.

Honold, P., (1999). "Learning How to Use a Cellular Phone: Comparison Between German and Chinese Users," *Jour* Soc. Tech. Comm., Vol. 46, No. 2, May 1999, pp.. 196-205.

Hoppe, Michael H. (1990) 'A comparative study of country elites: international differences in work-related values and learning and their implications for management training and development'. Unpublished Ph.D thesis, University of North Carolina at Chapel Hill, NC.

Huff, S, and Syrcek, B. (1997)."Town Government in Cyberspace," in *Community Networks:Lessons from Blacksburg, Virginia*, A. Cohill and A. Kavanaugh (eds.), Artech House, Boston, pp. 72-87.

Huo. Paul Y.. and Donna M. Randall (1991) 'Exploring sub-cultural differences in Hofstede's value survey: the case of the Chinese'. *Asia Pacific Journal of Management* 8/2: 159-173.

Hyde, Lewis. (1983) The Gift : Imagination and the Erotic Life of Property. New York: Random House.

Ellis, Clarence, S.J. Gibbs, and G.L. Rein. 1991. Groupware: Some Issues and Experiences. *CACM* 34(1)(Jan):38-58

E-Tech Korea, http://www.etechkorea.info/articles/20030921001.php.

Evers, V. and Day, D. (1997). The Role of Culture in Interface Acceptance. In Mende S. Howard, J. Hammond and G.Lindgaard. In Proceedings of the Human Computer Interaction INTERACT'97 Conference (Sydney: Chapman and Hall) pp. 260 – 267.

Idowu, B., Ogunbodede, E., & Idowu, B. (2003). Information and communication technology in Nigeria: The health sector experience. *Journal of Information Technology Impact, 3*(2), 69-76.

Inkeles A, and D.J. Levinson, 1969. National character: the study of modal personality and sociocultural systems. In: The handbook of social Psychology, 2 nd edition, vol. 4, Lindsey and Aronson (eds), Reading MA: Addison-Wesley. Internetworldstats, Dec, (2006). www.Internetworldstats.com/stats.htm

ISO 13407 (1999), *Human-centred design processes for interactive systems.*

ISO 9241 (1998) 11, *Ergonomics of office work with VDTs - Guidance on usability.*

ITU-International Telecommunication Union (2004), Telecomworldwire 7 May (2004)-ITU reports increased mobile phone adoption in Africa(C)1994-2004 M2 COMMUNICATIONS LTD http://www.m2.com

ITU-International Telecommunication Union (2004), Social and Human Considerations for a more Mobile World. *Background Paper, ITU/MIC Workshop on Shaping the Future Mobile Information Society,* International Telecommunication Union (2004).

ITU–International Telecommunication Union (2003), World Telecommunication Development Report: *Access Indicators for the Information Society – Executive Summary, December*, ITU.

ITU- International Telecommunication Union (2002), Internet for a mobile generation. Geneva: ITU.

Jagne, J., Smith, S.G., Duncker, E. and Curzon, P. 2004. Cross-cultural Interface Design Strategy, Technical Report: IDC-TR-2004-006, Interaction Design Centre, Middlesex University.

Jarkko Oikarinen and Darren Reed. Internet Relay Chat Protocol. (1993). *Internet Network Working Group Request for Comments 1459.*

Joinson, A. N., Woodley, A., & Reips, U-R., (2007). *Personalization, authentication and self-disclosure in self-administered Internet surveys*. Computers in Human Behavior,23 pp.275-285.

Jones, Q. (1997). Virtual-communities, virtual-settlements and cyber-archaeology: A theoretical outline. Journal of Computer Mediated Communication, 3(3).

Kasesniemi, E. and Rautianen, P. (2002) 'Mobile Culture of Children and Teenagers in Finland', in Katz, J. and Aakhus, R. (eds) *Perpetual Contact: Mobile Communication, Private Talk, Public Performance*, Cambridge University Press, Cambridge.

Katz, J.E. and Sugiyama, S. (2005), "Mobile phones as fashion statements: Evidence from student surveys in the US and Japan", New Media and Society.

Katz, J. (2001) 'Do Machine Become Us?' in J. Katz (ed.) *Machines that Become Us: The Social Context of Communication Technology,* pp. 187-98. New Brunswick, NJ: Transaction Publishers.

Katz, J.E, & Aspden, P. (1997). A national of strangers? *Communication of ACM,* 40(12), 81-86.

Kelly, T., Minges M., & Gray, V. (2002) World Telecommunication Development Report: Reinventing Telecoms. Executive summary. Available at http://www.itu.int

Kidd, Jennifer M. (1982) 'Geert Hofstede: "Culture's consequences : international differences in work-related values" *'Journal of Occupational Psychology* 55/1: 70-71.

King, D. (2000) Four principles of Interpersonal Communication, http://www.pstcc.edu/facstaff/dking/interpr.htm

King, J., Grinter, R. and Pickering, J. (1997) "The Rise and Fall of Netville: The Saga of a Cyberspace Construction Boomtown in the Great Divide," in *Culture of the Internet*, S. Kiesler (ed.), Lawrence Erlbaum Associates, Mahwah, NJ, 1997, pp. 3-33.

Kirakowski, J. (1996) The software usability measurement inventory: Background and usage. In PW Jordan, B. Thomas, BA Weerdmeester and IL McClelland (Eds.), Usability evaluation in industry (pp. 169-178) London: Taylor and Francis.

Kirk, R. (1995) *Experimental Design Procedures for the Behavioural Sciences*. USA: Brooks/Cole Publishing Company.

Kitchenham, B.A., Pfleeger, S.L., Pickard, L.M., Jones, P.W., Hoaglin, D.C., El Emam, K., and Rosenberg, J. (2002). "Preliminary guidelines for empirical research in software engineering", *IEEE Transactions on Software Engineering*, vol. 28, no. 8, 721-734.

Kluckhohn, F. R. & Fred L. Strodtbeck. (1961) *Variations in Value Orientations*. New York, NY: Harper and Row.

Kluckhohn, D. The study of culture. In D. Lerner & H.D. Lasswell (Eds), (1951*).The Policy Sciences*.Stanford, CA: Stanford University Press.

Korman, Abraham K. (1985) 'Culture's consequences: international differences in work-related values'. *Journal of Occupational Behavior* 6/3: 243-244.

Kraut, R., Kiesler, S., Boneva, B., Cummings, J. N., Helgeson, V., & Crawford, A. M. (2002). Internet paradox revisited. Journal of Social Issues, 58, 49-74.

Kraut, R.E., Mukhopadhyay, T., Szczypula, J., Kiesler, S. and Scherlis, W. (1999) Communication and information: Alternative uses of the Internet in households. *Information Systems Research* 10, 4 pp. 287–303.

LaLomia, MJ, and Sidowski, JB. (1990) Measurements of computer satisfaction, literacy, and aptitudes: A review. International Journal of Human-Computer Interaction, 2(3), pp. 231-253.

