Exploring user contexts - a qualitative study of everyday activities

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The physical, social, and computational context of people affect their choice of activity, thus also their need for and use of mobile services. It is quite easy to find likely examples of situations where this would be true. For example, a person who is standing on a subway station on the way home from work, waiting for a train that does not appear to be on time, is more likely to feel a need for a subway time table or traffic information than someone who is driving a car. To what degree does context matter is however not easy to answer precisely. Which context parameters matter for which activities, and in which combinations?

This report describes a study with the aim to draw a map of user activities and context parameters, as well as combinations of context parameters. The study is based on a qualitative method with only 10 study participants, and thus, no precise answers can be given to any question regarding which context parameters matter more than others when trying to predict what user activity is needed the most for every given situation. However, the intention is that the report will assist in determining which context parameters and user activities are the most interesting to take a closer look at.

1   Method

In the present study there were 10 participants between 20 and 30 years of age, all the participants were also working in an office. The study was conducted by using an ethnographical approach. The purpose was to study and observe the participants in real life settings, both in situations when they were using mobile devices and in other situations. The presuppositions for the study consisted of a limited amount of time, and there were no possibilities to observe each participant for a longer period of time (weeks or months), which should have been the case with a "proper" ethnographical study. However, to get the most out of the observations, careful pilot tests were conducted. These tests resulted in a study set-up with 2 half-days of observations and one interview after the observations. To be able to overcome some of the initial bias related to the relation between the observer and the participant, participating observations (Svensson & Starrin, 1996) was chosen as a method. The participants are always more aware of the observer during the initial phase of a study using observations as a method. Therefore it is better to make this relation explicit (with participating observation) in situations where there is too little time for the observer to become "invisible". During the second day the observer became more active and also asked questions about some of the behaviors that had been observed, however more complex questions were written down (by the observer) and saved for the interview. The interview consisted of questions related to behaviors that have been observed during the observations and what was found to be interesting during the proceeding of the study. This way of letting the questions and topics change and narrow down on some topics is according to the chosen method of Grounded Theory (Svensson & Starrin, 1996). Further, the interview also consisted of questions about attitudes related to the use of mobile devices and other aids. All the participants were clearly informed in advance about the purpose of the study.

The method used in the present study is similar to the one used in other studies concerning mobility. Observations are, according to Weilenmann (2003), the most suitable method when studying mobility in a geographically limited area. The combination between observation and

interviews is furthermore a recommended method to study mobility (Sperschneider & Bagger, 2003). In the present study we were only able to observe the participants in some situations and contexts, and the areas that were chosen for the observations were: during transportation, performing private tasks at work, and time spent after work (during leisure activities).

1.1   Analysis of the material

All material from the observations and from the interviews has been written down and all the material have been read several times from different perspectives and with different foci. There has both been an intention to capture relevant and interesting phenomena, and to try to find different contexts and activities related to the purpose of the study.

The approach during the study, and during the analysis, has been based on Grounded Theory (Svensson & Starrin, 1996), where previous observations affect forthcoming observations (which they always do, but with this method it is explicit). The implication of this approach is that it is allowed to choose observed phenomena that have been found interesting, and focus more on them, however remain open for new, not earlier observed, impressions and behaviors. This approach have made it possible to bring up interesting behavior in the interviews and also to get explanations of the participants behaviors in different situations.

The results from the study are presented in the forthcoming three sections of the report. In the Contexts section, we briefly describe the contexts of the observations made. In the Activities section, we have categorized the observed activities, and highlight some relations to the described context types. In the Attitudes affecting behavior and activities performed section, we discuss some general issues that primarily have been taken from the interviews with the participants.

2   Contexts

Below we outline the outer contexts that have been observed in the study. In the following section "context" refers to places and situations where observations have been taking place. However, in this section we will also briefly describe some behavioral (what people do) and social (if there are much people around the participant and the observer, or if they are alone) contexts that are related to the places where the observations have been made.

2.1   Work place

The work place is the most frequently occurring context in our study. However, many private matters are being dealt with during the course of a normal workday.

2.1.1   Private office

The observations that were made at private offices showed a mixture of work related tasks and private tasks. The work related tasks were: using the computer, writing emails and talking on the phone. Several errands to other parts of the office and to colleagues were also conducted, and much planning of work related tasks took also place. The private tasks also involved a lot of planning of later activities during the same day.

2.1.2   Open plan office

In most of the observations the participants had their work places in an open plan office. The overall attitude was that it was a good thing being able to easily talk to colleagues, however in some situations it seemed to be disturbing not being able to make private phone calls. It was also noted that the concern regarding not talking too loud in public not only was directed towards the people in the room, there was also a concern directed towards the counterpart at the other end of the phone, where our participants said that they paid attention to whether the conversation was sensitive for the person they were talking to.

2.1.3   Coffee room

The coffee rooms that have been observed have mainly been passed through in a hurry, picking up coffee or preparing something for breakfast. In this study we did not observed any particular interesting issues related to this context/place.

2.1.4   Meeting room (home/visiting office)

Observations have been made both in meeting rooms at a home office of the participants, as well as in meeting rooms in a client's office. Business meetings seem to be important to our participants.

2.1.5   Corridor

Some observations have been made in corridors, where the participants or colleagues have tried to get hold of each other for short meetings right away. Walking in the corridors and meeting colleagues might also fulfill a larger social need within offices that does not have the open plan structure.

2.2   Travel

Many of the observations made have been during travels between different places – primarily home and work place, and work place and places for leisure activities (restaurants, bars, and sports activities). Our participants have shown a surprisingly high degree of activity during

these travels, and many of the below-described activities are represented in this context. The travels observed have typically taken place in the morning, during lunchtime, and in the evening.

2.2.1   Walking (outdoor)

Some of our participants regularly walk a part of their way between home and work. This is usually in combination with public transportation like bus or subway. In all cases this context is busy with a lot of surrounding street traffic, high noise level, and many other (unknown) people in the surrounding. This context is also characterized by the fact that the participants are on the move all the time.

2.2.2   Walking (mall)

Some of the participants passed through a mall on their way to the office. The situation and the activities were similar to the ones performed when walking outdoors.

2.2.3   Public transportation (subway and bus)

Just as with the context of walking outdoor, there are typically many other (unknown) people on buses and subways. The noise level is moderate however, and people can usually sit down during the travel. This makes the context more suitable for the use of mobile services and for communicating with peers.

