KUNGL
TEKNISKA
HÖGSKOLAN

TRITA-NA-E02088 ● CID-192 ● ISSN 1403-0721 ● Department of Numerical Analysis and Computer Science

Mobile Messaging Usability – Social and Pragmatic Aspects

Susanna Hedbring

CID, CENTRE FOR USER ORIENTED IT DESIGN

Susanna Hedbring

Mobile Messaging Usability – Social and Pragmatic Aspects
Report number: TRITA-NA-E02088, CID-192
ISSN number: ISSN 1403 - 0721 (print) 1403 - 073 X (Web/PDF)
Publication date: April 2002

Reports can be ordered from:

CID, Centre for User Oriented IT Design
NADA, Deptartment of Numerical Analysis and Computer Science
KTH (Royal Institute of Technology)
SE-100 44 Stockhom, Sweden
Telephone: + 46 (0) 8 790 91 00
Fax: + 46 (0) 8 790 90 99
E-mail: cid@nada.kth.se
URL: http://cid.nada.kth.se

Abstract

Mobile messaging is the general expression used in referring to voiceless communication applications for mobile phones such as SMS, MMS, mobile chat and mobile instant messaging. The purpose of this Master's project was to examine usability aspects of two mobile messaging services, SMS and mobile chat. A user study with cooperative tasks was performed. The goal was to retrieve information about the systems' efficiency, expressivity and support for social presence. According to former research, the richer and more immediate a medium is, the better it is for cooperative tasks. Richer is here thought of as how expressive and interactive the medium is, e.g., face-to-face conversation is richer than a mail conversation. The implication is that a synchronous messaging system such as mobile chat should be more socially conducive than SMS and thereby enable more efficient cooperation. The user study results were partly in line with this assumption. Although the mobile chat was considered as complicated to handle, it appeared to provide stronger feelings of social presence when compared to SMS. However, SMS was received as being more expressive and efficient. It ought to be mentioned that the participants had no experience with the mobile chat but they were all used to SMS. The awkward interaction design of the WAP-based mobile chat also made the chat conversation more complicated than it had to be. As a summary of the user study results, a usability guideline was developed with suggestions on how usable mobile messaging services may be created.

Referat

Användbarhet för mobila meddelandetjänster
– sociala och pragmatiska aspekter

Mobile messaging, eller mobila meddelandetjänster, kan användas som ett samlingsnamn för viss mobil kommunikation som baseras på text och inte ljud. SMS, MMS, mobil chatt och mobil IM kan nämnas som några exempel. Examensarbetets syfte var att undersöka användbarheten för två mobila meddelandesystem, SMS och mobilchatt. En sambarbetsbaserad uppgift löstes i en användarstudie och sedan mättes faktorer som effektivitet, expressivitet och social närvaro. Enligt tidigare forskning är ett kommunikationsmedium bättre för samarbetsbaserade uppgifter ju rikare och direktare det är. Rikare används här i betydelsen hur interaktivt och expressivt mediet är; ett samtal är alltså rikare än en brevkonversation. Ett synkront meddelandesystem som den mobila chatten borde alltså lämpa sig bättre för sambarbetsbaserade uppgifter än SMS. Resultaten från användarstudien visade sig delvis vara i linje med detta. Den mobila chatten var bättre på att förmedla känsla av social närvaro jämfört med SMS. Däremot ansågs SMS vara såväl mer effektivt som expressivt. Det bör nämnas att samtliga deltagare i användarstudien var vana vid att skicka SMS men hade inte tidigare testat mobil chatt. Den WAP-baserade chattens komplicerade interaktionsdesign och långsamma uppkoppling gjorde också att chattkommunikationen blev onödigt krånglig. Som en sammanfattning av arbetet skapades slutligen en riktlinje för hur användbara mobila meddelandetjänser kan skapas.

Executive Summary

This report concludes a Master's project in Computer Science with focus on Human-Computer Interaction, as part of the First Degree Program in Mathematics and Computer Science at Stockholm University.

Mobile messaging is the general expression used in referring to voiceless communication applications for mobile phones. Mobile messaging systems can be useful for informal messaging among friends, but also when there is a mismatch between the public setting and the audible features of the mobile phone. In contrast to many other mobile Internet services, mobile messaging is based on the only thing that really seems to interest people – to communicate with other people. The potential of mobile messaging systems should therefore be much bigger than other mobile services we are expected to use in a near future.

The purpose of this work is to examine the usability of two mobile messaging systems, SMS and mobile chat. SMS is interesting from a usability point of view, as its cumbersome interaction design goes against fundamental usability guidelines. Deployed on resource-poor devices, with small screens and keyboards it is amazing that it has become the success it actually is. Former research indicates that the richer – in the sense of being interactive and expressive – and more immediate the communication channel is, the more efficiently it allows for work to be performed. This is at least partly because rich communication channels allow for a heightened sense of social presence. The implication is that a synchronous messaging system such as mobile chat should be more socially conducive than SMS and thereby enable more efficient cooperation. This idea was explored through a user study.

The results from the user study indicated that SMS was easy to handle, while the mobile chat was considered as cumbersome and frustrating. The mobile chat was a WAP-based application and the connection link was sometimes poor. Too many keystrokes also made the chat conversation complicated. Despite this, the participants stated that the mobile chat allowed them to experience feelings of intimacy and being present. What is more, the user study indicated an interest for other messaging services than SMS. Proposed here is a contextual approach that uses three complementary mobile messaging systems. Only when deployed for its right purpose, a system's specific benefits can fully be taken advantage of. The identified employment areas for mobile messaging systems were:

(i) *Asynchronous mobile messaging system (SMS or MMS)*. A discrete way of communicating, when the sender does not require an immediate answer – a mobile version of email.

(ii) *Synchronous mobile messaging system (mobile chat)*. Useful for multi-party conversations, when place or topic does not allow telephone conference.

(iii) *Nearly-synchronous mobile messaging system (mobile IM).* In contrast to SMS, the IM-message is easily screened while being engaged in other activities, as it is presented directly on the screen without the need of additional keystrokes.

The results from the user study were used as a starting-point from which a usability guideline was developed. Theoretically, this investigation may help to explain the fundamental dynamics of mobile messaging. The guidelines that stem from the results may be used as concrete recommendations for developing usable mobile messaging applications.

Acknowledgements

This report concludes a Master's project in Computer Science with focus on HCI. It was completed April 23, 2002 at CID (Center for User Oriented IT Design), Royal Institute of Technology, in Stockholm.

I would like to thank the people at CID, and especially my supervisor Anders Hedman for providing an excellent and inspiring guidance throughout this work.

CONTENTS

INTRODUCTION

Purpose and Focus

The mobile phone has gone from being just a telephone to a multipurpose communication tool, an instrument used for phone calls, text messaging, geographic positioning, on-line services, games and much more. Just like the telephone in the 1940s, the mobile phone started as a tool for instrumental use, and later became more and more of a social artifact used in various social milieus. Mobile messaging systems are useful when there is a mismatch between the public setting and the audible attributes of the mobile phone. The ring signal might be silenced, but the talk will always be noisy.

The purpose of this work is to examine the usability of two mobile messaging services, SMS and mobile chat. Usability is here thought of in terms of field of application, functionality and design. The mobile message system of today, the Short Message System (SMS), has become a global success. Is this service enough or can it be further developed? Former research indicate that the richer, and more immediate a communication channel is, the better it can support cooperative tasks [Short et al. ’76, Chalfonte ’91, Jensen et al. ’00]. Rich communication channels (in the sense of being interactive and expressive) also tend to provide experiences of being socially present. This indicates that a synchronous messaging system such as mobile chat could allow for more efficient and socially conducive communication than SMS and this assumption was explored.

SMS is interesting from a usability point of view, as its cumbersome interaction design goes against fundamental usability guidelines. It is deployed on resource-poor devices, with small screens and poor keyboards. In addition, the operators charge unreasonable fees for this

service. However, these problems have not stopped people from overcoming the interface and use the service anyway. In contrast to many other mobile Internet services, mobile messaging is based on the only thing that really interest people – to communicate with other people. The potential of mobile messaging services is therefore much bigger than other mobile services we are expected to use in a close future.

Disposition

This report consists of six main parts: Introduction, Theory, Methods, Results, Discussion and Conclusion. The report starts with a section presenting the question at issue and gives a brief introduction to mobile messaging. The theory chapter is part of the literature study and forms a base for the rest of the work. This chapter includes a brief introduction to CSCW, a theoretical background to how the mobile phone evolved from being just an instrumental tool to becoming more of a social artifact, and a bit of social interaction theory. The Method chapter covers the HCI methods used in the diploma work; field studies, interviewing and experimental case studies. In the Results chapter, the results from these studies are summarized. The Discussions chapter provides more interpretative work and the method choices are discussed there in relation to the results. To conclude, design implications, usability guidelines and future indications are presented in the end of the Conclusions chapter.

Mobile Messaging

Today's mobile messaging services, mainly consists of Short Message Service (SMS). WAP-based mobile chat was released just before this diploma work started. Messenger Services was released during the time this report was written (March 2002), and Multimedia Message Service (MMS) will probably be released later this year. These facts can be worth to mention in order to show how quick the mobile messaging evolution is.

SMS

A message in the Short Message Service (SMS) is a text-message of not more than 160 characters. Whereas voice calls are sent over a dedicated radio channel for the duration of the call, short messages travel over and above the radio channel using the signaling path. As such, users of SMS rarely, if ever, get a busy or engaged signal as they may during peak network usage times. Each mobile telephone network has one or more messaging centers to handle and manage the short messages. There was hardly any promotion for or mention of SMS until after SMS started to be a success. Developers and designers were asking whether SMS is needed at all, and who would use it. This may be seen as a contrast to WAP, a feature that was carefully planned by the developers. However, SMS is already considered an old technique, and the developers now work with the next big step in mobile messaging, MMS.