Lasen, A. (2003) *The Social Shaping of the Fixed and Mobile Networks: A Historical Comparison*, paper for Digital World, http://www.surrey.ac.uk/Publications/Index.htm

Lasen, A. (2002) *A Comparative Study of Mobile Phone Use in Public Places in London, Madrid and Paris*, paper for Digital World, http://www.surrey.ac.uk/Publications/Index.htm
Laughlin, Z. (2001) Mobile Phone Users: A Small-Scale Observational Study, Retrieved November, 2 2006 from

http://www.aber.ac.uk/media/Students/zgl9901.html

Lazar, J., & Preece, J. (1999). Implementing Service Learning in an Online Communities Course. Paper presented at the Proceedings of the 1999 Conference of the International Association for Information Management.

Lea, M., O'Shea, T., Fung, P. & Spears, R. (1992). 'Flaming' in computer-mediated communication. In M. Lea, (Ed.), *Contexts of Computer-Mediated Communication.* London: Harvester-Wheatsheaf, pp. 89-112.

Lederach, John Paul 1995. *Preparing for Peace: Conflict Transformation Across Cultures*, New York, NY: Syracuse University Press.

Lee, J. Y. (1996). Charting the codes of cyberspace: A rhetoric of electronic mail. In L. Starte, R. Jacobson, & S. B. Gibson (Eds.), Communication and Cyberspace: Social Interaction in an Electronic Environment (pp.175-296). Cresskill NJ:Hampton Press.

Lenhart, A., Rainie, L. and Lewis, O. (2001) *Teenage Life Online: The Rise of the Instant Message Generation and the Internet's Impact on Friendships and Family Relationships*. Pew Internet and American Life Project. June 20, 2001. http://www.pewinternet.org/.

Leung, L. (2001). College student motives for chatting on ICQ. *New Media & Society, 3,* 483-500.

Levitt, M. & Mahowald, R.P. (2002). Worldwide email usage forecast, 2002-2006: Know what's coming your way. IDC 27975, September 2002.

Lewis, J. R. (2002). Psychometric evaluation of the PSSUQ using data from five years of usability studies. *International Journal of Human-Computer Interaction*, 14, 3-4, 463-488.

Lewis, J.R. (1995). IBM Computer Usability Satisfaction Questionnaires: Psychometric Evaluation and Instructions for Use. International Journal of Human-Computer Interaction, 7(1), 57-78.

Licoppe, C. and Heurtin J-P (2002) 'France: Preserving the Image', in Katz, J. and Aakhus, R. (eds) *Perpetual Contact: Mobile Communication, Private Talk, Public Performance*, Cambridge University Press, Cambridge, pp.99-108.

Light, A. (2003). Culture and Usability: Will Design Patterns ease Problems of Context?, in Usability News.http://www.usabilitynews.com/news/article1185.asp.

Likert, R. (1932) A technique for the measurement of attitudes. *Archives of Psychology*, No. 140.

Lin, M., & Sears, A. (2005). Chinese character entry for mobile phones: A longitudinal investigation. *Interacting with Computers, 17*(2), 121-146.

Ling, R. (2004). *The mobile connection: The cell phone's impact on society.* San Francisco: Morgan Kaufmann.

Ling, R., Yttri, B., (2002), Hyper-coordination via mobile phones in Norway, In James E, Katz & Mark A, Aakhus (Eds), *Perpetual contact: Mobile communication, private talk, public performance* (pp, 139-169), Cambridge: Cambridge University Press.

Ling, R. and Helmersen, P. (2000) *"It Must be Necessary, it has to Cover a Need": The Adoption of Mobile Telephony among Pre-adolescents and Adolescents*, Paper presented at the seminar 'Sosiale Konsekvenser av Mobiltelefoni', organised by Telenor, 16th June, 2000, Oslo. Available at http://www.telenor.no/fou/program/nomadiske/artikler.shtml

Ling, R. (2000) '"We will be reached": The Use of Mobile Telephony among Norwegian Youth', *Information Technology and People* Vol. 13, No.2.

Ling, R. (1998) "It's OK to be Available": The Use of Traditional and Mobile Telephony amongst Norwegian Youth, Paper presented to the XIV World Congress of Sociology, 'Social Knowledge: Heritage, Challenges, Prospects', Montreal, 26th July – 1st August.

Lofland, J., and Lofland, L.H. (1995). Analyzing Social Settings: A Guide to Qualitative Observation and Analysis, 3rd Ed. Belmont, CA: Wadsworth.

Love, S. (2005) Understanding Mobile Human-Computer interaction. Elesvier Blueworth Heinemann, London.

Love, S. and Perry, M. (2004). Dealing with mobile conversations in public places: some implications for the design of socially intrusive technologies. Proceedings of CHI 2004, Vienna, 24-29 April, ACM 1-58113-703-6/04/2004..

Love, S. (2001). Space invaders: Do mobile phone conversations invade people's personal space? In Human factors in telecommunication. Nordby, K. (ed.) Bergen, Human Factors in Telecommunications.

Lowe, Sid (1994) Hermes Revisited. Paper for the ISPAB Conference, Bangkok.

Lowe, E. A.(1981) 'Culture's consequences: international differences in work-related values'. *Journal of Enterprise Management* 3/3: 312.

Maguire, M (2001), 'Context of use within usability activities', *International Journal of Human-Computer Studies,* vol. 55, no. 4, pp. 453–483.

Maitland, C., & Bauer, J. (2001). National level culture and global diffusion: The case of the Internet. In C. Ess (Ed.), *Culture*, Technology, Communication: Towards an Intercultural Global Village (pp.. 87-120). Albany, NY: State University of New York Press.

Mackay, W. E. and Fayard, A.-L. (1997) HCI, Natural Science and Design: A Framework for Triangulation Across Disciplines *DIS "97 Amsterdam* ACM Press 223 – 234

Maldonado, Ernest Montez (1983) 'Mexican-American participation in law enforcement in California. Law enforcement the impact of cultural related value differences'. Unpublished Ph.D thesis, Claremont Graduate School, Claremont.

Marcus,Aaron, and Baumgartner, Valentina-Johanna. (2004b). "A Practical Set of Culture Dimension for Evaluating User-Interface Designs" in *Proceedings*, Sixth Asia-Pacific Conference on Computer-Human Interaction (APCHI 2004), Royal Lakeside Novotel Hotel, Rotorua, New Zealand, 30 June-2 July , 252-261.

Marcus, A. and Gould, E.W. (2000). Crosscurrents: cultural dimensions and global Web user-interface design.Interactions, 7(4): 32-46.