2.2.4   Car

Some of our observations have been made in private cars. This context is more private than walking and public transportation. Depending on whether the participant has been the driver of the car, or simply a passenger, a varying degree of available attention for mobile services and communication with peers have been observed. The limited attention available for a driver has however not prevented our participants from attempting to use mobile services and communicating with peers. Some observations were also made when the participants were traveling with taxi, a situation where it is possible to both pay full attention to other issues than driving, and also being able to change destination or meeting point very easily (just tell the driver to drive to another address).

2.2.5   Waiting

Some observations were made while waiting for transportation (bus and subway). It seemed like our participants to quite a large extent tried to avoid waiting by walking to stops where they did not have to wait or by walking all the way to their destination. However, this context is very sensitive to the study situation - that is, when there is only a few minutes of waiting time, the most obvious activity is to talk to the observer. Indeed, one participant said that she would have made more phone calls if she had been alone at the bus stop.

2.3   Eating-situations

The context that covers the restaurant environment has been divided into three different categories depending on the purpose with the meal (besides eating): eat, work, and social.

2.3.1   Eat

In our observations breakfast seemed to be the most common meal that only was eaten with the purpose to get rid of hunger. Most participants had a quick breakfast on their way, or beside their working place.

2.3.2   Work

Lunch was used for a combination of working purposes and social purposes. The lunch was eaten with colleagues or used as a meeting opportunity with representatives from other companies.

2.3.3   Social

Social eating or drinking was observed at a coffee places, at a bar, and in one participant's home. At the bar, several interesting observations regarding the behavior of the people in the bar was made. These observations revealed issues about how the cell phone is used as a social artifact, sending out signals to the environment about how open to contact the owner is.

2.4   Shopping

In some cases our subjects have made quick errands in convenient stores while on their way to work or some other activity. They have all been brief and focused (e.g. buying breakfast or lunch on the way to the office). However, the timing of these errands has been well picked in order to minimize the effort (e.g. stopping by a place along the way to work, or buying lunch in the morning in order to reduce the time spent in queues).

2.5   Dimensions of context and related parameters

In an attempt to quantify the concept of user contexts, we define a (non-exhaustive) number of dimensions of context.

2.5.1   Social place

The social place is what the environment or the space is used for (the intended use of a space). In contrast to geographic position, the interpretation of a social place differs between individuals, as well as groups of people. This property however, makes it easier to generalize over relationships between place and activity for different individuals. "Home" may for example be a place in which many people turn of their work cell phone. In such a case the geographic position is in itself meaningless.

   The social place can be described from a number of different perspectives: personally (e.g. home and bedroom), work related (coffee room, meeting room xyz, etc,), publicly (the subway, road 55, etc.), geographically (e.g. New York and Times Square), transportationally (taxi, subway, bus, etc.), and so on.

2.5.2   Social context

The people surrounding someone most easily describe the social context of that person. It is difficult however, to come up with a precise definition of this dimension, but it can be described from a number of different perspectives: privacy (public/private), formality (formal/informal), classification (family, friends, colleagues, etc.), and so on. The observations in the study make it clear that the social context contains important indicators to what activities users commit to, as well as how they are executed.

2.5.3   Physical environment

A number of factors in our participants' physical environment have clearly played an important role in determining activities and choices made. The noise level is one such factor, which participants explicitly have stated as important for how they act. Other factors include limitations in how to move around, whether it is possible to sit down comfortably, weather conditions when outdoors, etc.

2.5.4   Available information technologies

The currently available information technologies are also salient in determining which activities should be committed and how. Are phones available (landline, cell phone, etc.), is it possible to search for information on the Internet, are instant messengers (e.g. ICQ) available for communicating with friends, etc.

Availability is of course one important factor when determining the importance of information technologies, but the quality of the technologies is also important. Is the cell phone connection shaky? Is the device for browsing the Web small with limited screen and keyboard, or is it a fully equipped desktop computer. Are there costs associated with the direct use of technology (which is for example the case with calling on a cell phone)?

3   Activities

In this section we describe observed phenomena and activities, which we have found to be interesting and relevant with respect to the purpose of the study. These topics have gained increasing focus throughout the study, as mentioned in the method section, according to the Grounded Theory approach.

3.1   Planning

One activity that was found to be interesting during the proceeding of the study was planning. It took place in many different situations and for different purposes. The way the participants planned, the artifacts they used and the way they communicated also seemed to be different in different situations and contexts. A rough decomposition of the activity provided three kinds of planning modes: long-term planning (tomorrow or later on), short-term planning (later today), and ad-hoc planning (planning an on-going or immediately upcoming activity).

3.1.1   Long-term planning

The attitudes towards long-term planning were dependent on whether it was private meetings or professional meetings, where some of the participants reported that they where more well planned in their professional life (participant 16, interview, page 4; participant 17, interview, page 5). Most of the participants planned business meetings and private activities days, and even weeks, ahead. On the other hand, some of the participants avoided the private long-term planning because they did not view themselves as "long-term planners" or because they did not want to be booked long time in advance. Further, it seemed like private meetings were more commonly rescheduled, and that these bookings not were taking for granted to the same extent as professional meetings (participant 11, day 1, page 7).

The professional long-term planning was mainly related to future meetings at work, with colleagues or with people at other offices or departments (participant 13, day 1, observation 1; participant 15, day 1, page 6). The observed situations for private long-term planning consisted of, for example weekly shopping (participant 13, day 1, page 7), and making plans for holiday (participant 20, day 1, page 4-5).

3.1.1.1   Artifacts to use for long-term planning

A paper calendar was one of the most common aids that the participants used in their long-term planning. Several of the participants said that a paper calendar was the easiest planning aid to use, because of the overview and the ease of use. A paper calendar is easy to carry around, and it was also observed to be used as a support when discussing plans for projects with colleagues (participant 13, day 1, page 2). Some of the participants have earlier used a palm pilot but after a while returned to use a paper calendar because of its advantages to a small digital device. The view on paper calendars can be summarized in what one of the participants said: "everybody uses a paper calendar" (participant 12, day 2, page 11).