EMS

Enhanced Messaging Service (EMS), is a small improvement of SMS. EMS requires specially built mobile phones. Except for text, audio and simple pictures can be sent. EMS is commonly used for sending new ringtones. An EMS is transported in the same way as an SMS, thus the operators do not have to make changes in the telephone network for providing this service.

MMS

The third text messaging step after SMS and EMS (Enhanced Message service) is MMS, (Multi Messaging Service) This technology barely has any limitations in terms of what type of file that may be sent to a mobile phone: text, graphics, video clips and audio files. This brings text messaging close to email as we know it, the main difference being that no Internet connection is required when using MMS. Technically, while SMS is transported in separate channels, MMS will be transported with the rest of the data traffic in mobile networks. MMS requires new messaging platforms for mobile networks in order to work. A number of issues remain, particularly with regards to charging. While SMS's always have the same size, the size of MMS's varies widely. An MMS that only contains text does not require much space, but by adding voice, pictures or video clips the size grows, and uses more bandwidth in the telephone network. The transition from Short Message Service (SMS) to Multimedia Messaging Service (MMS) has been referred to as important to the mobile phone as the transition from DOS to Windows was for the PC.

Mobile chat

For participating in a group chat, users access a public chat room and write text-based messages. The users do not always know each other. The bearers for mobile chat applications are today the Wireless Application Protocol (WAP) and the Short Message Systems (SMS). This study has focused on a WAP-based mobile chat.

Mobile Instant Messaging

Instant Messaging can be defined as one-to-one private communication to a known individual. Instant Messaging (IM) has early roots in Unix utilities such as "talk" and "write", but has in the last years via Instant Messenger products that are available free on the Internet (i.e. MSN Messenger, AOL Instant Messenger). The key features of Instant Messaging are a buddy list that shows whether the buddies are currently online or not. If they are online, they are able to send and receive messages instantaneously. Technically, Mobile Instant Messaging services may be delivered by WAP, or by hosting a Mobile Instant Messaging Server connected to a network operator's SMS Center. In order to use the service users have to log-on to indicate their availability to other users on their buddy list. This logon command may be initiated with a simple SMS message. In return the user receives confirmation that he or she is logged on [Mobile instant messaging].

THEORY

This chapter is meant to form a base for the understanding of the rest of the work. A brief introduction to CSCW will be given, as well as a social history of telecommunication, where the mobile phone evolved from being just an instrumental tool to becoming more of a social artifact. Finally social interaction theory will be introduced and the expressivity of the different communication channels will be discussed.

Mobile CSCW

Computer Supported Cooperative Work (CSCW) is about groups of users – how to design systems to support their work as a group and how to understand the effect of technology on their work patterns. It is a relatively new research area – the first worldwide conference was held in 1986[1]. Just like HCI, CSCW draw on knowledge from a wide range of disciplines, but whereas HCI mostly draw on psychology-computing, CSCW mostly draw on the sociology-computing [Dix et al. '98 p.464]. Mobile CSCW concern people using mobile devices for collaboration. An important part of CSCW is groupware systems. Such computer systems are built to support group working. Unlike other software, groupware is focused on communication between humans instead of human-computer interaction. The mobile messaging systems is a typical groupware system, as focused on the communication between humans. A distinction can be made between synchronous and asynchronous groupware. Synchronous groupware assists people that are working together as a group, all at the same time while asynchronous means that the work is being done at different times.

[1] CSCW No 1, Austin, Texas, Dec 1986.

Time/space matrix

The time/space matrix (fig. 1) is commonly used in CSCW for classifying groupware systems [Dix et al. '98 p.464]. The time/space matrix summarizes *where* and *when* participants perform cooperative work. The time axis is often divided into synchronous and asynchronous systems, while the space axis is divided into co-located (same place) and remote (different place). Face-to-face conversation would accordingly be referred to as synchronous and co-located, and telephone conversation as a synchronous remote communication mechanism. Mobile messaging systems can consequently be represented of both asynchronous systems (SMS) and synchronous systems (mobile chat).

	Same place	Different place
Same time	Face-to-face conversation	Telephone conversation
Different time	Post-it note	Letter

Fig. 1. Time/space matrix [Dix '98 p.464].

However, there are a few problems with this simple matrix. The term asynchronous is rather ambiguous. SMS would be referred to as asynchronous, but what if two people in the same room have are having an SMS conversation. As a solution, Dix et al. suggest that we instead look at the data store and classify systems as synchronous when there is a real-time computer connection, or asynchronous when there is none [Dix et al. '98, p.489].

A social history of telecommunication

Without communication between individuals and groups, one could probably not talk about social organizations or cultures. Tele-communication can be referred to as the communicative glue of modern society, and is not a new phenomenon. Even ignoring the early telegraph, telecommunications has been with us since the invention of the telephone by Bell in 1876. The telephone, and to a certain degree also the telegraph, introduced live communication between people at separate places. Earlier there was the letter, but the letter separates time and place. With the telephone there was suddenly a way to communicate directly with someone physically distant. Mobile telephony was the second step in the direction of fundamental change in the way human beings communicate. The first step – telephony

itself, “speaking over a distance” – really was just that, a first step. The progress towards mobility in telecommunication does not, however, have to be seen as a linear development. Just because most people today have telephones already, the move to mobility does not have to be just an extension of the telephone services.

Historians have documented the development of several technologies, but have rarely described their social roles. To ground the knowledge of design and business spaces of any technology, it can be worthwhile to reflect upon how and why the technology is used and how the public perception of the medium is shaped. In the following sections the development of landline telephony and the development of mobile telephony will be put in relation. How were these devices introduced and adopted? How did usage changed as the technology evolved, did it alter other actions? When people started to use the home telephone for social calls, did the social norms change?

Development of landline and mobile phones

The telephone began as a novelty, became business’s substitute for the telegraph, and then evolved into a mass product, an everyday device for handling chores and having conversations. The role of the telephone unfolded over time, and similarly we can see how mobile telephony has evolved. The mobile phone was introduced as a portable telephone and then fundamentally revolutionized our way to communicate. Where there was once just voice, then voice and text, then voice text and Internet there will soon be a provision of full multimedia features provided via the mobile phone.

Today people make most of their residential calls to friends and family, often holding sociable conversations. The telephone industry actively promotes such calls, encouraging people to “reach out and touch someone”. For many years, it did not. Sociability, obviously an important use of the telephone today, was ignored or resisted by the industry for almost the first half of its history [Fischer ’92 p.83-84]. Telephone salesmen from the 1880s to the 1920s praised the residential telephone for its usefulness in emergencies; that function is now taken for granted. Not until the early 1930s did the social role become relevant. “Friends who are linked by telephone have good times” is from an advertisement dated 1932. The advertisements now starts to emphasize friendship, not just family; on fun, not just function; and on sociability as a reason for subscribing in the first place not just as a reason for calling long-distance calling.

Reasons for acquisition

Fischer found that motivations for acquiring landline telephony initially tended to be instrumental, rather than socially focused. In the early 20th century, "safety" and "business" were central to telephony adoption. Despite these more functionally-focused reasons for acquisition, the telephone rapidly grew to become associated with sociability which soon became a reason for acquisition itself. Safety reasons have a whole spectrum of possible meanings but can here be interpreted as home safety; the lady of the house could use the telephone in case of sickness, accidents or thieves. Similarly business reasons can be interpreted as "business-to-business communication" or a communication between the businessman and his wife at home, e.g., to tell her that he will be late for dinner.

Mobile telephony was initially built for safety. As early as in the 1920s, police departments in the US sought to use radiotelephone services in their patrol cars. This technology had already improved the safety of oceangoing ships. Research on new mobile phone shows that social use is still absent among the reasons cited for initial mobile telephony adoption, but after a certain time often becomes a very important part of communication practice users [Palen et al. 2000]. Reasons for acquiring mobile telephony tends to be either for a particular event, or organized around business or job-related reasons, and safety and security reasons. Safety and security reasons are here to be associated with unknown situations that might arise, or with car-related safety.

Social Norms

People have always felt anxiety against new media. In 1926 the Knights of Columbus Adult Education Committee were concerned with modern inventions and whether modern comforts softened people, electric lighting kept people at home, and radio's low-grade music undermined morality. Among the specific questions the committee posed were: "Does the telephone make men [people] more active or more lazy?" and "Does the telephone break up home life and the old practice of visiting friends?" The Knights declared further that "these inventions are all indifferent, of course; the point is to show people that unless they individually master these things, the things will weaken them." [Fischer '92 p.1].

A general early concern about telephone use, was for the psychological effects. People were worried about the possible creation of an alert and tense frame of mind. This would imply people being on

edge – a call may occur at any instant, and impatient – the telephone has trained them to expect immediate results. On the other hand, people would need public spaces less often and thus disengage from public life, and instead stay isolated in familial cocoons [Fischer '92 p.25]. Such worries could easily be applied to mobile phone users of today. The fact that they can expect a call at any instant, could easily create a tense frame of mind. But unlike landline telephony, mobile telephony encourage people to move in public places and they can always be reached no matter where they are.

The telephone was the fist electric medium to enter the home. Before the telephone, communication between people were either face-to-face or with the written word (letters, telegraph messages). At the introduction of the telephone at home, people felt insecure about how to behave. Suddenly people could not interpret non-verbal cues from the caller such as facial expression as in face-to-face conversations. Neither could they prepare for, nor reflect upon, discussions as they could in letters. Early landline phone users had to deal with evolving norms around phone greetings, publicity of conversations, and with resolving negative feelings of ease of accessibility – issues that mobile phone users contend with today.