Masaki, Y. (2002). Intergroup Comparison versus Intragroup Relationships: A cross-cultural examination of social identity theory in north american and east Asian cultural contexts. *Social Psychology Quarterly*, Vol. 66, No. 2, Special Issue: Social Identity: Sociological and Social Psychological Perspectives (Jun., 2003), pp. 166-183

Massey, A.P., Hung, Y.C., Montoya-Weiss, M. and Ramesh, V. (2001). When culture and style aren't about clothes:perceptions of task-technology 'fit' in global virtual teams , in Proc. 2001 International ACM SIGGROUP Conf. on Supporting Group Work Boulder, Colorado, USA, pp 207 - 213 ACM Press New York, NY, USA

Masters, K. (2005, 28-30 April). *Low-key m-learning: A realistic introduction of m-learning to developing countries.* Paper presented at the Sixth Conference on Communications in the 21st Century: Seeing, Understanding, Learning in the Mobile Age, Budapest.

Mathews, J., (2001): Cell Phones on Campus Advocated. Los Angeles Times, Sept. 30.

Mauss, M. (1997): *The Gift: The Form and Reason for Exchange in Archaic Societies.* London:Routledge.

McCoy, S. 2003. 'Integrating National Cultural Into Individual IS Adoption Research: The Need for Individual Level Measures'. Ninth Americas Conference on Information Systems, USA.

McWilliam, G. (2000). Building stronger brands though online communities. Sloan Management Review, Spring, 43-54.

McWilliams, G. (2000). Building stronger brands through online communities. Sloan Management Review, 41(3), 43-54.

Merker, Stephen (1982) 'Geert Hofstede: "Culture's consequences"'. Behavioral Science 27/2: 195-197.

Mobileafrican (2006) retrieved Nov. 2006 http://www.mobileafrica.net/n1279.htm

Mooij, M. K. (2004). *Consumer Behavior and Culture: Consequences for Global Marketing and Advertising.* Thousand Oaks, CA: Sage.

Mooij, M. (2003) *Consumer Behavior and Culture. Consequences for Global Marketing and Advertising,* Thousand Oaks, CA: Sage Publications Inc.
Eurobarometer 55 and The Young Europeans (2001) Brussels: European Commission Directorate.

Mooij, M. (2002). Convergence and divergence in consumer behavior: implications for international retailing. *Journal of Retailing*, 78, 61-69.

Moon, J. Y., & Sproull, L. (2000). Essence of distributed work: The case of Linux kernel. *First Monday, 5*(11).

Moore, G. C. and I. Benbasat 'Development of an instrument to measure the perceptions of adopting an information technology innovation' Information Systems Research Vol 2 No 3 (1991) pp 173-191.

Moyal, A. (1992)."The gendered use of the telephone: An Australian case study." *Media Culture and Society* 14:51-72.

Müller, S., & Gelbrich, K. (2004). *Interculturelles Marketing*. München: Vahlen.

Murtagh G.M. (2001): "Seeing the "rules": preliminary observations of action, interaction and mobile phone use". In: Brown, B. / Green, N. / Harper, R. (eds): *Wireless World. Social and Interactional Aspects of the Mobile Age*, London: Springer-Verlag, pp.. 81-91.

Mutula, S. M. (2002). The cellular phone economy in the SADC region: Implications for libraries. *Online Information Review, 26*(2), 79-91.

Mwanza, D. (2002). Towards an Activity-Oriented Design Method for HCI Research and Practice, The Open University, United Kingdom.

Nardi, B.A., Whittaker, S. and Bradner, E., (2000) Interaction and Outeraction: Instant Messaging in Action. In *Proceedings of ACM Conference on Computer Supported Cooperative Work (CSCW)*, (Philadelphia, PA), New York, N.Y.: ACM Press, 79-88.

Nasa-Ames Research Center, Human Performance Group (1986) Collecting NASA Workload Ratings: A Paper-and-Pencil Package. Moffet Field, CA: NASA-Ames Research Center.

Nielsen NetRatings (2002). Instant messaging used by more than 41 million home Internet surfers. Retrieved February 1, 2003, from http://www.nielsen-netratings.com/pr/pr_020617.pdf

Nocera, J.A & Hall, P. (2003). 'Making sense in intercultural software implementation'. Culture and HCI: Bridging the Cultural and Digital Divides.

Norman H. NIE D. Sunshine Hillygus (2002) The Impact of Internet use on Socialbility : Time Diary Findings, IT&SOCIETY, Volume 1, Issue 1, Summer 2002, PP.. 1-20 http://www.ITandSociety.org

Obadare, E. "The Alternative Genealogy of Civil Society and its Implications for Africa: Notes for Further Research" *Africa Development*, Vol. XXIX, Number 4, 2004, pp. 1-19

Oksman and Rautiainen (2003) Extension of the hand: Chldren's and teenager's relationship with the mobile phone in Finland. In Fortunati, L., Katz, J.E., and Riccini, R. (eds), *Mediating the human body: Technology communication and fashion.* Lawrence Erlbaum, Mahwah, NJ, pp.103-112.

Oksman, V., Malinen, S., Utriainen, A., Rautiainen, P.,Liikala, H. (2001) *Mobile Communication Culture of Children and Teenagers in Finland.* A research project based on qualitative fieldwork 1997-2001, University of Tampere.

Oyeyinka -. Oyelaran, B, and, Adeya Nyaki. (2004), Internet access in Africa: empirical evidence from Kenya and Nigeria, *Telematics and informatics*, 21, (1), PP. 67-81.

Palen, L. *Mobile Telephony in a Connected Life.*(2002) Communications of the ACM, 45(3), 78-82.

Palen, L., Salzman, M., and Youngs, E. (2000) *Going Wireless:Behaviour and Practice of New Mobile Phone Users.* Proceedings of the Conference on Computer Supported Cooperative Work (CSCW'00), 201-210.

Patton, M.Q. (1990): Qualitative evaluation and research methods, second edition. Sage.

Peacock, S., Hooper, J., (2007). E-learning in physiotherapy education. Physiotherapy, 93pp.218-228

Pew Internet and American Life project, (2005). Available online at: /http://www.pewinternet.org/pdfs/PIP_Spyware_Report_July_05.pdfS, accessed on August 22, 2006.

Pew Internet & American Life Project April (2004, p.3). *55% of adult internet users have broadband at home or work.* Pew Internet Project Data Memo. Available at http://www.pewinternet.org

Plant, S. (2002) On the Mobile: The Effects of Mobile Telephones on Social and Individual Life. Motorola, London. Available at http://motorola.com/mot/doc/0/267_MotDoc.pdf

"Pope Delivers Daily Message by Text", Scotsman.com, (2003), 2 December, http://news.scotsman.com/latest.cfm?id=2327608

Pooyam, Abdullah (1984) 'Acculturation, acculturative stress and their relationships to both work and non-work outcomes'. Unpublished Ph.D Management Science, University of Texas at Dallas.

Potter, J. and Wetherell, M. (1987): Discourse and social psychology: beyond attitudes and behaviour. Sage

Preece, J. and Diane Maloney-Krichmar (2003) Online Communities. In J. Jacko and A. Sears, A. (Eds.) Handbook of Human-Computer Interaction, Lawrence Erlbaum Associates Inc. Publishers. Mahwah: NJ.

Preece, J, Rogers, Y.R., Sharp, H., (2002), *Interaction Design: Beyond Human-Computer Interaction* (JohnWiley and Sons).