It was also observed in the study that several participants used their paper calendar together with a computerized calendar. The use and integration of several aids for long-term planning was one further interesting issue that was discovered during the observations. For example participant 16 used a paper calendar together with the outlook calendar (participant 16, day 2, page 6). Two other participants had both one professional and one private paper calendar (participant 15, interview, page 1; participant 18, interview, page 1), and one of them also had a computerized calendar; and had to coordinate between the different calendars (participant 15, interview, page 1). However, the use of a computerized calendar was only

work-related, and it seemed like the participants were more or less "forced" to use it because of routines at their work.

The coordination between different places and devices might also explain the common use of paper calendars, since it is easy to carry around. One example of this could be seen in one observation where the participant brought the paper calendar to conduct a booking of a meeting room (participant 19, day 1, page 3). Another observed way of coordinating planning aids, was that the participants first took notes an a piece of paper and later on added the meetings or bookings to another calendar (participant 19, day 2, observation 1; participant 16, day 2, observation 1).

While some of the participants had several planning aids (both private and at work) and had to coordinate them, others only had a paper calendar at work (participant 14, interview, page 1; participant 17, interview, page 2), and one of the participants did not plan at all (participant 20, interview, page 4).

3.1.2 Short-term planning

Short-term planning takes place during the same day as, but well before, the planned activity. This type of planning takes place while performing some other activity, e.g. working. In numerous cases, our participants planned lunch activities for the same day during the early working hours (while working in their office), breaks for smoking, and evening activities during the afternoon. Many work meetings (between participants within the same company) were also planned in this way, where the participants contacted their colleagues and planned for a meeting later on the same day. Our participants did this regardless of whether they worked in open office spaces or in office spaces of their own. This kind of planning (as well as long-term planning) involved several different communication artifacts and information sources including paper calendars, cell phones (SMS, phone book, calendar, and voice calls), and personal computers (calendar, email, phone book, and instant messaging) – often in various combinations.

On aspect of short-term planning that was observed, was that it was used to confirm previous arrangement that had been planned long time in advance (long-term planning). For example, one participant did several phone calls during the day to confirm such previous arrangements (participant 12, interview, page 3). This behavior was observed for work related arrangements, as well as for private plans related to evening activities (participant 12, day 1, observation 6). Besides confirming a planned meeting, short-term planning also was used for making final decisions about where to meet (participant 15, day 1, observation 1). In these "confirming situations" the most common way to communicate was through a phone call/phone calls.

One further interesting issue that was found during the observations was that much communication was about the short-term planning of meetings, especially lunch and smoking breaks. It seemed like this communication also served another purpose, where this communication was used as a reason for taking a short break (e g. contacting some and discuss further details for lunch) (participant 15 day 1, observation 2; participant 16 day 1, observation 3; participant 17 day 1, page 4; participant 18 day 1, page 3-5).

Another kind of short-term planning that was observed, was planning the work for the day, both in terms of discussions with colleagues about what to do during the day (participant 19, day 1, page 3), and in terms of getting information (instructions) about the work that was supposed to be done (participant 18, day 2, page 2).

3.1.2.1 Making plans for the time after work

Short-term planning was also used to a quite large extent (among the participants in the study) to plan for private errands and events (restaurants, movies etc.) in the afternoon and in the evening (participant 11, day 2, observation 4; participant 13, day 1, page 4).

One participant reported it to be frustrating not to be able to make up plans for the evening spontaneously, since every day already was booked (participant 11, day 1, page 7). On the other hand, other participants conducted short-term planning to try to find someone to join (participant 15, day 2, observation 2, 3, 5), or something to do for the evening (participant 17, day 2, page 2). One participant considered himself as the organizer among his friends and sent out SMS to several people to try to arrange activities for the evening (participant 15, interview, page 3-4).

Finally it was observed that short-time planning that fails (e. g. they do not find the time to meet later on that day) can turn into long-term planning when instead deciding to meet another day (participant 18, day 2, observation 4). Short-term planning was also conducted as a way to plan for later ad-hoc planning (decide to get in touch later on when it is time to meet), both regarding work meetings (participant 19, day 1, page 3), and regarding private meetings (participant 12, day 2, observation 1).

3.1.3 Ad-hoc planning

For people with mobile communication devices, which include most people of today, and all our participants, it seems as if much of the final planning of meetings, dates, and other activities was performed in an ad-hoc manner on the way to the activity. The ad-hoc planning occurred in some situations at work, however it was very common for the private life. People make calls on their cell phones and send instant messages (e.g. SMS and ICQ) just before they are leaving a place for an activity elsewhere, or while they are on the way to the activity. In some cases our participants even invited peers to activities while they where on the way to the activity (for example breakfast at the office). Ad-hoc planning have also been observed for tasks related just to the person itself, like what errands to do on the way home from work (participant 18, day 2, page 6), or decisions about not to do already planed errands (participant 13, day 1, page 7). In other cases, the participants also performed pure information searches as a part of this type of planning (e.g. checking a subway timetable on the Internet just before leaving the office).

3.1.3.1 Dynamic planning

During our observations it was noted that several of the participants called the person they were going to meet either before they left (participant 12, interview, page 3), or after they had arrived (participant 17, day 2, page 2). However, it seemed like a more common way, at least among our participants, of conducting ad-hoc planning was to plan during the way to a (not professional) meeting. The participants decided during their transportation where to go (participant 15, day 2, observation 4) and how to get there (participant 13, day 2, page 2-4 and observation 3). In the study this behavior was observed in several different situations, one example of it was one participant that when traveling by taxi changed his mind and redirected the taxi-driver (participant 19, day 1, page 2). Another example of this dynamic planning was in a bar when the participant was about to meet some friends. In this situation the friends were told (from the bar through calls or SMS) where and when to go (participant 12, day 2).

The growing use of mobile communications has made all kinds of ad-hoc planning easier, and it has also become easier to change plans just before a meeting. Many people live active lives, both with respect to their work and their private life, and there is very little time to make up plans or book tickets for different events (buying tickets to cinemas, sport events etc.)

(participant 13, day 1, page 8). In this perspective ad-hoc planning and ad-hoc booking becomes more important and create opportunities to attend to activities that otherwise had been difficult to join.

During our observations we have also noted participants that changed plans in an ad-hoc manner after they had experienced changed conditions (for example missed the train and instead walked to the next station) (participant 12, day 1, page 8). Another situation where this was observed was in a bar, where the participant and her friend/s thought it was too crowded and therefore notified their friends that they were going to another bar (participant 12, day 2, observation 1 and observation 2 ff).