Historians and sociologists have often tracked changes in customs by examining formal prescriptions for behavior. For this purpose, rules of conduct can be a prime source. Fischer examined a sample of 21 etiquette books written by and for women and published between 1891 and 1955 to see what they wrote on assimilation of the telephone into social life. One clear development was the growing acceptance of the use of the telephone for dinner invitations and similar events. In the early 1890s the major etiquette dilemma concerned the appropriateness of mailing invitations rather than sending them by messenger. Yet, when noting that mail was now ok, the author made some admittance to the telephone: "Invitation by telephone is one of these modern innovations…which shocks elderly, conventional persons". In the 1940s, telephone inviting was more or less accepted but with strict rules: "The invitee should be informed of the appropriate level of dress and that the guest of honor should be mentioned." Other manuals warned against occupying the line for long periods of time, being rude, and calling at inappropriate hours [Fischer '92 p.185–186].

Mobile phone users tend to modify their perceptions of social appropriateness around mobile phone use. When new mobile phone users were asked about their feelings of seeing other people using mobile phones, reactions were surprisingly negative and strongly felt. In particular, subjects had concerns about using mobile phones while driving and in public places like restaurants. There appears to be a

correlation between the amount of personal experience with mobile phones and feelings of tolerance for other users [Palen et al. 2000]. However, after about two weeks after acquisition, some subject began to temper and qualify their opinions about use of phones in public places. In particular, many who thought they would never talk and drive also admitted to doing so.

Social Spaces

Why is it that public use of a mobile telephone is so offensive to some? Palen et al. suggest that talking on a mobile phone in a public place is a conflict of social spaces in which people assume different faces [Palen et al. '00]. Ling suggests that applying Goffman's theory of public "faces" or personas can help us to understand what is happening [Ling '96, Goffman '59]. When mobile phone users are on the phone, they are simultaneously in two spaces: the space they physically occupy, and the virtual space of the conversation (the conversational space). When a phone call comes in, the user decides, consciously or otherwise, what face to take: the face that is consonant with one's physical environment, or that of the conversational space? The greater the conflict between the behavioral requirements of the two spaces, the more conscious and difficult this decision might be. First, choosing to be behaviorally present in a different space from one's physical location may be perceived as inconsiderate by those in that same physical location. Second, a mobile phone user might have to violate the social norms of the physical space in order to honor the norms in the conversational space. Finally, the users face on the phone might not be the same as the face he or she presented just before the phone call. Introduced technology must be designed to accommodate a caller's private use of public space. Text-based communication services offer solutions that make this collision of spaces less conspicuous. The mobile messaging user might be behaviorally present somewhere else, but the very conversation is not obvious for the environment.

Social Interaction

Speech might be what first comes to mind when thinking of human communication. Speech is what most distinguishes our social activities from those of animals, and is important in most human

social behaviour. When two people are involved in a conversation, they exchange a range of subtle non-verbal cues in addition to the verbal material. These non-verbal cues include facial expression, direction of gaze, body-language and physical distance [Short ’76 p.44]. Face-to-face interaction is often seen as the ideal to which computer-mediated communication should aim, as it is by far the richest communication channel [Dix et al. ’98 p.510]. Text-based conversation is characterized by reduced feedback for confirmation, less context to interpret utterances, and slower pace of interaction. Some of the non-verbal cues from face-to-face communication can be simulated in text-based conversation.

Face-to-Face Interaction

When two people are engaged in interaction, each one emits a variety of visible and audible signals, intentional or not, which may affect the others present. When we come to use computer-mediated forms of interaction, we carry forward all our expectations and social norms from face-to-face interaction [Dix ’98 p.511]. Social psychologist Michael Argyle lists the non-verbal cues used during a conversation in his book “Social Interaction” [Argyle ’69 p.72].

- *Mutual attention and responsiveness* There must be continuous evidence that the other is attending and responding during the conversation. This is signaled by head nods and gestures if the two interactors are face-to-face. If they are having a phone conversation they could instead show attention by brief utterances such as “yes”, “ah ha”, “umm” and so on. The fact that most people are used to telephone conversation makes this replacement natural.

- *Channel control* The conventions determining who shall speak and for how long. Head nods and eye movements are used as channel controllers.

- *Feedback* Feedback can be explained as the listeners reactions catched by the speaker without making the listener a speaker. In order to plan his /her utterances, the speaker needs to know how the listener is reacting to what he or she just said. Non-verbal signals may sensitively track agreement or disagreement. If the visual channel is removed, the speaker must wait for a verbal reply from the listener before he has any feedback on his remarks.

- *Illustrations* Speech is accompanied by gestures of the hands, which may be used e.g. to illustrate an object or action. Gesticulation can be defined as gestures expressed simultaneously as speech. They are intimely associated with the semantic content in the speech. Some people mean that speech and gestures are products of common representation in the brain. It is therefore hard to speak about gestures without concurrently considering speech.

- *Emblems* This term is used to refer to gestures being used instead of a word, for instance a head-shake for "no". This category can be considered as less important than the others. It is in any case, by definition, replaceable by words in the absence of the visual channel.

- *Interpersonal attitudes* Non-verbal cues may be used by the listener as a source of information about the speaker's attitude to him or her. This information is important because verbal messages are so polite and so carefully controlled that attitudes and intentions are often concealed. Gesture, facial expression and eye-gaze – all the cues discussed earlier – may be used as sources of this affective information.

Telephone Interaction

Telephone interaction is a verbal, synchronous interaction where the visual non-verbal cues from face-to-face interaction are lacking. However, there are a number of auditory non-verbal signals conveying information similarly to the visual non-verbal signals. Tone of voice pausing behavior or paralinguistic materials, such as "um", "ah" to mention some [Short '76 p.59]. On the one hand, the reduction of cues in a telephone conversation will reduce the efficiency of the interaction. On the other hand, it can be useful in cases when face-to-face conversation may allow too much personal contact. In a survey made by William Short, people were asked about when they would prefer to use the telephone rather than seeing the other person face-to-face. High conflict situations and embarrassing situations were cited reasons, because they were not distracted by non-verbal cues [Short '76 p.62].

Text-based Interaction

Text-based interaction is a non-verbal synchronous or asynchronous interaction. What concerns mobile phones, the currently available text-based interactions are SMS and mobile chat. In both systems, users type messages into a window. However, SMS is based on an asynchronous communication with a dyadic (one-to-one) call model, while the mobile chat users could enter rooms to synchronously converse with whomever is there. This report will concern the dyadic communication in mobile chat, even though the system allows multiparty dialogue.

The visual and verbal low-level feedback is lacking in text-based communication. Most people are familiar with text-based communication because they have written and received letters. But this carry forward expectation from letter writing is not always appropriate. In fact, SMS and mobile chat are more of speech substitutes than letter substitutes. The format is not as formal as in letters – one line or even one-word messages are not uncommon. An SMS is quick to write and there is no need to worry about whether the receiver is busy or in a bad mood. It also gets a reply almost as quickly as the telephone if the receiver has the phone close at hands. The message can be sent at any time and will be replied to when the receiver has time to deal with it.

Media Richness

The human face is the most important communication channel for expressing feelings and attitudes towards other people. Facial expressions change quickly and play an important role in social interaction. In this report, two dimensions will be used to distinguish rich from impoverished communication channels: *interactivity* (i.e., quickness and appropriateness of feedback) and *expressiveness* (i.e., ability to convey personal feelings and emotions into the communication). However, empirical research, which frequently compares face-to-face and phone conversations with written communication, often fails to adequately distinguish between these dimensions [Chalfonte ’91]. Whatever the relative importance of facial and bodily cues, there can be no doubt that both can constitute an important source of information about the mood and personality of the other – a source of information removed with the absence of a visual channel.

In telephone conversations we replace the visual cues by nuances in the voice. In text-based conversation, we have to replace the visual

and audible cues by other cues to clarify the message. These cues can be for example emoticons. Emoticons (fig. 2) are facial expressions made by a certain series of keystrokes. The emoticon was probably invented by Scott Fahlman circa 1980, in a message posted on CMU bulletin board systems [Computer Knowledge]. Emoticons are used by Internet users in chat or email so that they can express thoughts and emotions without wasting time typing them out. There are hundreds emoticons but only a few are commonly used.

Example of common emoticons:

:-) Basic smiley face; used for humor and sometimes sarcasm
:-(Basic frowney face; used for sadness or anger
;-) Winkey face; more often used for sarcasm
:-/ Wry face; used for wry humor

Fig. 2. Emoticons [Computer knowledge].

Teenagers use the mobile phone in an expressive way while adult has a more informative way of using the mobile phone [Ling ’99]. Younger people use the mobile phone to express information about themselves and their identities while older users communicates information. Expressivity is concerning to Goffman, gestures, signs, utterances, indications and trends produces by the presence of a person [Goffman ’59]. To improve the expressity of SMS’, and to be able to write quicker, many people use a mixture of acronyms and abbreviations. A few examples:

ASAP – as soon as possible
CYA – see you
GL – good luck
IMHO – in my humble opinion
IOU – I owe you
LOL – laughs out loud
ROFL – rolling on the floor laughing
SUP – what’s up

METHODS

This chapter covers the HCI methods used in the diploma work. The theoretical background is also reviewed in this chapter. The HCI methods have been categorized with regards to qualitative and quantitative techniques. Qualitative techniques are briefly about observing people in natural settings, while quantitative techniques often are about experiments and measurable data. Both methodologies are common in HCI and are often used to complement each other. Simultaneous use of methods, e.g., triangulation of methods, gives a broad data foundation, and a reliable base for interpretations [Repstad '93 p.19]. A qualitative feasibility study can improve the questions in the quantitative survey. Further can field knowledge facilitate the researcher's interpretation of the case statistics. Some information is simply not accessible with quantitative analysis. In some cases the researcher needs to get close to the milieu where it can be found. In this particular work, field studies, interviewing and questionnaires have been used to gain insight into people's attitudes and use of mobile phones in their everyday life. Additionally, experimental case studies have been performed to verify specific questions at issue and to gather measurable data.