Preece, J. (2000). Online Communities: Designing Usability, Supporting Sociability. Chichester, England: John Wiley & Sons.

Preece, J. (1999a). Empathic communities: Balancing emotional and factual communication. Interacting with Computers, 12, 63-77.

Preece, J. (1998). Empathic Communities: Reaching out across the Web. Interactions Magazine, 2(2), 32-43.

Preece, J., & Ghozati, K. (1998). In search of empathy online: A review of 100 online communities. Paper presented at the Proceedings of the 1998 Association for Information Systems Americas Conference, Baltimore, USA.

Preece, J., Rogers, Y., Sharp, H., Benyon, D. (1994). *Human-Computer Interaction.* Essex, UK: Addison-Wesley Longman Ltd.

Punnett, Betty Jane, and Siri Withaney 1988a,b,c, (1988a, 1988b, 1988c) 'Testing the validity of Hofstede's value indices'.Unpublished Paper, University of Windsor.

Puro, Jukka-Pekka (2002): Finland: a mobile culture. (In: Katz, James E. / Aakhus, Mark A. (eds.):Perpetual Contact. Mobile Communication, Private Talk, Public Performance.Cambride University Press Cambridge 2002.

US. Department of Commerce (2002) A Nation Online: How Americans Are Expanding Their Use of the Internet. U.S. Government Printing Office, Washington, D.C.

Rainie, L., & Packel, D. (2001). More online, doing more. Pew Internet & American Life Project. [online]. Available: http://www.pewinternet.org/reports
Rakow, L.F. and Navarro, V. (1993) "Remote mothering and the parallel shift: Women meet the cellular telephone." *Critical Studies in Mass Communication* 10:144-157.

Rautiainen, P. and Kasesniemi, E.-L. (2000): 'Mobile communication of children and teenagers: case Finland 1997-2000', in R. Ling and K. Thrane (eds.): *Proceedings of the Workshop on "The social consequences of mobile telephony: the proceedings from a seminar about society, mobile telephony and children"*, Oslo.

Redding, C.(1982) Unpublished personal communication to Hofstede (Bosland 1985:13).

Reid, E. (1993). Electronic Chat: Social Issues on Internet Relay Chat. Media Information Australia, 67, 62-70.

Rheingold (2002), Smart Mobs, The Next Social Revolution, Cambridge MA: Perseus Publishing.

Rheingold, H. (1994). A Slice of Life in My Virtual Community. In L. M. Harasim (Ed.), *Global Networks: Computers and International Communication* (pp.. 57-80). Cambridge: MA: MIT Press.

Rheingold, H. (1993). The Virtual Community. Homesteading on the Electronic Frontier. Reading, MA: Addison-Wesley Publishing.

Rice, R. E. (2001). The Internet and Health Communication: A Framework of Experiences. In R. E. Rice & J. E. Katz (Eds.), The Internet and Health Communication: Experiences and Expectations (pp. 5-46). Thousand Oaks, CA: Sage Publications.

Rivera, K., Cooke, N & Bauhs, J. (1996) The Effects of Emotional icons on Remote Communication, *CHI'96* (Interactive Poster).

Riviere, C. A., & Licoppe, C. (2005). From voice to text: Continuity and change in the use of mobile phones in France and Japan (pp 103-126). In R. Harper (Eds.), *The Inside Text: Social Perspectives on SMS in the Mobile Age*. London: Springer-Verlag.

Robinson, J. P., Kestnbaum, M., Neustadtl A., and Alvarez, A. (2001). Information Technology, the Internet and Time Displacement. Revision of paper presented at the Annual Meetings of the American Association of Public Opinion Research in Portland.

Robinson, R.V (1983), "Geert Hofstede: culture's consequences", *Work and Occupations,*.10:110-5.

Robson, C., (2002), *Real World Research* (Oxford: Blackwell Publishing).UK

Robson, C. (1993) *Real World Research: A Resource for Social Scientists and Practitioner-Researchers*. Blackwell.

Rose, G.M., Evaristo, R., and Straub, D. (2003) Culture and Consumer Responses to Web Download Time: A Four-Continent Study of Mono-and Polychronism. IEEE Transactions on Engineering Management, 50, 1, 31-44.

Rose, Michael (1986) 'Geert Hofstede: "Culture's consequences". *Journal of Economic Psychology* 7/2: 249-256.

Rosenthal, C. (1985). "Kinkeeping in the familial division of labor". *Journal of Marriage and the Family* 47:965-974.

Rozmovits, L., Ziebland, S., 2004. What do patients with prostate or breast cancer want from an Internet site? A qualitative study of information needs. Patient Education and Counselling 53, 57–64.

Ruopp, R., & Haavind, S. (1993). From current practice to projects. In R. Ruopp, S. Gall, B. Drayton, & M. Pfister(Eds.), LabNet: Toward a community of practice (pp. 21–57). Hillsdale, NJ: Lawrence Erlbaum Associates.

Rust, J., and Golombok, S., (1989), *Modern Psychometrics: The science of psychological assessment* (Routledge: London and New York).

Salmon, G. (2000). *E-Moderating: The key to teaching and learning online.* London: Kogan Page Limited.

Salustri, F. (2003). *Brainstorming, Design Notes.* Available Online at: http://deed.megan.ryerson.ca/~fil/t/brainstorm.html (Accessed: 6/11/2003).

Samuel, J., Shah, N., & Hadingham, W. (2005). *Mobile communications in South Africa, Tanzania, and Egypt: Results from community and business surveys.* Retrieved March 9, 2005, from http://www.vodafone.com/assets/files/en/AIMP_09032005.pdf

Sander, W., Pinhey, T., (1974) The Conduct of Social Research CDS College Publishing. New York.

Sattle, J. W (1976). "The inexpressive male: Tragedy or sexual politics." *Social Problems* 23:469-477.

Sauro, J. Kindlund, E. (2005) A Method to Standardize Usability Metrics Into a Single Score. In Proceedings of CHI 2005, (Portland, Oregon, USA), pp.. 401 - 409

Seddon, J. (1983) Unpublished personal communication to Hofstede (Bosland 1985: 11, 17).

Sennett R (1992) *The Fall of Public Man*, New York, Norton

Shulha, L., & Wilson, R. J. (2003). Collaborative mixed-methods research. In A. Tashakkori, & C. Teddlie (Eds.), Handbook of mixed methodology, (pp. 639–670). Newbury Park: Sage.

Sillence, Elizabeth, Briggs (2007): *Please advise: Using the internet for health and financial advice.* Computers in Human behaviours, 23 (1) pp.727-748

Sillence, Elizabeth, Briggs, Pam, Harris, Peter and Fishwick, Lesley (2006): *A framework for understanding trust factors in web-based health advice.* In International Journal of Human-Computer Studies, 64 (8) pp. 697-713

Sesay, B.-B. (2005). *From guns to mobile phones: Calling for change in Sierra Leone*. RetrievedMay 10, 2005, from http://www.panos.org.uk/newsfeatures/featuredetails.asp?id=1180

Schooler, Carmi (1983) 'Culture's consequences'. Contemporary Sociology; *A Journal of Reviews* 12/2: 167.