3.1.3.2 Informing about being late or changing time for meeting

From our observations and interviews it seemed like the demands on getting in touch when someone is running late has increased. The most common way in our observations have been to call to tell the waiting part that one is late (participant 12, interview, page 3; participant 13, interview, page 1; participant 14, day 2, page 1-2; participant 18, interview, page 6), however our participants also mentioned that whether or not to get in touch and how to contact to tell about the time delay, is different between different people (both the one that are late and the one that are waiting (participant 13, interview, page 1; participant 19, interview, page 5).

3.1.3.3 Work related ad-hoc planning

The work related ad-hoc planning that was observed, concerned meetings or breaks. It could be about setting up a spontaneous meeting right away (participant 13, day 1, page 4), or invite someone to a meeting that he or she not originally had planed to attend to (participant 15, day 1, page 4). Further, it was observed that arrangements about which meeting room to use, or which people to gather also was done in some situations in this ad-hoc manner (participant 12, day 1, page 5; participant 16, day 2, observation 3; participant 17, day 1, page 2). The ad-hoc planning that took place with respect to breaks consisted of calling someone about lunch (participant 14, day 2, page 7-8) or calling someone about having a cigarette (participant 15, day 1, page 2 and 4).

3.2 Coordination

In many of the situations described, we have observed participants using a number of information sources and artifacts in combination as part of accomplishing a higher-level activity. The mere work of coordinating these activities are of course time consuming, and they may sometimes cause the user to lose focus of attention.

3.2.1 Search on one device – commit an action on another

During observations we have seen participants checking their paper calendars while writing e-mails and sending instant messages (participant 11, day 1, observation 6) or interacting with e.g. Internet based travel agencies (participant 19, day 2, page 3). This behavior can be described as searching for information on one device or artifact, in order to commit an action on another device or artifact.

In other cases, people have used their cell phone to look up a phone number stored in its phone book, just to place a voice call on a landline phone (participant 11, day 1, observations 3, 5, 11, and 13; participant 17, day 1, observation 2; participant 17, day 2, observation 1).

3.2.2 Synchronization of calendar information

Another case of coordination is synchronization between different sources of calendar data. Nine out of ten participants used paper calendars for planning, but most of them also used

some kind of electronic aid as well (see below). Some participants used reminders on their cell phones as a planning aid in combination with their paper calendars. Others used electronic group calendars such as MS Outlook for planning work related activities, usually on a long-term basis (participant 12, day 2, page 11; participant 15, interview, page 1; participant 16, interview, page 2).

In either case, with more than one source for calendar information, the amount of work needed to synchronize information between the sources increases.

3.3   Information search

Many of the activities observed during the study can be classified as information search. This is for example true for looking up an entry in a calendar or searching for a number in a phone book. Our participants also performed more direct search activities such as searching for information controlled by others and searching for colleagues and friends.

3.3.1   Search for information

Our participants searched for many different kinds of information, via a number of different channels. The most obvious case of information search was to use the Internet (both the Web and via WAP) in order to search for subway and bus timetables (participant 18, day 2, page 5). Similarly, our participants searched for tips on where to dine or what movie to catch later during the evening (participant 15, interview, page 4), and even for dinner recipes while on the bus on the way home (participant 17, interview, page 3).

Another participant used direct social communication to find information by calling a close friend and asking for the name and phone number of another person (participant 19, day 1, observation 1).

3.3.2   Search for individuals

One obvious strategy for finding people (that does not answer the phone) is to call the receptionist of the person's company (again a kind of direct social communication) (participant 13, day 1, page 2 and 5). In several other cases, participants have walked around in the corridors of a workplace looking for someone, sometimes asking colleagues as well (participant 12, day 2, observation 5; participant 18, day 2, page 3; participant 20, day 1, page 4).

Instant messengers such as ICQ is often helpful when trying to find people, but in two cases, traditional search strategies have failed due to misunderstandings or technical failure. In one case a colleague to our participant mistakenly assumed the person to be missing and started to look for her, simply because the instant messenger indicated her as status as "extended away" (participant 14, day 2, page 8). In another case a colleague to our participant, knowing that network services were temporarily not working, placed a voice call to the participant when signing off for lunch, instead of using the instant messenger or e-mail as usual (participant 18, day 1, page 4-5).

3.4   Communication

In most of the above-described activities, our participants communicate with peers in one way or the other – be it via cell phones, landline phones, instant messaging (SMS and ICQ in our observations), physical notes, etc. What artifact/channel that is used and when, is of course dependent on the context. Individual differences might however be large, and the choice also varies with who the recipient is. One observation describes how a participant, while briefly stopping by her apartment, leaves a post-it note to her spouse. When asked why she left a note

instead of sending an SMS or placing a voice call, she stated that she did so sometimes simply because she knows that her spouse finds such notes charming (participant 12, day 2, page 6).

3.4.1 Choice based on sender context

The combination voice calls on cell phones is the most general artifact/channel combination, and it is used for most activities in most contexts. In some cases, SMS seems to replace voice communication when the surrounding noise level gets too loud for voice communication to be practical (participant 12, interview, page 3; participant 15, interview, page 3). Poor coverage (participant 11, interview, page 3) and meeting situations (participant 17, interview, page 4) are other context factors that made our participants choose SMS instead of voice.

However, the most common communication decision based on context among our participants was to place (social) calls to family and friends while on public transportation (e.g. participant 16, interview, page 5; participant 18, interview, page 6; participant 19, interview, page 8; participant 20, interview, page 5).

3.4.2 Choice based on receiver

While one could expect instant messaging (valid for both SMS and ICQ) to be used primarily for notifications of different sorts, some of our participants use it for plain socializing as well (participant 14, interview, page 1; participant 15, interview, page 2). E-mail is also mentioned as a primary channel for keeping the contact with friends (participant 13, interview, page 5; participant 16, interview, page 3).

Participants have also stated that they choose between SMS, voice call, and e-mail, based on their professional relationship with the receiver (participant 12, day 1, page 9; participant 11, interview, page 3; participant 17, interview, page 4).

Some participants take into account not only who the receiver was, but also the assumed context of the recipient. SMS was for example to prefer when the receiver was busy working out at a gym or at a movie (participant 14, interview, 2), or if it just seems to be simpler to respond to an SMS than a voice call at the moment (participant 14, interview, page 2).