Qualitative Techniques

The word "qualitative" refers to quality, i.e., of prominent features or characteristics. The word "qualitative techniques" can be put in contrast to "quantitative techniques". In broad outlines you could say that quantitative techniques depend on quantities and numbers to analyze and describe a phenomena, while qualitative techniques depend on text and notes based on observations done by the researcher [Repstad '93 p.9]. Measurement and numbers are sometimes impossible to avoid even in qualitative research in order to be more precise, but are generally of secondary interest in this type of research. Examples of disciplines that use qualitative techniques are social anthropology, and ethnography. The purpose of qualitative techniques, or qualitative ethnographical methods as Hammersley calls them in his book, can be summarized as: (i) To illuminate the reality that is

intended to be examined, in order to give detailed descriptions. (ii) Understand events in their natural context – who is doing what, when and how. (iii) Seeing the world through the eyes of the involved persons [Hammersley '95].

In the 19th century, social anthropologists were doing social research on what was at the time called "primitive cultures". Missionaries and business travelers provided the researchers with information, but the researchers themselves were rarely receiving first hand information about the culture they were studying. The social anthropologist Malinowski was the first researcher who actually lived in the culture he studied. In the year of 1915 he put up his tent on an island in the Pacific Ocean. His intentions were to learn the native language and understand the world-picture of the inhabitants . He ended up staying on the island for many years. It is still a central idea in qualitative research to observe people in their natural settings, seeking to record without causing any disturbance, as in ethnomethodology described below.

Ethnomethodology

In the HCI and CSCW literature the terms ethnography and ethnomethodology are sometimes used interchangeably. Citing Jeanette Blomberg in "Perspectives on HCI" [Monk & Gilbert '95 p.176], ethnomethodology however refers to a particular analytical perspective with respect to the object of study, while ethnography is practiced by individuals with varying theoretical and analytical perspectives. Ethnomethodology was founded by the American sociologist, Harold Garfinkel in the early 1960s. The main ideas are set out in his book "Studies in Ethnomethodology" [Garfinkel '67]. Ethnomethodology can be defined as the empirical study of the ways in which people make sense of their social world, using qualitative techniques such as participant observation, analysis of official records and naturalistic observation world. Ethnography is, as employed in HCI and CSCW, most often an approach used to understand everyday work practices and technologies in use. It is used as a starting point from which the developer gains knowledge of user needs. Of course, practical circumstances often limits the time spent out in the field among users. Increasingly short product realization cycles have led to a growing interest in more time efficient methods. Rapid ethnography is a term advocated by Norman [Norman '98] and Millen [Millen '00] as a collection of field methods that give a reasonable understanding of users and their activities with a limited time in the field. This requires focused observation, careful selection of informants, and great informant interaction together with suitable data analysis tools.

Researcher's Effect
An observation can be overt or covert. When performing a covert observation, the researcher does not tell the actors that they participate in an observation. In an overt observation, the actors are aware of being observed, but they do not necessarily know any further details. There are several ethical arguments against hidden observations, but the main advantage is that it does not give rise to a researcher's effect.

The researcher's effect occurs when actors behave differently from what they would have done if unaware of being observed. They start to act strategically and rectify their behavior [Repstad '93 p.28]. The field studies described below, were naturally hidden observation as they happened to be in open situations where there were no one to ask for permission.

Field Studies

The most important goal with the field study was to find answers to the questions "How do people handle the private phone conversations in public places?" and "Would it be convenient with a quiet way to communicate, for people who must respond to callers while engaging in public activities?" The collected user data were used as a starting point to gain knowledge of the users' needs. Two observational procedures were deployed. The first observations took place in noisy settings with public conversation: public transports, waiting areas and social areas such as cafés. The second kind of observations took place in quiet environments such as reading rooms, libraries etc. The observer stayed in the area for 20 minutes and noted mobile phone activities.

Qualitative Interviewing
In relation to the case studies, the test persons also participated in qualitative interviews to gather supplementary attitudes and opinions about text-based communication on mobile phones. A qualitative interview is a flexible interview where the questions are not strictly decided in beforehand. The question template is to be used as a memory list, and the respondent is encouraged to explain and clarify his answers. A good qualitative interview is not only an informal conversation, but requires careful planning of what themes should be covered. With careful planning, the interview can be structured in a

flexible way, and gathered information from different respondents can be compared [Repstad '93 p.60].

User Studies

The purpose of the experimental studies was to measure the participants' experiences of mobile messaging. Experimental or laboratory studies can be put in contrast to the qualitative field studies described above. The mobile phone is normally used in noisy public settings, far from the silent lab. So why is there any point of performing studies in the experimental milieu? The advantage is that the researcher is able to control many aspects of the use situation even if it is important to be aware of the researcher's effect. In contrast to "real life", the experimental tasks are highly constrained and must be accomplished within limited time, so that quantitative measurements can be collected. Case studies of this size, warrants further investigations in order to validate the results. This study can therefore be seen as a rough appreciation. However, citing Repstad, small studies are helpful no matter the results' general validity [Repstad '93 p.15].

Test Task

The experiment involved the following parts: tasks, questionnaire and interview. The test persons participated two by two, and the task implied that they would test different communication modes: SMS, mobile chat and speech. For each task, the test users were given the scenario that they should go to a movie/concert/exhibition together with their friend. With the specific communication mode, they cooperatively choose what to see, and decided where and when they would meet. To their assistance they had a newspaper with a list of all the actual movies/concerts/exhibitions. After each task, the users' experiences of the specific communication mode were gathered.

Experimental Design

From the participants point of view the test was about comparing different kinds of mobile phone communication. When comparing two

different systems, there are two ways of employing the test persons: *within-group design* (all groups get to use all systems that are being tested) and *between-group design* (each group only test one system) [Nielsen '93]. In this particular experiment, within-group design was chosen, and it entailed that all groups tested SMS, Mobile Chat and Phone Calls. Within-group design was considered being the most appropriate experimental design because: (i) Within-group design automatically gathers more data – each group uses all systems and data from each system can therefore be collected (ii) This method automatically controls for individual variability, since a group which is particularly fast will be about equally superior in each test condition. (iii) The test tasks were relatively small so there was no problem to have *time* to test both systems. The major disadvantage with within-group design is that that some transfer of skill takes place between the systems, and the users will be better at using the second system than they were at using the first. In order to control for this effect, the groups switched orders of the tasks and the communication mode [Nielsen '93].

Experimental Setup

The participants arrived to the study two by two. They were placed in separate rooms and were equipped with mobile telephones with chatboards (fig. 3). The chatboard was chosen so participants could use the telephones readily and with less bias, as none of them had any former experience with chatboards. The chatboard is an accessory for mobile phones that is suitable for messaging services. The use of messaging services often require that moderate amounts of text is written, an activity which the telephone keypad is not ideal for. The telephones were two Ericsson t39:s. The t39 was one of the few phones equipped with a GPRS-connection at the time of the study.

Fig. 3. Equipment used in the user study: Ericsson t39 equipped with a chatboard.

Participants

The test persons were selected according to two criteria. (i) Adequate experience with mobile phones and SMS (ii) Some experience with a desktop computer chat at least some time. The participants included five men and 11 women. Age ranges were 14 to 33 years. Two persons were tested at the time; partly because the task was of cooperative nature and partly in order to contribute to a relaxed atmosphere.

Collecting Data

The collecting of measurable data consisted of *activity logg* of user communication, their opinions on the communication means in a *questionnaire* with a semantic differential scale (fig. 4). A variant of this scale lists two opposite terms along some dimension (for example, very easy to learn vs. very hard to learn) and asks the user to place the system on the most appropriate rating along the dimension [Nielsen '93 p.36]. Finally, the participants' general attitudes and opinions were collected in a *qualitative interview.*

Fig. 4. Example of semantic differential scale.

Ethics
There are a few rules of ethics that are practiced in user testing in general. According to Nielsen, the users should never be referred to as "subjects", "guinea pigs", or other such terms. He instead suggests the term "test user", or terms emphasizing that it is the *system* that is being tested not the users [Nielsen '93 p.182]. In this report, the term "test person" or "participant" will be used.

Summary

This chapter covered a presentation of the HCI methods used in this work. A discussion of these methods will be presented later in the

report. The Method chapter started with a brief introduction to HCI methods classified by qualitative and quantitative techniques. The term *ethnomethodology,* commonly used in HCI and CSCW, was explained as the study of how humans see their own social world. There was further a specific note on the *researcher's effect*, and how researchers should be aware of their influence on test persons. The HCI methods used in this work, were qualitative field studies and interviewing together with quantitative case studies. These techniques were used together to attain a broader base for interpretations. The goal of the *Field studies* was to find answers to the questions: "How do people handle the private phone conversations in public places?" and "Would it be convenient with a quiet way to communicate, for people who must respond to callers while engaging in public activities?". The collected data was used as a starting point for understanding the users needs. *Case studies* were then deployed, in order to study text-based communication with mobile phones for a specific task (arranging social meetings). The goal of the case studies was to get measurable data of the participants' attitudes about SMS and mobile chat. This data would then be used to understand how to create usable mobile messaging systems. *Interviews* were finally performed. In the interviews, the participants expressed and clarified their thoughts and feelings about the use of the various communication modalities, e.g., by explaining why and when they used SMS and what they thought about mobile chat in comparison to SMS.

RESULTS

This chapter covers results from the field studies, the experimental case studies, and the interviews. Some anecdotal material from the field and from the interviews will be used to provide a more nuanced picture of the work, so that the reader can follow the author's conclusion as well as make his or her own inferences.