Schwartz, B. (1967): The Social Psychology of the Gift. American Journal of Sociology, vol. 73, no.1, pp.. 1–11.

Schiano, D.J., Chen, C.P., Ginsberg, J., Gretarsdottir, U., Huddleston, M. and Isaacs, E., (2002) Teen Use of Messaging Media. In Proceedings of ACM Conference on Human Factors in Computing Systems CHI '02, (Minneapolis, MN,), New York, NY: ACM Press, 594-595.

Schuler, D. (1994). New community networks: wired for change, Addison - Wesley.

Siala, H. O'Keefe, R. Hone, K. (2004) The Impact of Religious Affiliation on Trust in the Context of Electronic Commerce. *Interacting with Computers,* Volume 16, (2004) 7-27

Shackleton, Viv. J., and Abbas H. Ali (1990) 'Work-related values of managers: ,test of the Hofstede model'. Journal of Cross-Cultural Psychology 21/1 109-118.

Sheridan, T.B., Charney, L., mendel, M.B., and Roseborough, J.B., 1986, Supervisory control, mental models, and decision aids. *MIT Department of mechanical Engineering technical report* (Massachusetts Institute of Technology, Cambridge, MA).

Smith A., Dunckley, L., French, T., Minocha, S. and Chang, Y. (2004). A Process Model for Developing Usable Cross-Cultural Websites. *Interacting with Computers*, 16: 63–91.

Smith, A. and Chang, Y. (2003). Quantifying Hofstede and Developing Cultural Fingerprints for Website Acceptability, In *Proceedings Of The IWIPS 2003 Conference*, Berlin, Germany, July 2003, V. Evers, K. Röse, P. Honold, J Coronado, D.L. Day, Eds. University of Kaiserslautern.

Smith, A., French, T., Chang, Y. & McNeill, M. (2001). 'eCulture: A comparative study of eFinance web site usability for Chinese and British users'. Designing for global markets. Conference (6th.). Proceedings of the third international workshop on internationalisation of products and systems. Edited by D. Day & L. Duckley. Buckinghamshire: The Open University. p.87-100.

Søndergaard, M. (1994) Research Note: Hofstede's Consequences: A Study of Reviews, Citations and Replications. *Organization Studies* 15, 3, 447-456.

Sorge, A (1983), "Culture's consequences", *Administrative Science Quarterly*, pp.625-629.

Spears, R., Lea, M., & Lee, S. (1990). De-individuation and group polarization in computermediated communication. *British Journal of Social Psychology*, 29, 121-134.

Sproull, L., & Faraj, S. (1997) Atheism, sex, & databases.In *Culture of the Internet. Ed. Kiesler S.*, Lawrence Erlbaum Ass. Mahwah, New Jersey.

Sproull, L., & Keisler, S. (1986). Reducing social context cues; Electronic mail in organizational communication. Management Science, 32, 1492-1512.

Stone, A., Lynch, K., & Poole, N. (2003). *A case for using mobile internet and telephony to support community networks and networked learning in Tanzania.* Paper presented at the ICOOL 2003 - International Conference on Online and Open Learning.

Straub, D., Boudreau, M-C. and Gefen, D. (2004). Validation guidelines for IS positivist research. Communications of the Association for Information Systems, 13, 380-427.

Straub, D., Keil, M. and Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study, *Information and Management, Vol. 33, No. 1*, pp. 1-11.

Sun, H. (2003) Exploring Cultural Usability: A Localization Study of Mobile Text Messaging Use. Paper presented at the CHI 2003, Ft. Lauderdale, FL.

Swartz, K., (2003) Style Ranks High in Cell phone Design. *Knight Ridder/Tribune Business News*, 10, November, 2003. Retrieved on 27, April, 2004 from InfoTrac Database ITEM03314009.

Uslaner, Eric. (2000) "Trust, Civic Engagement, and the Internet." Paper presented at the Joint Sessions of the European Consortium for Political Research. Workshop on Electronic Democracy: Mobilisation, Organisation, and Participation via New ICTS, University of Grenoble.

Tannen, D. (1990). You Just Don't Understand. Men and Women in Conversation. New York: William Morrow and Co. Ltd.

Tannen, D. (1994). Talking from 9 to 5. New York: William Morrow and Company, Inc.

Tannen, D. (1991) You Just Don't Understand: *Men and Women in Conversation.* London:Virago.

Taylor, A. S., and Harper, R. (2003). The gift of the gap: a design oriented sociology of young people's use of mobiles. *Journal of Computer Supported Cooperative Work (CSCW)*, 12(3),267-296.

Telecom paper (2007) Global mobile phone sales up 21.3 percent in 2006 Retrieved March, 29, 2007, from http://www.telecom.paper.nl/news/article.aspx?id=159716&nr=

Tella, S. & Mononen-Aaltonen, M. (2000). Towards Network-Based Education: A Multidimensional Model for Principles of Planning and Evaluation.

Tella, S. (ed.) (2000). Media, Mediation, Time and Communication: Emphases in Network-Based Media Education. Media Education Centre. Department of Teacher Education. University of Helsinki. Media Education Publications 9.

The British Psychological Society, (1993), Code of Conduct, Ethical Principles and Guidelines.

The Japan Times Online. (2002). *Laws urged to curb mobile phone scams, spam.* Retrieved March 1, 2005, from http://www.japantimes.co.jp/cgi-bin/getarticle.pl5?nn20021226b6.htm

The New York Times (2005) Cellphones Catapult Rural Africa to 21 st Century. RetrievedAugust 25, 2005, from http://www.nytimes.com/2005/08/25/international/africa/25africa.html

The Worldbank Report (2004) retrieved February 3, (2006) from http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTWDRS/EXTWDR2004/0,,menuPK:477704~pagePK:64167702~piPK:64167676~theSitePK:477688,00.html

Thurlow, Crispin & Brown, Alex. (2003). *Generation Txt? The sociolinguistics of young people's text-messaging.* Discourse Analysis Online.

TNS. (2002). Wireless and Internet Technology Adoption by Consumers Around the World. Accessed March 20, 2004 at www.tns-global.com

Townsend 2000 "Life in the Real-Time City: Mobile Telephones and Urban Metabolism." Journal of Urban *Technology.* (7)2:85-104. 2000. It is based upon work supported by the National Science Foundation under Grant No. SBR-9817778, "Information Technology and the Future of Urban Environments". (http://www.informationcity.org)

Treichler, P.A., and Kramarae, C. (1983). "Women's talk in the ivory tower." *Communication quarterly* 31, 2:118- 132.

Triandis, H.C. Review of Geert Hofstede (1982) "Culture's consequences". *Human Organization,* 41, 86-90.

Trompenaars, F. and Hampden-Turner, C. (1993). *Riding the Waves of Culture.* London: Brealey

Turkle, S. (1999). 'Looking toward cyberspace: beyond grounded sociology.