3.4.3 Choice based on topic for communication

Our participants also indicate that they regularly select channel for communication based on the purpose with the communication. SMS was for example dominant for ad-hoc planning (participant 15, interview, page 3; participant 17, interview, page 5; participant 19, interview, page 6), even if other participants mentioned voice calls and e-mail for this purpose as well (participant 19, interview, page 8, participant 17, interview, page 5). Urgency was also mentioned as both a reason for choosing SMS (participant 11, interview, page 5) as well as a reason for *not* choosing SMS (participant 12, day 1, page 9).

SMS and instant messengers was also mentioned as preferred channels for communicating brief statements ("I'll be 5 minutes late!") and short questions (participant 17, interview, page 4; participant 18, interview, page 4; participant 19, interview, page 6).

3.4.4 Combining communication with other activities

In numerous cases we have observed participants that have combined communication activities with a number of other activities. For example, our participants have been observed communicating while walking, riding a train, driving a car, and so on (participant 12, day 1, observation 10; participant 12, day 2, observation 3; participant 12, day 2, page 11; participant 19, interview, page 8). Participants have also taken the opportunity to run an errand (such as grabbing a cup of coffee) while talking on the phone (participant 19, day 1, page 3).

We have also observed participants that have been interacting with other devices while communicating. Searching for information and taking notes are two obvious activities that easily combines with communicating (participant 11, day 1, observation 3; participant 18, day 1, observation 2; participant 18, day 2, page 2-3; participant 19, day 1, page 5). These activities are not always related though (e.g. participant 20, day 1, page 3).

Other examples involve the use of calendars, as well as other communication channels, while e.g. talking on the phone (participant 16, day 2, observation 2; participant 19, day 2, observation 1).

3.5 Spending time or creating breaks

Some of the observations describe activities that subjects seemed to perform to "spend time". For example some participants have been playing games on their cell phone while waiting, or when they have been bored (participant 15, interview, page 3; participant 16, day 2, page 6), they have been listening to the radio (participant 18, interview, page 6), or just been fidgeting with their cell phone when have had nothing else to do.

Another way of using/approaching the phone is to use it for a communication purpose (calling someone, send an SMS etc), but with an underlying purpose, which is to have a reason to get a break from the work related tasks. This behavior (calling someone just to get a break) has also been observed as one of several other behaviors (for example get print outs, small talk to a colleague etc.) that are conducted to get short breaks from work (participant 11, day 1, page 3; participant 15, day 1, page 2-4).

At the same time as the phone is used for spending time (fidgeting, sending an SMS etc.) it can be used as a social communication device. The position where its being kept, and how much attention the owner shows it tells much about to what extent a person are open to his or her social environment. Some observations were made regarding this, but these findings are related to other people and not the actual participants. However, the observations are interesting and worthwhile to mention. The observed people (at a bar) were fidgeting with their phones as smokers might do with their cigarette packages. It seemed like they wanted something to do or (as in one case) wanted to be sure not to miss any phone calls. However, by having the phone visible or by fidgeting with it, the owner also sends out signals about not wanting to be disturbed or not wanting to have a conversation with someone else. When the observed people's friends arrived at the bar, the waiting part immediately put down the phone. Another issue that was observed at this occasion was that when one person in a group started to fidget with the mobile phone, the other persons in the group followed and started the same behavior (participant 12, day 2, page 12).

One very common way of spending time with mobile phones is to make social calls to friends or relatives, for example during transportation (participant 18, interview, page 6). This phenomenon will be described below.

3.6 Socializing

Humans are social beings and one important aspect of our social life is to just stay in touch with people. We contact friends to let them know that we think about them, to tell them how we are, and to ask how they feel and what they are up to. The aim with this communication can both be private (keeping in touch with your friends) and work related (not losing good relations for business etc). The way of communication depends on the surrounding context (walking, underground, busy, noisy etc) but also on which person it is.

In the study the participants were both observed at transportation (where socializing through cell phones took place) and interviewed about how and when they socialized with friends and relatives.

Calling during transportation, when waiting (participant 20, interview, page 4-5) or when walking (participant 17, interview, page 6) where different ways to socialize with friends. However, during transportation SMS seemed to be the most common way to socialize among the participants (for example participant 13, interview, page 5; participant 15, interview, page 2). The use of ICQ was also mentioned for keeping in touch with friends.

Some of the participants preferred e-mail to keep in touch with others since it would reduce the risk of "getting caught" in a lengthy conversation, while others found it more appropriate to talk instead of writing, when there was a social purpose (participant 20, interview, page 4).

3.6.1   Socializing as a part of another call

Socializing also exists as a part of the communication when there is another purpose. It can be a part of a call, mainly in the beginning or at the end (participant 18, day 2, observation 3; participant 19, day 1, observation 1), or it can be seen as a bonus (take the opportunity to bond with a client). On the other hand, it can also be seen as a mandatory thing to do, and therefore some people chose to send an SMS or an e-mail instead of calling (participant 13, interview, page.5; participant 19, interview, page 6).

The need to socialize or the relation to the counterpart (work related or private etc.) can be seen in relation to the chosen modality to communicate. In some situations SMS or e-mail are avoided because people want the socializing part of a phone call. With private relations it might be a way of getting a closer relation, and in the profession the personal contact might be used to build up/enhance the contact. There is also a different need for socializing in different professions (participant 13, interview, day 6), or - the socialization might be an important part of the actual profession (participant 16, interview, page 4).

Several of the participants in the study mentioned that they used or preferred e-mail or SMS when there was no need for socialization (participant 17, interview, page 4), or when they just wanted a smooth communication (participant 17, interview, page 6). Finally, it was also mentioned that the use of e-mail (instead of calling) was used when there was no time for the socializing part of the conversation (participant 16, interview, page 3).

4   Attitudes affecting behavior and activities

The observations and interviews have also resulted in more abstract findings. They can be seen as topics that in some cases can be used to explain activities and the need for mobile services, or simply as interesting findings on their own. These findings are described in the following section.

4.1   Environment and relation to other people

The need for mobile services is to some extent likely to be predicted by the environment around the user, and the users' relation to the environment. The following section discusses the aspects that have become clear during the study.