Field Studies

The field studies revealed how people use mobile phones in public settings. Mobile phone activity was documented in a range of areas, from quiet to noisy. Of interest were the users' visible behaviors: What were people doing when calling or being called? How did they respond to calls and SMS'? How did people in the surrounding environment respond to these actions? In public, calls and SMS' were frequently received as well as sent. An average of fifteen calls per hour and five SMS' was documented in seven hours of field observation. Many incidents were recorded where the observer could not help but overhear personal information. In these cases a text-based conversation-like service could be a solution. In field studies at cafés the mobile phone was often placed on the table, so the owner could easily see if there was an incoming call or SMS. In other public areas, it is often placed in the handbag for women, and in jacket or trouser pockets for men. The mobile phone is always close to hand and diligently used. People seemed to use their waiting time on public transports etc., for calling and sending SMS. Other artifacts were commonly used simultaneously with the mobile phone, as agendas, pen and paper etc. When in silent settings, people walked out when receiving calls, but responded to SMS'.

Case Studies

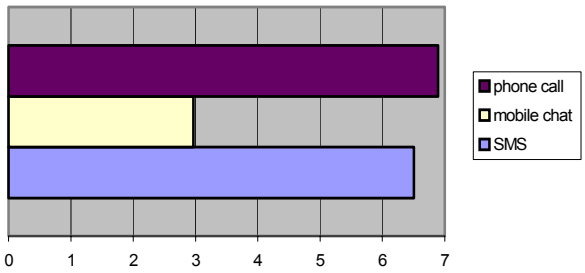
The goal of the experimental case studies was to gather measurable data of attitudes and opinions around mobile messaging. The hypothesis was that more immediate forms of communication prove to be more effective in promoting cooperation, and provide a heightened sense of social presence than less immediate forms. Former research supports this hypothesis – the richer and more immediate the communication mode is, the more efficient it is for cooperation tasks [Short et al. '76, Chalfonte '91, Jensen et al. '00]. Therefore, phone calls were used as a reference to be compared with the two text-based mobile messaging features available at the time for the experiments (March 2002) – SMS and mobile chat. The mobile chat was a WAP-based chat available through Comviq. The participants' subjective opinions on the different communication modalities were documented after each task. Their opinions were measured on a semantic differential scale ranging from 0 to 7, where 0 represented "I do not agree at all" and 7 represented "I agree totally". The results presented below are categoried using three types of questions; *general satisfaction, expressivity* and *personal way of communication*.

The results indicates in conclusion that:

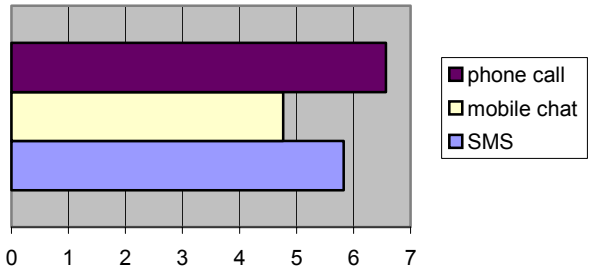
- SMS was considered almost as easy to handle as a phone call.
- Mobile chat was more frustrating to use and not as fun as SMS.
- For this particular task (arranging social meetings), the participants would rather use a phone call or SMS than a mobile chat.
- It was harder to understand the other persons reactions, and harder to express oneself in mobile chat than in SMS.
- Despite this, mobile chat provided a heightened sense of social presence than SMS.

General satisfaction

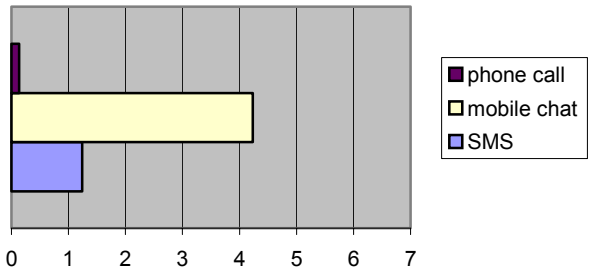
It was easy to understand how to communicate



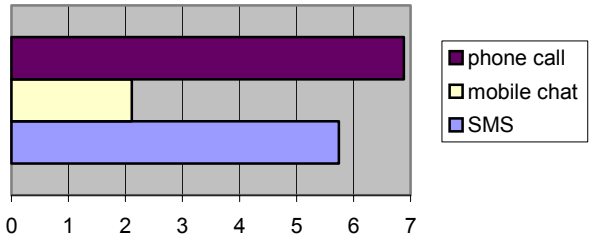
The task was fun



The task was frustrating

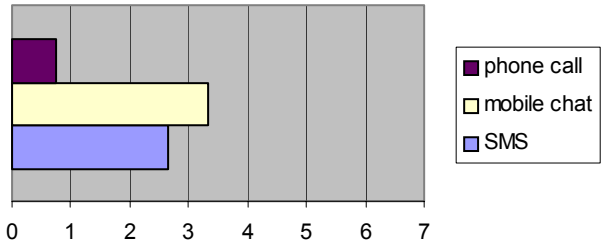


This way of communicating works well for arranging social meetings

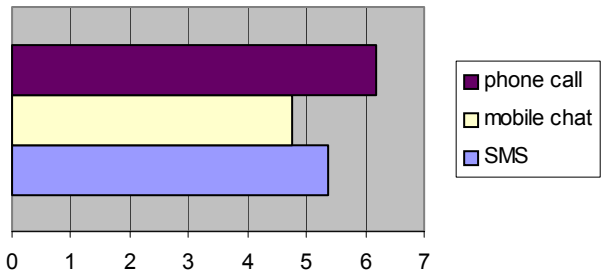


Expressivity

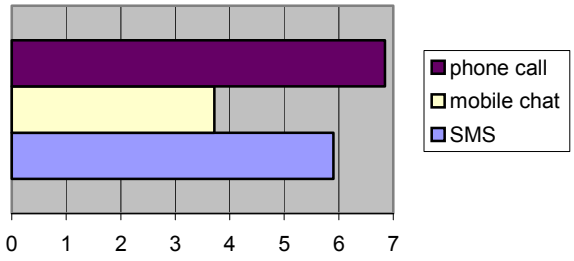
It was difficult to understand the other's reactions to what I wrote



It was easy to express oneself

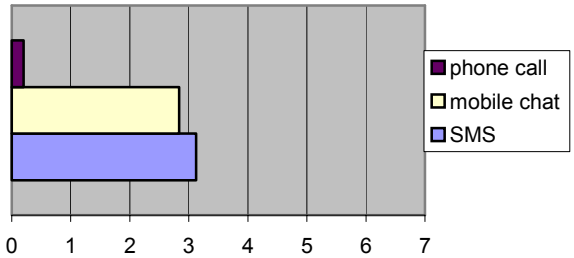


It was easy to understand the other



Personal way of communication

We could not establish personal contact



Activity Logging

Despite the fact that SMS is asynchronous and mobile chat synchronous, mobile chat was proven to be more time consuming (fig. 5). This might be explained with that the participants were used to SMS, and the slow and unstable communication links etc.

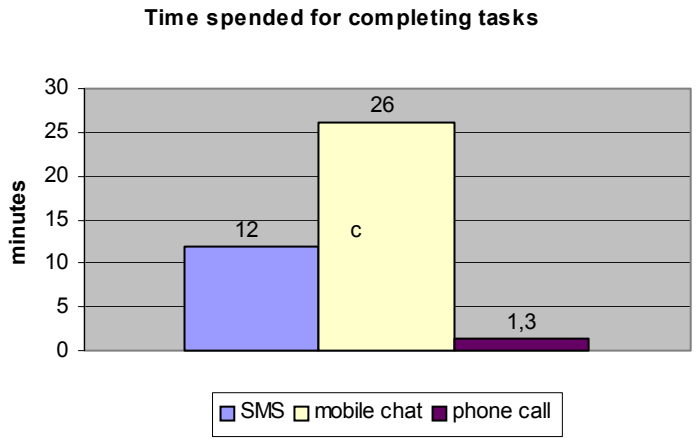


Fig. 5. The average time of performing the task with the different communication modalitie.s

Below, some of the SMS and mobile chat dialogues are presented in the original Swedish language and as translated to English. These dialogues illuminate the atmosphere and expressivity of the conversation.

SMS conversation 1

[A] 12.32 JA VILL SE TUNGT VATTEN, PÅ REST. SNÖVIT KL 21 VA SÄGS OM ATT VI MÖTS PÅ SÖDER NÅNSANS JA E PÅ VÄG HEN PUSS
I would like to se [the concert]"Heavy Water", on restaurant "Snow White" at 9 p.m. What about meeting somewhere in Southern Stockholm. I'm on my way home. Kisses.

[B] 12.38 JO DET BLIR BRA MED TUNGT VATTEN. HAR FAKTISKT INTE HÖRT TALAS OM DEN, MEN DET LÅTER BRA **:)** VI KAN MÖTAS I SÖDERHALLARNA, VID INGÅNGEN KL. 20.30, OKEJ? PUSSEN
ok, that sounds fine with Heavy Water. Haven't heard of it actually but it sounds fine :) We could meet in the southern market place, at the entrance at 8.30 p.m. ok? kisses

[A] 12.41 PERFEKT. HOPPAS DE E BRA. TUFFT NAMN, HEEHE HAHA BLEV LITE FEL DÄR ÄLSKLING PUSS

perfect. hope it will be good. tough name hehe haha. got a little wrong there darling kisses

[B] 12.43 HAHA, JA FAKTISKT. MEN VI SES SEN DÅ! P&K! JE T'AIME, MON AMOUR!
haha, yes actually. see you later then! hugs and kisses! Je t'aime mon amour!

[A] 12.43 DIN MOBIL RINGER
your mobile is ringing

[B] 12.47 GÖR DEN? ELLER VA MENAR DU? DENHÄRA ELLER MIN EGNA?
is it? or what do you mean? this or my own?

SMS conversation 2

[A] 13:25 SKA VI GÅ PÅ BIO IKVÄLL?
Want to see a movie tonight?

[B] 13:26 GÄRNA DET, VAD SKA VI SE?
I would love to, what should we see?

[A] 13:29 MONSTERS, INC KL. 11.45 PÅ FILMSTADEN CAMERA. VAD SÄGS OM DET?
Monsters Inc at 11.45 at movie city camera. What do you say?