Cyberspace and identity'. *Contemporary Sociology* ,Vol. 28, No. 6. 643-667.

Turkle, Sherry (1995) *Life on the Screen: Identity in the Age of the Internet.* New York, NY: Simon & Schuster.

Tylor, Edward B. (1871). *Primitive Culture.* New York: Harper.

Useem, J., Useem, R. and Donghue, J. (1963) 'Men in the middle of the third culture', *Human Organizations,* 22(3):169-179.

Vaananen-Vainio-Mattila, K. & Ruuska, S. (2000). Designing mobile phones and communicators for consumers 'needs at Nokia. In: E.Bergman (Ed.), *Information appliances and beyond: interaction design for consumer products* (pp. 169-204). San Francisco: Morgan Kaufman

Vasgar, J. (2005) 'Talk is cheap, and getting cheaper' *Guardian Unlimited Special reports,* 15 September *retrived on January 2006*
http://www.guardian.co.uk/hearafrica05/story/0,15756,1569470,00.html
Wallace, P. (1999). The Psychology of the Internet. Cambridge: Cambridge University Press.

Walther, J. B. (1996). Computer-mediated communication: Impersonal, interpersonal and hyper personal interaction. *Communication Research*, 23, 1-43.

Walther, J. B. (1997). Group and interpersonal effects in international computer-mediated collaboration. *Human Communication Research*, 23, 342–369.

Wang, Y.D., Emurian, H.H., (2005). *An overview of online trust: concepts, elements and implications.* Computers in Human Behavior 21, pp.105–125.

Warner, Malcolm (1981) 'Culture's consequences'. *Journal of General Management* 7/1: 75-78.

Wei. C. "Language and the Internet in Uzbekistan, (2004) " in *Proceedings of the Fourth Conference on Cultural Attitudes Toward Technology and Communication (CATaC '04),*Karlstad, Sweden, pp.. 393-96.

Wellman, B. (2001b). Physical Place and Cyber-Place: Changing Portals and the Rise of Networked Individualism, *International Journal for Urban and Regional Research,* 25(2), p. 227-252.

Wellman, B. (2000). Changing Connectivity: A Future History of Y2.03K, *Sociological Research Online.* 4(4):
http://www.socresonline.org.uk/4/wellman.html

Wenger, E. (1998) 'Communities of Practice. Learning as a social system', *Systems Thinker,* http://www.co-i-l.com/coil/knowledge-garden/cop/lss.shtml. Accessed December 30, 2002.

Westwood, R. G., and J. E. Everett (1987) 'Culture's consequences: a methodology

for comparative management studies in Southeast Asia' *Asia Pacific Journal of Management* 4/3: 187-202.

Whittaker, S., Issacs, E., & O'Day, V. (1997). Widening the net. Workshop report on the theory and practice of physical and network communities. SIGCHI Bulletin, 29(3), 27-30.

Williams, R. L., & Cothrel, J. (2000a). Four smart wasys to run online communities. Sloan Management Review, Spring, 81-91.

World telecommunication Report (2002). Retrieved 3, March 2006 from http://www.itu.int/ITU-D/ict/publications/wtdr_02/

Yeh, Ryh-song (1988) 'Values of American, Japanese and Taiwanese managers in Taiwan: a test of Hofstede's framework'. 48th Annual Meeting of the Academy of Management, Anaheim. Academy of Management Best Papers Proceedings.

Yu, L. and T.H. Tng (2003) 'Culture and Design for Mobile Phones in China', in J. Katz (ed.) *Machines that Become Us: The Social Context of Communication Technology,* pp. 187-98. New Brunswick, NJ: Transaction Publishers.

Zijlstra, F.R.H. (1993) Efficiency in Work Behaviour: a Design Approach for Modern Tools. Delft: Delft University Press.

:: APPENDIX 1

Questionnaire used for Study 1

Background information

Thank you for agreeing to take part in this study. I am interested in how culture may affect the way people use their mobile phones. The information you provide will be anonymous and confidential.

ID:

Age:

Gender:

Period of residence in the country:

☐0-5 years ☐6-14 years ☐15+ years

Occupation:

1).Which brand of mobile phone do you have?

☐Nokia ☐Motorola ☐ Samsung ☐Other please specify

2). Why did you choose this brand?

☐ Cost effective ☐ Reliable ☐ Easily maintained ☐All of these ☐

Other

Please explain

3). What type of mobile contract do you have?

☐ Monthly contract ☐ Pay as you go

4). Do you pay your mobile phone bill?

☐ Yes ☐ No

If No who pays the bill? Does this affect the way you use your mobile phone

5). Which form of mobile phone communication do you use the most?

☐ Phone calls ☐ Missed calls (*calling someone and hanging up intentionally before the recipient can pickup the mobile phone*) ☐ Text messaging

Please give reasons for your answer

6). How many mobile phone calls do you make per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

7). How many mobile phone calls do you receive per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

Use of mobile phones in public places

8).How comfortable would you feel about using a mobile phone in the following places:

I would be comfortable using my mobile phone in restaurant

☐ Very comfortable ☐ Comfortable ☐ Neutral ☐ Uncomfortable ☐ Very uncomfortable

I would not be comfortable using my mobile phone on public places

☐ Very comfortable ☐ Comfortable ☐ Neutral ☐ Uncomfortable ☐ Very uncomfortable

I would be comfortable using my mobile phone when walking down the street

☐ Very comfortable ☐ Comfortable ☐ Neutral ☐ Uncomfortable ☐ Very uncomfortable

Please state your response to the following statements:

9) Mobile phones should be switched off in places of worships:

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree

10) Mobile phones should not be switched off during meetings:

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree

11) Mobile phones should be switched off in schools during classes:

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree

Design Features

12).Would you like to have a camera in your mobile telephone?

☐ Yes ☐ No

If Yes why? Please give reasons for your answer

If No why? Please give reasons for your answer

Please state your response to the following statements:

13). Increasing the capacity of text message not to include more than 160 characters for each text message is not important:

☐Strongly agree ☐ Agree ☐ Undecided ☐Disagree ☐ Strongly disagree

14). Improving mobile phone memory capacity to store more text messages is a good idea.

☐Strongly agree ☐ Agree ☐ Undecided ☐Disagree ☐ Strongly disagree

In some cultures caller display service is not freely provided. In light of this please answer the following questions:

15).Do you think having a mobile phone caller display service is important?

☐ Yes ☐ No

Please give reasons for your answer:

16).Would you pay to have a mobile phone caller display service?

☐Yes ☐No

Please give reasons for your answer:

Missed calls

In some culture mobile missed calls are used as a form of communication in light of this please tick the answer that agrees most with your view:-

17).What do you use mobile phone missed calls for?