4.1.1   People's physical mobility and need for mobiles functions

One of the advantages with the chosen design for our study is that it provides information about differences between the participants and their real life environment, which can contribute to their need for mobile services. One of those is to what extent an individual's physical mobility can help in predicting the need for mobile services. One participant for example, who lives and works within the same part of the city and thus moves within a small geographical area, stated that she generally do not need to use her cellular phone that much or practice much short-term or ad-hoc planning, since everything is easy to reach and activities are easy to join within a short notice (participant 13, interview, page 4 & 7).

4.1.1.1   Privacy

Some aspects of the study that turned out to be interesting were some of the participants' attitudes towards privacy when talking on the phone. Several participants declared that they are more sensitive if people they know can overhear a conversation. Those persons however, tend to talk on their phones at busses and other public places (participant 11, interview, page 4, participant 13, interview, page 7, participant 16, interview, page 5 & participant 19, interview, page 8-9). All the participants in the study did not avoid talking on the phone when friends were around though. One participant turned off his cell phone during public transportation because he did not think that his private life concerned others. He, on the other hand, said that he had no problems with his friends listening to him when talking (participant 15, interview, page 5). There are, off course, not two distinct attitudes in this matter. One participant for example, stated that it is equally sensitive if strangers can listen, compared to people she knows (participant 18, interview, page 5). This study does not deal with the question of cultural and generational differences. However, it is likely that there are differences between small and bigger towns, and between younger and older people.

The finding that overhearing phone conversations is a sensitive issue was most evident for calls that concerned private life when the participant was at work. One participant, for example, said that it could be difficult to be private at work, and that he usually uses a meeting room for private calls and for important work related calls as well. The atmosphere at that office seemed to provide little privacy, and the participant was worried that his colleagues would listen and try to get involved in the conversation (participant 17, interview, page 6). Two other participants were observed to seek up more private places where their colleagues could not hear them talking. These observations were also confirmed during the interviews. In the first case the call was placed in a separate room (participant 16, day 2, page 4 & participant 16, interview, page 5) and in the other case the participant made a private and a bit sensitive call on the way to work (participant 13, day 1, page 1) The workplace of another participant had a place where people could go to seek privacy (participant 17, day 1, page 4).

The same participant also showed a tendency to slow down when walking with others in order to get a bit behind the rest of the group when receiving a phone call (participant 17, day 1, page 7).

A common statement among the participants was the fact that the sensibility and nature of the call is the most decisive factor for when to seek privacy, and the second is the present environment.

4.1.1.2   Respect to the present environment

The study shows that our participants tried to adjust their behavior and use of mobile functions to their present environment. The most distinct part concerns behavior at meetings and is discussed further down. Another interesting behavior is to change cell phone profiles. Profiles are used at meetings and in other situations mainly in order to avoid disturbing other people. One example is at the movies or at concerts (participant 20, interview, page 5-6). The behaviors of leaving a group of people when receiving a call or not to talk about too private topics when others can hear have also been observed. Some of the participants state that they behave like that out of respect to people in the vicinity. They do not want to disturb a conversation by talking about other topics on the phone (participant 13, interview, page 8 & participant 13, day 2, page 3) and they do not want to make their company uncomfortable by talking about private things in their presence (participant 17, interview, page 8).

4.1.1.3   At meetings and similar situations

The context of meetings usually demands a higher level of respect to other people attending the meeting. Most of our participants either turned off their cell phone or switched to quiet mode. The reason for using a quiet mode is to be able to see if anyone has called during the meeting or to be able to answer some prioritized calls (participant 11, interview, page 4).

However, the interviews showed a difference in attitude to answer calls during meetings. One participant was strongly against talking on the phone during meetings, and she thought it to be a lack of respect to the other participants when answering a call. If anyone is expecting an important call, she believed it to be important to notify the others in advance (participant 12, day 1, page 6-7). On the other hand, there are some statements that indicate a more relaxed attitude when it comes to more informal meetings, as well as a higher tolerance towards people that are seen as more busy (participant 11, interview, page 4 & participant 19, interview, page 9). The main factor for the limit of tolerance of people answering the phone during meetings seems to be divergent and depending on the current social context.

4.1.2   Respect of the distant part

The participants in the study showed an evident attitude to try to adjust their behavior with the respect of the distant part of a phone call. The clearest observation of adjusting the behavior with respect to the distant part was to leave a noisy environment, not to be able to hear better but out of respect of the distant part (participant 12, day 2, page 9). Another issue concerning respect was whether it was an appropriate time for accepting a call for the distant part. Behaviors like excusing for disturbing or asking if the distant part had time to talk, were examples of this kind of respect (participant 16, day 1, page 4). The concern of the distant part, once again, does not apply to all participants (participant 19, interview, page 8).

4.1.3   Relation to distant part and way of communication

A very stringent finding from the study is the behavior of using different ways of communicating with different people depending on the relation to the distant part. The most interesting findings concerned to which people the participants send SMS to, and to whom they send e-mails.

4.1.3.1   To send SMS

Concerning the private use of SMS it seemed like the participants found that way of communication a bit impersonal, and that they also preferred to send SMS to people they did not know well instead of calling. One participant sent a message to a person that he had met once at a private dinner just to say thank you (participant 11, interview, page 3). Another example is a participant that sent a socializing SMS to someone that the participant did not know so well and thus felt a bit uncomfortable calling (participant 15, interview, page 3).

On the other hand, the study showed another attitude concerning work related issues. The behavior was nearly the opposite. The participants in our study stated that they send SMSs to some colleagues, (participant 19, interview, page 6 & participant 15, interview, page 4) but not to all, since it feels too private in most professional contexts and relations (see below under attitudes to phone usage and mobile behavior).

4.1.3.2   To send e-mail

One stringent finding was the fact that the participants tended to prefer to send e-mails or possibly call some friends instead of sending an SMS. The distinction between who they would send e-mails to was based on how soon the receiver would read the message. If they know that the receiver works in front of a computer all day, the participants stated that they often send e-mails when they expect an answer soon or for short-term planning (participant 11, interview, page 5, participant 14, interview, page 2 & participant 19, interview, page 7). The distinction also concerned situations that depended on quick answers. The crucial aspect was whether the distant part would read the e-mail in time (related to the nature of the subject of the email). Thus, some participants stated that they often send emails to friends in order to socialize. They found the advantage of being able to easily keep in touch with people abroad significant (participant 13, interview, page 4, participant 16, interview, page 3 & participant 18, interview, page 4).