[B] 13:31 TÄBY E FÖR LÅNGT BORT, VI SER SAMMA FILM PÅ SERGEL 11.50 ISTÄLLET. OK?
Täby is too far away, let's see the same movie at Sergel 11.50 instead. ok?

[A] 13:33 OK, DET HAR DU RÄTT I. VI SER DEN DÄR DU SA ISTÄLLET. SES VID BION KL. 11.40? OK?
Ok, you're right. let's see it where you said instead. see you at the movie theater at 11.40. ok?

[B] 13:35 LÅTER UNDERBART! HAJDÅ!
Sounds wonderful. bye

[A] 13:36 BRA! SES DÄR DÅ!
Good! see you there then!

Mobile chat conversation

[A] KOMMER IN
Enters

[A] HEJ
hello

[B] KOMMER IN
Enters

[A] HALLÅ?
hello

[B] HEJ, NU ÄR JAG INNE I CHATTRUMMET!![2]
hello, I'm in the chat room

[B] HOHO!!
hoho

[A] JAPP D EDU

[2] This was part of the task description, the participant would write this sentence when he or she entered the chat room in order to see how it worked.

yeah that's you
[B] SOFI
sofi
[A] HUR E D?
how r u
B] LÄMNAR[3]
Leaves
[A] LÄMNAR
Leaves
[B] KOMMER IN
Enters
[A] KOMMER IN
Enters
[B] LIE KRÅNGLIGT DT HÄR VILKEN FILM SKA VI SE?
this is cumbersome, what movie should we see?
[A] FILM?
movie?
[B] HEJ, NU ÄR JAG INNE I CHATTRUMMET
hello, i'm in the chat room now
[A] HEJ
hello
[B] VILL SE THE OTHER BIOPALATSET VAD TYCER DU
want to see the others at Biopalatset. what do you think
[B] DET HÄR TAR TUSEN ÅR OCH MINA FINGRAR GÖR ONT
this takes 1000 years and my fingers hurt
[B] LÄMNAR
Leaves
[A] LÄMNAR
Leaves
[A] KOMMER IN
Enters
[A] DET BLEV KNAS MEN NU Ä JAG TILLBAKA
daft but i'm back now
[TRÖTT] KOMMER IN
[TIRED] Enters
[A] THE OTHERS 9.30 BIOPALATSET TRÄFFAS UTANFÖR 8.30 SÄG BARA JA FÖR JAG KA IE SKVA MER MIN FINGRAR DÖ
the others 9.30 Movie Palace. meet outside 8.30. just say yes cause i cannot write any more. my fingers are dead
[TRÖTT] MOBILEN ÄR TRÖTT
The phone is tired
[A] JAG HA BLÅMLRKEN PÅ MIA FIGRAR
i have bruises on my fingers
[TRÖTT] OKEJ. DET BLIR RA. CP PÅ WAPP
ok, that's fine. I hate WAP
[A] ÄR DET JAG BESTÄMDE BRA?
is what i decided good?
[A]BRA VI SES
fine. see you
[TRÖTT] JAG HAR ONT I NÄSN
my nose hurts
[TRÖTT] JJA DET BLIR BRA
yyes that's fine

[3] Indicates that the connection link was broken.

[A] JAG GÖR NÄSTA NU FÖR VI É VÄLL KLARA
i continue with next task now, cause we are ready right?
[A] LÄMNAR
leaves
[TRÖTT] VILKEN TID SA DU? OCH VAR?
what time did you say? and when?
[TOMAS] KOMMER IN[4]
[TRÖTT] LÄMNAR

Interviews

For arranging social meetings, the participants would rather use a phone call or SMS than a mobile chat. Clearly, the two mobile messaging systems were designed for different purposes. SMS supports dyadic, informal asynchronous communication while mobile chat supports synchronous multi-person conversations. The specific task was a dyadic cooperative task, so a phone call or SMS conversation was more appropriate here. The questionnaire formed a base for the qualitative interviewing, and some opinions on the different communication medias and are presented below.

SMS

After the experimental trials, the participants filled in a questionnaire that formed a base for the interview. The results from the interview indicated that the benefits of SMS was that it can be used when a phone call is not appropriate; in early mornings, late evenings, or when the sender does not want to disturb the receiver for various reasons. With a phone call, the time and topic may be convenient for the initiator, but not necessarily for the recipient. An advantage with SMS was its immediacy – the mobile phone is often at hand, so it is quicker than e.g. sending an email, which is also a "discrete" way of sending information without disturbing the receiver. As with the phone, the recipient of an SMS may or may not "answer". SMS also eliminates certain formalities, as "how are you doing", associated with phone calls. Instead the participants can go straight on to the actual matter. A central use of SMS was for social small talk with friends, and for quick greetings. SMS was also used for sending brief messages to family members ("Buy milk. I did it the last time") or messages about school ("I finished my biology work").

On the question of why and when people were sending SMS, some of the comments were:

[4] Someone else enters the chat room.

- When I want to send a greeting to family/friends and not having other things to do.
- When I am bored and don't have anything better at hands.
- When I only have something short to say.
- When I don't dare to call. Early mornings and in the middle of the night.
- When I don't have the money or time to call. When it is too late to call.

Upon the question about their feelings about SMS comparing to mobile chat and phone call, some of the comments were:

- SMS is ok if you only want to say something short, but is sometimes unnecessary.
- SMS is good if you just want to say something short. But the chatboard5 reacted slow on my keystrokes.
- It is nice to receive SMS's, but it takes a while before you get an answer. Sometimes you don't know if the "mess" ["mess" is a slang word in Swedish for SMS] got through or not.
- It is easier to decide things on the phone than with SMS's, but SMS is sometimes a good alternative.
- With SMS you don't misunderstand time and place, as you can do when having a phone conversation. But then of course, SMS is more expensive in the long run.
- With SMS, you know that the other person gets your message sometime, which is good if you don't have the time to call. But it is time consuming.
- SMS is quite slow. Besides, the chatboard didn't work very well.
- SMS is easy and fun.

[5] The participants were using a mobile phone with a chatboard.

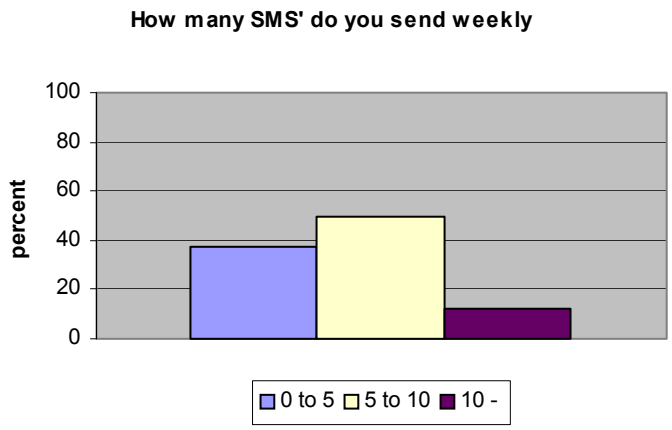


Fig. 6. Amount of weekly sended SMS

Most of the participants sent about five to ten SMS weekly (fig. 6). On the question on how to improve SMS, the participants stated that they wanted to be able to write longer messages, use color pictures, and that the telephone should be able to store many SMS' (i.e. small size).

Mobile chat

Mobile chat is a new feature for mobile phones, and none of the participants in the test had used it before. At first hand, mobile chat appears to have all of the advantages stated for SMS – it can be used at inappropriate times, a brief and informal way for sending short messages. However, while SMS does not require an immediate answer, both parties need to be active in the mobile chat. The initiation process can be a problem. As one participant expressed it:

> "How do you start a chat conversation? Should I call my friend and say 'Let's meet in the chat room and start chatting'?! I would feel obliged to have something important to talk about then! "

Another participant thought it was annoying with other people in the chat room, and wished for a private chat for two.

> "The computer-based chat 'MSN Messenger' is good, because you can choose to chat directly with your friends on your buddy-list. In the mobile chat you have to enter a chat room where there are a lot of other people that try to get in contact with you."

Other comments on mobile chat:

> "Irritating that you couldn't see the 'message board' at the same time when writing your message, it made the conversation sluggish."

> "It is a rather complicated way for arranging appointments. A positive point though, is that you can communicate with several persons at the time."
>
> "Mobile chat is complicated and it is difficult to express what you mean. But on the other hand you can easily 'meet' other people, which is positive."
>
> "Mobile chat is fun, but takes more time than a phone call. Annoying when other people enter the chat room. It makes the conversation impersonal."
>
> "Mobile chat was not the same thing as the computer chats I've tried. It was too unstable, complicated and time consuming."
>
> "Mobile chat was strenuous because you can not write as long messages as you want, and it was pretty lengthy."
>
> "Mobile chat could be nice if you want some company while waiting for the bus or something."

Speech was, as expected, considered as the fastest and most satisfying communication media. SMS was faster than mobile chat, but mobile chat was experienced as more personal. Mobile chat was disliked, mostly because of the slow connection link. Other factors were that the keyboard did not work well, too small screen, the surrounding environment was disturbing, the length of the messages was to short complicated service/complications and that the mobile phone reactions is too slow. The chat board mainly contributed to this, but also the slow connection link.

Social norms and spaces

The interviews also comprised questions on social norms and social spaces. None of the participants were new mobile phone users. They had all owned a mobile phone for one year or more. The feelings with regard to mobile phone use in public naturally varied from person to person. Some examples illustrating popular sentiments follow:

> "It doesn't matter if people in public hear [my private conversations], because I will never see them again."
>
> "If you are with a bunch of friends and someone starts 'messing' [i.e. sending SMS], that's no big deal. It is worse if someone starts to talk on the phone."
>
> "That's ok [if someone talks on the phone]. But if he or she is talking for long time and is laughing and speaking with that person on the phone, one can feel a bit outside after a while."
>
> "I am annoyed if someone is talking loud on the mobile phone about what he did or will do this weekend. It is like he wants to prove something."