☐ To request a call back

☐ Socially to communicate with others

☐ As a reminder for prior arrangement

☐ To draw the recipient's attention to a sent message

☐ To check the availability of the mobile's recipient before sending a text message

☐ To reply back for a missed call

☐ As an emotional gift just to say "Hi"

☐Others Please specify

☐ Never use your mobile phone to make a missed call

18). Which form of the mobile phone missed calls mentioned above do you use most and why?

19). How many mobile phone missed calls do you make per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

20). How many mobile phone missed calls do you receive per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

Text messages

21). What do you use mobile phone text messaging for?

☐ Social

Please explain

☐ Business

Please explain

☐ Others

Please specify

22). How many mobile phone text messages do you send per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

23).Do you feel that mobile text messages can replace face to face contact.

☐ Yes ☐ No

Please give reasons for your answer

24). Would you please list the four easiest functions to use on your mobile phone?

25). Would you please list the four most difficult functions to use on your mobile phone?

:: APPENDIX 2

Modified Computer System Usability Questionnaire used for Experiments 2 and 3

Please kindly fill in this Questionnaire:

ID:.....
Age:.....
Gender: ☐ Male ☐ Female
Occupation:.....
What type of mobile contract do you have?
☐ Monthly contract ☐ Pay as you go

Task A: Placing Missed Calls

1.	It was easy to use the icon-based missed call service to send a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
2.	I have not enjoyed making a missed call from the icon-based missed call service	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
3.	During the process of making a missed call if I make a mistake I recover quickly	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
4.	Organization of information related to sending a missed call is not clear on the screen.	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
5.	I like using the icon-based missed call service to make a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
6.	The icon-based missed call service has not got all the functions I expect it to make a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
7.	Overall, I am satisfied with the icon-based missed call service in relation to making a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐

	It was easy to use the icon-based missed call service to receive a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
	I have not enjoyed receiving a missed call from the icon-based missed call service	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
	During the process of receiving a missed call if I make a mistake I recover quickly	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
	Organization of information related to receiving a missed call is not clear on the screen.	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
	I like using the icon-based missed call service to receive a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
	The icon-based missed call service has not got all the functions I expect it to recieve a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
	Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
			1	**2**	**3**	**4**	**5**	**6**	**7**		**NA**

List the most **negative** aspect(s) the missed call service:

1. _____
2. _____
3. _____

List the most **positive** aspect(s) the missed call service:

4. _____
5. _____
6. _____

:: APPENDIX 3

Questionnaire used for pilot Study One

Background information

Thank you for agreeing to take part in this study. I am interested in how culture may affect the way people use their mobile phones. The information you provide will be anonymous and confidential.

ID:

Age:

Gender:

Period of residence in the country:

☐0-5 years ☐6-14 years ☐15+ years

Occupation:

1).Which brand of mobile phone do you have?

☐Nokia ☐Motorola ☐ Samsung ☐Other please specify

2). Why did you choose this brand?

☐ Cost effective ☐ Reliable ☐ Easily maintained ☐All of these ☐

Other

Please explain

3). What type of mobile contract do you have?

☐ Monthly contract ☐ Pay as you go

4). Do you pay your mobile phone bill?

☐ Yes ☐ No

If No who pays the bill? Does this affect the way you use your mobile phone

5). Which form of mobile phone communication do you use the most?

☐ Phone calls ☐ Missed calls (*calling someone and hanging up intentionally before the recipient can pickup the mobile phone*) ☐ Text messaging

Please give reasons for your answer

6). How many mobile phone calls do you make per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

7). How many mobile phone calls do you receive per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

Use of mobile phones in public places

8).Does the use of mobile telephones in public places disturbs you?

☐ Yes ☐ No

Please give reasons for your answer

9).How comfortable would you feel about using a mobile phone in the following places:

I would be comfortable using my mobile phone in restaurant

☐ Very comfortable ☐ Comfortable ☐ Neutral ☐ Uncomfortable ☐ Very uncomfortable

I would not be comfortable using my mobile phone on public transport

☐ Very comfortable ☐ Comfortable ☐ Neutral ☐ Uncomfortable ☐ Very uncomfortable

I would be comfortable using my mobile phone when walking down the street

☐ Very comfortable ☐ Comfortable ☐Neutral ☐Uncomfortable ☐ Very uncomfortable

Please state your response to the following statements:

10) Mobile phones should be switched off in places of worships:

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree

11) Mobile phones should not be switched off during meetings:

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree

12) Mobile phones should be switched off in schools during classes:

☐ Strongly agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree

Design Features

13).Would you like to have a camera in your mobile telephone?

☐ Yes ☐ No

If Yes why? Please give reasons for your answer

If No why? Please give reasons for your answer

Please state your response to the following statements:

14). Increasing the capacity of text message to include more than 160 characters for each text message is not important:

☐Strongly agree ☐Agree ☐ Undecided ☐Disagree ☐ Strongly disagree

15). Improving mobile phone memory capacity to store more text messages is a good idea.

☐Strongly agree ☐Agree ☐ Undecided ☐Disagree ☐ Strongly disagree

In some cultures caller display service is not freely provided. In light of this please answer the following questions:

16).Do you think having a mobile phone caller display service is important?

☐ Yes ☐ No

Please give reasons for your answer:

17).Would you pay to have a mobile phone caller display service?

☐Yes ☐No

Please give reasons for your answer:

Missed calls

In some culture mobile missed calls are used as a form of communication in light of this please tick the answer that agrees most with your view:-

18).What do you use mobile phone missed calls for?

☐ To request a call back

☐ Socially to communicate with others

☐ As a reminder for prior arrangement

☐ To draw the recipient's attention to a sent message

☐ To check the availability of the mobile's recipient before sending a text message

☐ To reply back for a missed call

☐ As an emotional gift just to say "Hi"

☐Others Please specify

☐ Never use your mobile phone to make a missed call

19). Which form of the mobile phone missed calls mentioned above do you use most and why?

20). How many mobile phone missed calls do you make per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

21). How many mobile phone missed calls do you receive per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

Text messages

22). What do you use mobile phone text messaging for?

☐ Social

Please explain

☐ Business

Please explain

☐ Others

Please specify

23). How many mobile phone text messages do you send per week?

☐ 0-5 a week ☐ 6-10 a week ☐ 11+ a week ☐ Never

24).Do you feel that mobile text messages can replace face to face contact.

☐ Yes ☐ No

Please give reasons for your answer

25). Would you please list the four easiest functions to use on your mobile phone?

26). Would you please list the four most difficult functions to use on your mobile phone?

:: APPENDIX 4

The post-task informal interview questions for Study 1

1. What do you use missed calls for?

2. missed calls can be used for the following: call me back, reminder for prior arrangement, before sending text message to check that the mobile phone of the receiver is available, after sending it to draw their attention to the text message, or it can be used as emotional gift just to say hi, thinking of you, in light of this which missed calls do you use the most and why?