4.2   Inner context

Every single person is not only a person in a social context, bur also a human being who has limitations regarding cognitive abilities, attention, and amount of information that can be processed. The aspects that have been found to be worth discussing are mainly the ability to work focused during the day and to keep attention to something at a particular moment.

4.2.1   Focus and Communication

The human brain cannot concentrate and keep a high attention for a very long time and it is natural to give the brain some "rest" in order to clear it out of thoughts once in a while during a day at work. This type of focus has in this rapport been called "long-term focus". The other kind of focus is the attention at the moment and is called "short-term focus" (Coren, Ward & Enns, 1999).

4.2.1.1   Long-term focus

The participants showed a general behavior of working in periods concerning the focus attention on work related aspects (participant 18, day 2, page 3 and 7). They created their own kind of brakes from work. Example of things to do is to visit the toilet, talk to someone about another topic in a more relaxed manner, read e-mail or to place phone calls. One participant showed a clear behavior of not working as focused during the end of the day as in the beginning. By the end of the day the brakes were more frequent and the participant looked in her paper calendar, wrote e-mails, and thus created brakes much more frequently (participant 11, day 1, page 4-6). Another participant made clear comments about this behavior. She stated

that she couldn't focus on work and talk at the same time (participant 18, interview, page 1&4). The same participant showed a very obvious pattern of sending e-mails when she worked with things that were not so demanding on her focus or keeping things in her mind (participant 18, interview, page 4).

The participants also showed a tendency to communicate in periods. It was common to make several phone calls in a row and it seemed like the participants got in to a "communicative mode" and focus on that task. This might be a result of taking a brake from the work that demands more focus but it can just as well be due to the "communicative mode". The association from one communicative errand to another is, in some cases, likely to be close. Examples of this behavior can be fund in the material (participant 16, day 2, page 2 & participant 17, day 1, page 3).

4.2.1.2   Short-term focus

Work can demand a high level of momentary focus and in those situations it is important not to be disturbed by any time dependent communication such as incoming phone calls (Coren, Ward & Enns, 1999). The participants showed some indications on this. No one turned off their phone when working intensively, but they focused intensively at work (participant 18, interview, page 4 & participant 11, day 2, page 7). The demand of attention most likely affected the coordination of tasks and choice of work task (participant 12, day 1, page 4-5).

Some participants have shown a behavior and stated that they prefer to talk on the phone when they are not close to anyone else or disturbed by the present environment. They might have a need to be able to focus all attention on a particular phone call (participant 12, day 2, page 9). Thus, some participants found the demand for short-term focus or attention on a phone call so important that they did not want to do any simultaneous activities. Further, one participant states clearly that one of the main reasons why he make phone calls when traveling is because he can focus on the conversation (participant 17, interview).

4.3   Attitudes to phone usage and mobile behavior

Since the cell phones have become such a natural part in everyday life it is natural that the users develop attitudes to the use and nature of them. Some aspects that have been observed and a discussion about them is presented below.

4.3.1   The view on the mobile phone compared to the landline phone

A remarkable difference in attitudes to cell phones compared to landline phones has come to be very clear throughout the proceeding of the study. The most evident part was the view on when one can call a person. It seemed like it was a silent agreement between the users that it was somewhat more acceptable to call a person late in the evening, at night, or anytime during the day, when calling someone on a cell phone. This was probably due to the fact that the users have the possibility to turn off their cell phones if they do not want to be disturbed. This leads to an idea that one can always *try* to reach a person on the cell phone.

A striking finding concerns calling people late in the evening and during the night. Despite the fact that not everybody turn off their phones at night (see further down), only one participant claims to be disturbed if someone calls late, and thus has started to turn it off at night (participant 14, interview, page 3). Other participants stated that this was not a problem since people rarely call them at night (participant 19, interview, page 5), or stated that "I would not keep it on if it was not ok" (participant 18, interview, page 5-6). It seemed like the idea "you can always call to a cell phone" is somewhat modified to not to call someone in the middle of the night if you are not sure that the person is awake.

4.3.2 Turning off the cell phone

The participants had different habits in turning off their phone at night (participant 11, interview, page 3 & participant 12. interview, page 2). Some always did that. Some turned it off if they suspected that they would receive an SMS or a call and did not want to be disturbed (participant 13, day 2, page 5, participant 18, interview, page 5-6 & participant 20, interview, page 3). One participant turned it off because he wanted to minimize the radiation (participant 19, interview, page 5), and one participant in order to save the batteries (participant 18, interview, page 5-6).

4.3.3 How private is the phone?

During one observation the participants answered colleagues' cell phones in an open plan office. In the interview the participant said that this was ok if it was a cell phone that was used strictly professionally (participant 12. day 1, page 3-4). Another participant said (during the interview) that she answers other people's cell phones, but only if the person is a close friend (participant 14, day 2, page 5). A third participant said that she sometimes answers colleagues' cell phones if the caller is another colleague or their boss. In one interview the participant said that the cell phone is not a very private item in itself, and the only thing that she would be uncomfortable with would be if someone else read her SMSs. However, she also said that she trusted her friends regarding this matter. Another participant did not approve when other people was "looking around" in his cell phone. This participant, like the previous one, also said that reading someone else's SMSs is absolutely wrong. At one office where observations were made one colleague was talking in his cell phone and after a while passed it on to our participant. That also seemed to be a situation where the closeness to the colleague (open plan office) was important. In conclusion, the participants generally think that their cell phone is quite private and they do not want people to use it or for example turn off its ring signal (participant 16, interview, page 4). They seem, to some extent, to want to know or supervise what others do with their phones and generally find SMSs to be private (participant 17, interview, page 4). The results mentioned above are not in line with Weilenmans (2003) findings. She presents a theory that users tend to have a sense of shared ownership of cell phones. However, those findings are mainly based on surveys on teenagers. Thus, it might be a difference in attitude for different user groups (see discussion below).

4.4 Relation between private tasks and professional tasks

One of the aspects that were in focus during the study was the distinction between private and professional relation to needs and use of mobility. Distinctions like how to communicate, when to call someone, how to conduct long-term planning, and perform private tasks at work, have shown to be especially interesting.