Summary

In this chapter the results from the field studies and the experimental case studies were presented. The field studies were used as a feasibility study for gaining a better understanding of mobile phone use in public settings. The actors' overt behaviors were documented – how they responded to calls and SMS' and how they handled their private conversations in public places. Many incidents were recorded where private information was overheard. In field studies at cafés the mobile phone was often placed on the table, so the owner could easily see if there was an incoming call or SMS. In other public areas, it was often placed in the handbag for women, and in jacket or trouser pockets for men. The mobile phone was always close to hand and diligently used. People seemed to use their waiting time on public transports etc., for calling and sending SMS. When in silent settings, people walked out when receiving calls, but responded to SMS'.

The goal of the experimental case studies was to gather measurable data of attitudes and opinions around mobile messaging. The results indicated that:

- SMS was considered almost as easy to handle as a phone call.
- Mobile chat was more frustrating to use and not as fun as SMS.
- For this particular task (arranging social meetings), the participants would rather use a phone call or SMS than a mobile chat.
- It was harder to understand the other persons reactions, and harder to express oneself in mobile chat than in SMS.
- Mobile chat provided a more personal/presence-like experience than SMS.

To summarize, SMS is a commonly used medium that is immediate and informal. People use SMS to send short messages to friends or family when they for different reasons do not want to call. The time or setting may, e.g., be inconvenient or the content may be better suited for SMS (e.g., a long address on the Internet), or they just want to send a short message without the formalities as "how are you doing?". The topics in SMS' are mostly social, keeping in touch with friends and arranging social meetings. For the particular task in the

experiment (arranging social meetings), SMS was quicker than mobile chat, and was referred to as more fun and less frustrating. What is more, it was easier to understand each other and catch the other person's reactions.

Mobile chat was a new feature to all the participants. In contrast to SMS, both parties have to be active in this conversation. Mobile chat gave a stronger feeling of being present than SMS did, but annoyed people with its slow connection links, short message length (50 characters) and other complications. Most participants stated that they would not use mobile chat for arranging social meetings, but more as a place where they could meet other people. The mobile chat was apparently not as good as its desktop counterpart. People felt they had less control of what was happening in the chat, e.g., nothing indicated when the counterpart was writing a message. Furthermore, it was complicated to initiate the chat conversation.

DISCUSSION

This chapter is divided in three parts: method discussion, result discussion and future directions. Questioning whether qualitative and quantitative methods reflect reality in a neutral and objective way would be to batter open doors. But in order to better understand what affected the results, we start with motivations on the method choices and what uncertainties they yield with respect to the results. Next, there are interpretations of the results and solutions to some of the problems that were stated during the case studies. Finally, the bearing of this study on designing future text-based communication systems for mobile phones is delineated.

On the Methods

The field studies were performed in noisy and silent public settings. The goal was to study the social use of mobile phones. The observer noted all phone-related activity during 30 minutes in the different settings. The main problem with the field study was that observation of SMS use is not as easy as observing phone conversation. The overt behavior of SMS conversations does not say much about what is written. However, a study of the written language in SMS and other mobile messaging systems is not the most important thing in this study, and is another field of research.

The case studies had a task-oriented focus. In reality, mobile phones are also used for leisure related or informal communication. The social use is however easier to study with field studies and interviews than with experimental studies, so this is why the experimental studies were more oriented towards instrumental use. The test tasks were chosen to be small enough to be completed within the time limits of the test, while at the same time being modeled on some task commonly performed with mobile phones. After pilot testing,

arranging a social meeting was considered as the most appropriate task. The cooperative nature was congenial to the study, because it required two test persons at the time. Having two test persons at the time is useful for creating a relaxed atmosphere. The two test persons would decide on an event to attend and on a place to meet using either: SMS, mobile chat, and speech. The tasks were: (i) Decide on a movie to see, (ii) Decide on a concert to attend (iii), Decide on an exhibition to visit. To their help the participants had a newspaper and were given the specific page where they could find information about the task. The tasks were given to the users in writing. This was done to ensure that all users got the tasks described in the same way, but also to allow the users to check the task description during the test. After reading through the task description, the participants were asked if they had any questions, in order to minimize the risk of misinterpretation. The communication activity was logged by either the test leader or by "the system itself". Received and sent SMS' were saved in the mobile phone. The test leader logged the mobile chat activity, and the phone conversation was recorded with a mini disc recorder. In order to diminish the researcher's effect, the test leader left the room and waited outside.

The experimental design was chosen to be a within-group design. In contrast to the between-group design, the within-group design implies that all groups get to test all systems. In this particular study, all groups tested the conditions: SMS, mobile chat and phone call. A problem with within-group design is that there might be some transfer of skills between the conditions. If a group starts with SMS, they might handle the mobile chat more easily afterwards. In order to control for this effect, the groups switched orders of all possible tasks. This meant that group one first tested SMS for deciding on a movie, then mobile chat for deciding on a concert, and finally phone call for deciding on an exhibition. Group two started with testing phone call for deciding on a concert, then mobile chat for deciding on a movie, and finally SMS for deciding on an exhibition.

The participants included five men and eleven women in the ages ranging from 14 to 33 years. The age distribution was over-represented by young people, but one can assume this age group to be more experienced in SMS, and computer chats[6]. There were more girls than boys that applied for participating. An explanation can be that girls in the ages 15 to 18 years, are the most mobile group[7]

[6] The participants had to have "adequate experience with mobile phones and SMS" and "at least some experience with a desktop computer chat", in order to participate in the study.
[7] concerning to a user study that covered 300 people in the ages 15 to 25 years. The results cathegorize the participants in four groups where the most mobile group is girls in the ages of 15 to 18 years.

[Ritzén & Svensson ’00] and thus would be interested in participating in this kind of study.

On the Results

In spite of the cumbersome interaction design, SMS is considered as fun and easy to use. The SMS technology is implemented on a small screen client with buttons that are certainly not built for writing text messages of up to 160 characters. This has not stopped people from using the service anyway. After all, SMS interactions consists of no more than typing text into a window, and still it succeeds in providing enough context to express emotional nuances. It is interesting to see how people overcome the usability problems and replaced the main non-verbal components in speech as emotional tone, speech timing, and accent. When messages took a long time to enter, abbreviations were used (such as “CYA” for “See you”). The use of emoticons also helped to express feelings in a way that was difficult with just text. The fact that the participants knew each other might have contributed to this relaxed way of communicating. So, is there a need for improving mobile messaging, or is SMS everything that mobile phone users need? The results pertaining to benefits and employment areas for SMS together with an analysis of the problems that arouse with mobile chat, can be used to understand how to create more usable text-based communication media for mobile phones.

SMS was quick and efficient, but mobile chat allowed the participants to experience feelings of intimacy and being present. The mobile chat is a synchronous application and thus more conversation-like. This is in line with the assumption that the richer, and more immediate a communication channel is, the more effective it can be in providing a sense of social presence. In this particular case study, SMS proved to better support the cooperative task. This can be explained by the chat’s technical problems, e.g., slow and unstable communication and other complications such as technical problems with the chatboard. Most participants stated they would not use mobile chat for arranging social meetings.

Initiating a chat session showed to be cumbersome. Several keystokes were needed in order to log on to the chat. First, the WAP-adress had to be written (http://iqchat.comviq.se/#mainmenu). Next, one has to

choose “Chat room” (fig 7), user name and what chat room to attend (fig. 8).

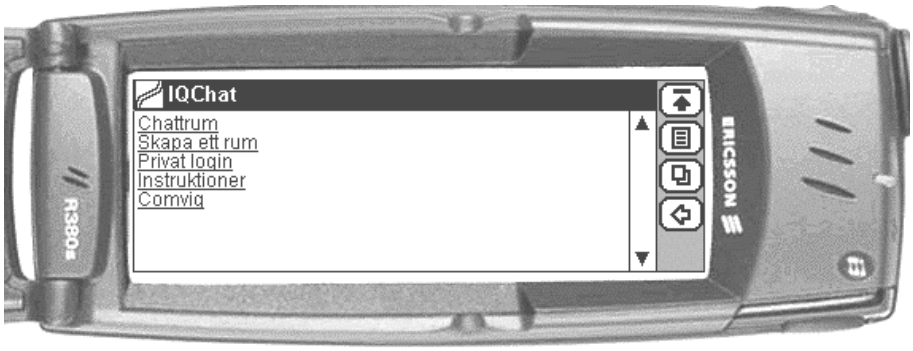


Fig. 7. The user interface of the mobile chat.

Fig. 8. The user has to choose a user name (alias) and choose a room. Dating(5) means that there are five participants in the Dating chat room.

A buddy-list could be proposed as a solution. A buddy-list shows if buddies are currently logged on to the chat system, and lets the initiator know when a recipient is available for a message. Simply by clicking on the receiver’s name, a conversation is initiated. With a buddy-list, the chat is becoming similar to Instant Messaging (IM). Research shows that IM-messages are easily screened while being engaged in other activities, because it is presented directly on the screen without any keystrokes [Nardi et al ’00]. Such monitoring is more difficult with other media; for example, it is not easy to respond to a phone call and carry on a face-to-face conversation simultaneously. Likewise, it is difficult to read an SMS or other text-based mobile messages and carry on a face-to-face conversation. As mobile phones are commonly used in social milieus, it would be helpful to have an easily screened and monitored messaging technology. This would allow discontinued engagement in other social activities. A mobile chat function similar to the existing IM-systems would therefore be a good idea.