3. Do you see the missed call as a gift?

4. when sending a missed call as a gift to someone how do they understand it is a gift

5. When receiving it from someone how do you understand it is a gift or what it means?

6. When receiving any missed call how do you understand it and how do you reply back?

7. Do you think a missed call can play a role in recalling past thoughts? If yes in a similar way to the sms?

8. Do you misinterpret the meaning of the missed call sometimes?

9. Do you accept missed calls as way of communication at all occasions?

10. Are there any moral obligation to reply back for a missed call?

11. What is the benefit of the missed call to the recipient and the caller?

12. What do you use text message for?

13. How do you reply when you get a text message?

14. Do you use abbreviation when writing a text message and do you write long text messages with greeting and introductory section or just go straight to the point?

15. Do you use predefined templates (the ready made messages), would you use them if they are more expressive and are designed for different occasions like happy birthday, hi, thinking of you? And why?

16. When do you accept text messages when don't you accept them?

17. Do you think the text message can be a substitute for phone calls?

18. What do you think of the balance transfer introduced by Mobitel, would you transfer some of your balance to someone, would ask someone to give you some balance, who would you ask or take from? What do you think of it in general?

:: Appendix 5

The post-task informal interview questions for Experiment 2

1. When placing/receiving a missed call message has the use of icons added more contextual cues and decreased the level of ambiguity associated with the meanings of the missed calls? please explain your answer:
2. When placing/receiving a missed call did you feel that all icons have symbolized the meaning of the missed call you want to convey? Please explain your answer
3. Would you use these icons to place/receive a missed call?
4. Would you change any of these icons? If yes please draw an alternative to the ones you would change? Please explain your answer:
5. In what way do you think the new missed call service would help you?
6. How would you feel about placing/receiving a missed call using the new system in a social gathering e.g. in a café or a friend's house?
7. How would you feel about placing/receiving a missed call using the new system on public transport?
8. How would you feel about placing/receiving a missed call using the new system when walking in the street?
9. Who would you send one of the new missed calls icons to?
10. Would you be comfortable sending/receiving any of the new missed call to a person who is the same gender as yourself? Please explain your answer:
11. Would you be comfortable sending/receiving any of the new missed call to a person who is much older than yourself? Please explain your answer:

12. Would you be comfortable sending/receving any of the new missed call icons to all your old missed call contacts? Please explain your answer:
13. Do you think the new missed call icons will enhance your communication with others? please explain your answer
14. How does placing/receiving a missed call using the icon system differ from sending smse. social meanings?
15. How does placing/receiving a missed call using the icon system differ from sending MMS i.e. social meanings?
16. How does placing/receiving a missed call using the icon system differ from sending sms i.e. social meaning?
17. In which circumstances (location, occasions, and times) would you choose to use the new missed calls icons over the sms?
18. Do you think the new missed call system can be a substitute for the sms?
19. Would you share viewing this new missed call system and with who?
20. How would you feel about assigning a ring tone that conveys the meaning of the missed call at the time of receiving the missed call?
21. Would you feel that the use of ring tones that conveys the meaning of the missed call might invade the privacy associated with the missed call? How?

:: APPENDIX 6

The post-task informal interview questions for Experiment 3

1. Which icon you will select for each of the missed call types? (Call me back, Emotional gift, I am late, Reminder for prior arrangement, I do not have credit and Choose your own missed call).
2. What are the basis for choosing a specific icon over the other?
3. What are the basis for choosing a specific icon over the other?
4. How would you use these selected icons? Meaning will the icon selected for each type of missed call be your default or fixed one?
5. Would the selection of a specific icon differ if you are using the missed call with any of these groups(close family member, extended, friends, work colleagues)
6. If you are in a public place (restaurant, public transport, walking down the street) would that affect which icon you would select and why?
7. If you thought the receiver is in a public place (restaurant, public transport, walking down the street) would that affect which icon you would select and why?
8. If this missed call of a similar price as the sms would you choose to use? Explain?
9. When would you choose to use the new missed call over the sms? (occasions, circumstances) explain?
10. What suggestion you have to further improve the personalised icon-based missed call service?

:: APPENDIX 7

The task sheet for Experiment 2

Control Session:

- **Practice task:** Place a missed call meaning 'after sending sms' and 'reminder for prior arrangement', and then exit the service. Access the log list and find if these two missed calls are received, and then exit the service.

- **Task 1:** send these missed call types:

1. After sending sms
2. Before sending sms
3. Call me back
4. Emotional gift
5. Reminder for prior arrangement

- **Task 2:** Access your log list and find out:

1. How many missed calls they received
2. The type of missed calls they received.
3. The time of receiving each of the missed calls

:: APPENDIX 8

The task sheet for Experiment Three

Control Session:

- **Practice task:** Place a missed call meaning 'call me back', and then exit the service. Access the log list and find if this missed call was received, and then exit the service.

- **Task 1:**
- Select the icon you prefer, and place a missed call that means "Call me back".
- Select the icon you prefer, and place a missed call that means "Emotional gift".
- Select the icon you prefer, and place a missed call that means "I do not have credit".
- Select the icon you prefer, and place a missed call that means "Reminder for prior arrangement".
- Select the icon you prefer to place a missed call that means "I am late".

- **Task 2:** Check your mobile phone for any received missed calls and find out:

1. How many other missed calls they had received
2. The type of missed calls they received.
3. The time of any missed calls they had received.

:: APPENDIX 9

Questionnaire Pilot Study 2

Please kindly fill in this Questionnaire:

ID:.....

Age:.....

Gender: ☐ Male ☐ Female

Occupation:.....

What type of mobile contract do you have?

☐ Monthly contract ☐ Pay as you go

Task A: Placing Missed Calls

1.	It was easy to use the icon-based missed call service to send a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
2.	I have not enjoyed making a missed call from the icon-based missed call service	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
3.	While making a missed call, if I make a mistake I recover quickly	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
4.	Organization of information related to sending a missed call is not clear on the screen.	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
5.	I like using the icon-based missed call service to make a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
6.	The icon-based missed call service has not got all the functions I expect it to have to make a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
7.	Overall, I am satisfied with the icon-based missed call service in relation to making a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
			1	**2**	**3**	**4**	**5**	**6**	**7**		**NA**

List the most **negative** aspect(s) the missed call service:

1. _____
2. _____
3. _____

List the most **positive** aspect(s) the missed call service:

Task A: Placing Missed Calls

1.	It was easy to use the icon-based missed call service to receive a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
2.	I have not enjoyed receiving a missed call from the icon-based missed call service	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
3.	While receiving a missed call, if I make a mistake I recover quickly	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
4.	Organization of information related to receiving a missed call is not clear on the screen.	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
5.	I like using the icon-based missed call service to receive a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
6.	The icon-based missed call service has not got all the functions I expect it to have to receive a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
7.	Overall, I am satisfied with the icon-based missed call service in relation to receiving a missed call	strongly disagree	☐	☐	☐	☐	☐	☐	☐	strongly agree	☐
			1	**2**	**3**	**4**	**5**	**6**	**7**		**NA**

List the most **negative** aspect(s) the missed call service:

1. _____

2. _____

3. _____

List the most **positive** aspect(s) the missed call service:

1. _____

2. _____

3. _____