4.4.1 Modes of communication

Some participants indicate that they do not send SMSs professionally. They said it felt too informal and private (participant 17, interview, page 4 & participant 18, interview, page 4). However it seemed like it was no problem to send SMSs when it concerned private issues or to colleagues that were more like friends (participant 16, interview, page 3). One participant, on the other hand, sent SMSs to people independently of relationship. He adapted more to his individual relation to the other part, but admitted that he did not send any SMSs to important contacts who are higher up in the hierarchy (participant 19, interview, page 6).

4.4.2 Working hours – when to contact people professionally

The study has given interesting findings in the participants' attitude towards the question of when you can call someone professionally. There were large variations between the participants and it was probably dependent on the nature of their profession. One participant had the strict idea that you can always call during "office hours" between 8 pm and 5 am (participant 13, day 1, page 3). One participant indicated a more flexible view on calling professionally. She, and her colleagues, agreed on a relatively fix time for when to stop working and leaving. The most important aspect was to deal with the tasks that needed to be taken care of before the end of the day. As a result of that she often talked on the phone with colleagues when leaving the office for the day. Thus the hours of when to call someone were more flexible (participant 12, day 2, page 4). Other participants declared an even more flexible attitude. It was probably due to the fact that they did not work at fixed hours. However, only one participant who thought that it was all right to call really late at night, or early in the mornings, to him (participant 20, interview, page 2-3). It was probably due to the fact that people tended to know the unwritten rules of when you can call someone professionally. That also seemed to depend on the contact and the purpose of the call.

4.4.3 Planning and memory aids for long-term planning

Long-term planning has, as mentioned earlier, shown to be an interesting activity. The participants often make clear distinctions between private and professional long-term planning. The general opinion of the observer is that most participants tend to be better planned and organized professionally than privately. One participant said that he did not have the energy to plan and organize much when it comes to the private life because he has no energy left for this after all the planning and organization at work (participant 17, interview, page 5). The view on one self as either a planner or a non-planner is a more accepted and common attitude privately than professionally. This becomes evident when analyzing which memory aids that are used for long-term planning in private life (see below).

4.4.4 Performing private tasks at work

Many of the planning activities observed at work places were private, and this issue has been emphasized in the interviews. The issue of performing private tasks at work is described below. It seemed like attitudes and performance of *private tasks at work* are not dependent on whether the working place is in a private room or located in an open plan office. The important issue whether private tasks are performed at work or not, seemed to be workload and the culture at the office (see further down). Private tasks at work seemed to be accepted at the offices where we have made observations, or as one participant put it: "everyone combines private duties and work at the office" (participant 12, day 1, page 4, 9). Besides planning activities we also observed participants performing tasks such as calling friends to socialize (participant 14, day 2, page 6), sending private letters from work (participant 11, day 2, page 3), preparing a work task to be conducted for another employer (participant 11, day 2, page 4-5), or just to socialize with others at the company. Thus, the participants generally seemed to find it acceptable to perform private tasks at work, at least if they have the time (participant 18, interview, page 4).

One participant seemed, at first, nearly to do as much private as professional things at work. She said that it was necessary to be creative and get influences and ideas in her profession. Thus, things that appear to be more private or leisure is purely professional. It was very common to have a more relaxed attitude at the office she works at (participant 14, day 2, page 3, 5 & 6). Another participant stated that the culture at her present office is very different

from her former place of work. She ads though, that this probably will change when she gets more used to her new work, and thus can relax more (participant 18, interview, page 4).

The attitude that "everybody combine (private and professional tasks)" and the relation to superiors, showed that it was common to trust colleagues and to have confidence in people taking responsibility their own work (participant 13, day 1, page 3). One participant, who is one of the owners of the company, even stated that he tries to stay at the office and not to leave for a more private place when talking on the phone. He thought to be an important contribution to the culture at the office and tries to be open with both his professional and personal calls (participant 19, interview, page 8).

An interesting finding was that very few of the participants have a strict relation to their superiors at work. One participant even had her desk facing one of her bosses. She stated that they have a very close relationship, and that she does not mind her boss seeing everything that she is doing (participant 12, day, page 5). There was not enough material from the study to draw further conclusions. However there are most likely differences between companies and between individuals. It is probably also dependent on individuals' comfort and security in their profession.

4.5   Services and target groups

4.5.1   The target group in the study

The participants in the study were controlled for age and gender, but the control for age is not as precise. That is due to the fact that it has been problematic to get in contact with participants who are in the younger part of the range. Thus, the results are probably more valid for an age span between 25-30 years of age. That age group is probably more similar in attitude and behavior to those who are older (30-35), than those who are younger. The main support for this theory is the fact that the behavior of the one participant who was younger than 25 has many similarities to those of the teenagers described by Weilenmans (2003). This finding indicates homogeneity within the chosen target group.

4.5.2   Cell phone and calendar use

Below are two compilations of what cell phone functionality our participants use, as well as what tools they use for planning their days. The first table (Cell phone use) reveals that most of our participants use four or more services (or pieces of functionality) of their cell phones. A few of our participants regularly make use of most of the commonly found services on a cell phone.

Cell phone use

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Voice	×	×	×	×	×	×	×	×	×	×
SMS	×	×	×	×	×	×	×	×	×	×
WAP						×	×			×
Phone Book	×	×$^?$	×	×$^?$	×$^?$	×$^?$	×$^?$	×$^?$	×$^?$	×$^?$
Calendar							×			
Reminders	×			×			×	×		×
Watch			×		×	×	×			
Alarm Clock					×	×		×	×	×
Games					×	×			×	
FM Radio	×							×	×	
E-Mail						×				
Notes						×				

? = Use not stated explicitly in interview, but observed during field observations.

While our participants seemed to make extensive use of the functionality provided by their cell phones, devices for planning their days seemed to be more conservatively chosen. All participants except one primarily used a paper calendar. A few combined the paper calendar with electronic calendars, primarily because their employers required them to do so. None of our participants used a PDA, but three participants explicitly stated that they had abandoned one or several of them in favor of paper calendars.

Use of calendar type

	1	2	3	4	5	6	7	8	9	10
Paper Calendar	$\times^A$	$\times^A$	$\times$	$\times$	$\times^W$	$\times^P$	$\times^W$	$\times^{P,\,W}$	$\times^A$	
Phone							$\times^S$			$\times^L$
PDA										
Shared Electronic Calendar					$\times^W$	$\times^W$				

W = Work only, P = Private only, L = Long-term only, S = Short-term only, A = Abandoned PDA

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