CONCLUSIONS

Two different forms of text-based mobile messaging systems were examined through the user study, SMS and mobile chat. SMS is already diligently used while mobile chat was recently introduced on the market and has a very limited user base so far. SMS is a popular mobile messaging system, although much is lacking in terms of meeting usability needs. Former research indicates that the richer, and more immediate a communication channel is, the better it can support cooperative tasks. Rich communication channels (in the sense of being interactive and expressive) also tend to support experiences of being socially present. This indicates that a synchronous messaging system such as mobile chat could allow for more efficient and socially conducive communication than SMS and this assumption was explored. The user study results were partly in line with this assumption. Although the mobile chat was considered as complicated to handle, it appeared to provide a stronger feeling of social presence when compared to SMS. However, SMS was found to be more expressive and efficient. The interaction design of the WAP-based mobile chat unfortunately made the chat conversation more complicated than it had to be.

The benefits and employment areas for SMS together with the perceived problems with mobile chat can provide a deeper understanding for messaging services. SMS communication share many characteristics with informal face-to-face communication, being immediate brief and socially relaxed. Apparently, the currently available mobile chat did not have the same benefits. This may be something for the developers to consider. Instead of developing new and more complicated services, there is a point in looking back at why SMS grew popular and other services did not. The benefits of SMS can be summarized as:

- *Immediate*. The mobile phone is often at hand, so it is quicker than e.g. sending an email, which is also a “discrete” way of sending information without disturbing the receiver.

- *Informal.* SMS also eliminated certain formalities, as "how are you doing", associated with phone calls. Instead the participants could go straight on to the actual matter.

- *Brief.* A central use of SMS was for social small talk with friends, for keeping in contact and arranging social meetings. SMS was also used for sending brief messages to family members ("Buy milk. I did it the last time") or messages about school ("I finished my biology work").

- *Discrete*. It can be used when a phone call is not appropriate; in early mornings, late evenings, or when the sender does not want to disturb the receiver for various reasons. With a phone call, the time and topic may be convenient for the initiator, but not necessarily for the recipient.

Except for the constraints associated with the phone and the connection link, the application specific problems with mobile chat can be summarized as:

- No natural way of initiating the chat session.

- Nothing indicated when the counterpart was writing a message. People felt they had less control of what was happening in the chat.

- When writing a message, the user missed out on events and history of messages.

- The dyadic conversation became impersonal when unknown people entered the chat room.

- Desktop computer chats are more stable and reliable than mobile chats. No clear benefit with the mobility of mobile chat.

- Message length was limited to 50 characters.

Design Implications

The purpose of this work is rather to form a base for understanding mobile messaging usage, than to create new design features. However, in order to achieve usable mobile messaging applications, it is important to identify how and when the application is supposed to be used. According to the results from the experimental study, the synchronous system is needed when people want to say something brief and informal in a conversation-like manner. The asynchronous system is better suited for sending short greetings in a discrete way without disturbing the receiver. The following mobile messaging systems are suggested, with suitable employment areas:

Asynchronous mobile messaging system (SMS, MMS)
Field of application:

- Offers a discrete way of communicating, when the sender does not require an immediate answer – a mobile version of email. It is useful for keeping in touch with friends, and especially when not wanting to disturb the receiver such as late in evenings or early mornings.

Features:

- Text messages with the possibility to attach graphics, video clips and audio files.

Nearly-synchronous mobile messaging system (IM)
Field of application:

- Like SMS it is useful for sending brief and informal messages. But in contrast to SMS, the IM-message is easily screened while being engaged in other activities, as it is presented directly on the screen without the need of additional keystrokes.

Features:

- WAP- or SMS-based messages with buddy-lists that show whether buddies are currently logged on to the chat system. By clicking on the receiver's name, a conversation is initiated.

Synchronous mobile messaging system (Chat)
Field of application:

- Multi-party conversations, when time and place do not allow a telephone conference or
- for "meeting" unknown people when a desktop computer is not at hands, for example in waiting situations instead of doing something else. This field of application is proposed with a

reservation for that mobile clients exhibit poor usability in comparison to their desktop counterparts. In order to succeed, this mobile service need to offer some added value to be interesting.

Features:

- WAP- or SMS-based service where the users have to enter a chat room in order to start the chat.

Usability Guidelines for Mobile Messaging

This work concludes in a unique usability guideline for designing mobile messaging systems.

1) *Easily screened messages.* As mobile phones are commonly used in social milieus, there is a need for an easily screened and monitored messaging technology. This includes reducing the number of keystrokes and text entry work that the user is expected to do as well as the amount of vertical scrolling by simplifying the displayed text.

2) *Indication of when the other is writing a message.* Indicating when the other is writing a message is an indirect way of providing users with a sense of control by increasing their awareness of who is doing what.

3) *Indication of events on the message board.* Similarly, an indication of events on the message board when writing message would give users a greater sense of control through increased awareness of what other users are doing.

4) *Show delivery status*. This feature should be optional. The user should be able to turn the feature "Show delivery status" on if he or she is about to send an important message or is uncertain whether the receiver gets the message or not.

5) *Simple hierarchies.* Use simple hierarchies that are similar to the phone menus that users are already familiar with.

6) *Facilitate the initiation process* for mobile chats by providing a buddy list of people who can be invited to the chat room.

7) *Allow for 160 characters.* The message should be brief, but the length should not be limited to 50 characters. as in today's mobile chat. Proposed is to limit the message length to 160 characters as the users are used to from SMS.

8) *Improved WAP-connection.* Improved connection links are needed to offer increased stability and better reliability.

9) *Use the medium's very mobility*. Systems that are simply converted from the desktop computer to the phone platform are not good enough.

10) *Better keyboard interaction* than today's phone keyboards. The chatboard is a good idea but the technology needs to be improved.

Future Directions

SMS was a grassroots revolution that the mobile industry did not purposefully nurture. This is in stark contrast to other industry led approaches, such as WAP and all the text-based services that came with it. In contrast to WAP, the mobile messaging services are based on the only thing that really interest people – to communicate with other people. The potential of mobile messaging services is therefore greater than that of other mobile services we are expected to use in a near future. It appears that growth for text-based services would involve establishing the environment conducive to success. Such environments can be realized if all actors implement the same open standards, putting the right payment technologies in place, and recognizing that it takes time to build a critical mass of usage. But it can also be as simple as refining the existing success of SMS, as with the MMS-technology. Moreover, it is important to recognize the different fields of application for each system.

Usability is an important issue for mobile messaging services that must be considered on small resource-poor devices. An interesting continuation would be to do long-term field studies of mobile messaging systems. Then the informal and non-task oriented behavior could be studied thoroughly. The laboratory testing helped delineate patterns of mobile messaging use, but provided no overall picture of the use in everyday life. In longer field studies such patterns could be

more authentically observed, as mobile messaging use would be studied as a natural part of everyday life. The results presented in this report may be something for mobile service developers to reflect on before developing new complicated services.

REFERENCES

Books and Papers

Argyle M (1969); *Social Interaction;* London; Methuen; ISBN: 0-416-13900-0.

Blomberg J (1995); Ethnography: aligning field studies of work and systems design; In Monk, A & Gilbert G (eds); *Perspectives on HCI*; Academic Press; London, UK; ISBN 0-125-04575-1.

Chalfonte B. (1991); Expressive Richness: A comparison of speech and text as media for revision; *Proceeding of CHI.*

Dix A, Finlay J, Abowd G, Beale R (1998) *Human-Computer Interaction.* Second edition. London: Prentice Hall. ISBN: 0-13-239864-8.

Fischer C (1992); *America Calling: A Social History of the Telephone to 1940*; Berkely: University of CA Press; ISBN: 0-520-08647-3.

Garfinkel J H (1967) *Studies in Ethnomethodology*; Englewood Cliffs, N.J. : Prentice-Hall.

Goffman E (1959) *The Presentation of Self in Everyday Life.* Edinburgh University Social Sciences Research Center.

Hammersley M & Atkinson P (1995); *Ethnography: Principles in practice*; Routledge; London, UK; ISBN 0-415-08664-7.

Jensen C, Farnham S, Drucker S & Kollock P (2000). The Effect of Communication Modality on Cooperation in Online Environments. In *Proceedings of the ACM Conference on Computer-Human Interaction (CHI '00),* Amsterdam, p. 470–477.

Ling R (1999); *Nobody sits at home and waits for the telephone to ring;* Telenor RoD Report.

Meurling J & Jeans R (1994); *The mobile phone book – The invention of the mobile telephone industry*; Stockholm: Informationsförlaget; ISBN: 91-7736-367-1.

Millen D (2000); Rapid ethnography; *Conference proceedings on Designing interactive systems: processes, practices, methods, and techniques*.

Nelson L, Bly S, Sokoler T (2001) "Quiet calls: Talking silently on Mobile Phones"; in *Proceedings of the SIGCHI conference on Human factors in computing systems March 2001*; p.174–181; ISBN: 1-58113-327-8.

Nielsen J (1993); *Usability Engineering*; AP Professional; Boston, USA; *ISBN:* 0-12-518406-9.

Norman D A (1990); *The Design of everyday things*; New York: Doubleday; ISBN 0-385-26774-6.

Norman D A (1998). *The invisible Computer*. The MIT Press, UK. ISBN 0-262-64041-4.

Palen L, Salzman M & Youngs E (2000); Going wireless: behavior & practice of new mobile phone users; *Proceedings of the ACM 2000 Conference on Computer supported cooperative work,* 2000, p.201–210.

Repstad P (1993); *Närhet och distans – Kvalitativa metoder I samhällsvetenskap*; Studentlitteratur; Lund; ISBN 91-44-27902-7. (In Swedish.)

Ritzén K & Svensson E (2000); *Morgondagens mobila tjänster*; Linköping University. (In Swedish.)

Short J (1976); *The social psychology of telecommunication*; London: John Wiley; ISBN 0-471-01581. (In Swedish.)

Web Sites

Computer Knowledge,
http://www.cknow.com/ckinfo/emoticons.htm

Mobile chatting,
http://www.mobilechatting.com/

Mobile Instant Messaging,
http://www.mobileinstantmessages.com/whatis.asp

(All web sites last accessed on April 19, 2002)