

Exploring everyday needs of teenagers related to context-aware mobile services

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Abstract

In recent years there has been research on context-aware mobile services that have supported e.g. making appropriate calls, being aware of others, and going on a guided tour. However, there is a lack of user studies that could show that others than engineers and researchers themselves need those services. Therefore, in this paper we will present the results of an observational study on teenage mobile phone users and how they could benefit from context-aware services in their everyday life.

Key words: context awareness, mobile services, user needs

1. Introduction

1.1. Context-aware mobile services

Dey (2001, 5) defines context awareness in the following way: “a system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends of the user’s task...There are three categories of features that a context-aware application can support:

- presentation of information and services to a user
- automatic execution of a service for a user
- tagging of context to information to support later retrieval.”

It is assumed (e.g. Ljungstrand, 2001; Schmidt and Gellersen, 2001; Milewski and Smith, 2000) that mobile phone users could benefit much from context awareness technology, in particular when about to make a call, if they can receive context information regarding the person they are trying to reach prior to establishing the call. Such a system might lead to less disrupting calls and less frustration for the calling party when a call is not answered.

Most prototypes of systems built (e.g. Schmidt and Gellersen, 2001; Milewski and Smith, 2000) for providing context information for the caller do not provide automatic tracking of context information but require the user on the other end to select an appropriate context mode each time the context changes. However, Ljunstrand (2001) thinks that automatic context sensing might be a key factor for a successful context-aware mobile

phone but there should be a possibility to “manually override” the automatic sensing, e.g. by stating that you are busy while not really being busy.

Mobile users might also benefit of context-aware mobile services that enhance group awareness. For example, Hummingbird (Holmquist et al., 1999) was a context-aware system that gave members of a group continuous aural and visual indication when other group members were close. The user evaluation of the Hummingbird prototype indicated that the system increased group awareness and facilitated making contacts in particular in an unfamiliar environment.

A group awareness system proposed by Keränen et al. (in press) had a background assumption that mobile community members have needs for sharing experiences and common interests. Therefore, Keränen et al. created a user interface prototype for providing status information of online community members. This context-aware system allowed attaching multimedia to the map that shows the location of the community members. Besides the map, the user interface included small icons representing other personal context information, such as user’s movement (walking/running etc.), the state of the surrounding environment (silent/loud; cold/hot) and the activity of the personal device (call/browse/chat/idle).

Finally, many researchers (Ciavarella and Paternò, 2003; Cheverst et al., 2000; Opperman and Specht, 2000; Abowd et al., 1997) have explored the possibilities of different kinds of guides to be services for mobile users. These guides usually utilize location information to provide relevant information or services to the user.

1.2. New user-centered service concepts

As the previous chapter indicates there are good guesses of what kinds of context-aware mobile services people would need. However, those guesses are mainly based on researchers’ and developers’ own life experiences. There is no research on what kinds of services people would really need in their everyday life.

There are some user studies (e.g. Fithian et al., 2003; Kaasinen, 2003; Cheverst et al., 2000) that have focused on the needs related to context-aware mobile services but they have been conducted after the service concepts have been selected. There are no user studies that would have explored various concepts based on various technologies and make recommendations on what concept would be natural part of people’s daily activities.

In this paper we will present a user study that aimed at exploring the possibilities of context-aware mobile services in teenagers’ life. First, we will describe the methods we used in the study. Then we will present the results of the study. Finally, we will discuss what kind of services teenager would need as part of their everyday life.

2. Methods

The user study was conducted in December 2002 – January 2003 in the capital area of Finland.

2.1. Participants

There were two reasons why we selected teenagers as our user group. First, they are heavy users of mobile phones. And second, their lives are different from researchers' and developers' lives.

Altogether five teenagers (3 boys and 2 girls) participated in our study. They were from 12 to 18-years old. Although the number of the observed teenagers is rather low, we believe that our study can give a good insight to the problem area. We did not observe more than five teenagers since the study reached its saturation point. In other words, things started to repeat themselves after studying five persons, which indicates that even small study like this can be useful in understanding user needs related to new mobile services.

2.1.1. Rami, 12-years old

Rami was a 12-years old boy who lived with her mother in a suburb close to Helsinki. His school trip was only 1,5 kilometers, and therefore he walked to school. His hobbies were chess and painting. His sister lived in Barcelona, Spain.

2.1.2. Robin, 12-years old

Robin was a 12-years old boy who lived together with his parents and brother in a suburb close to Helsinki. He had rather long school trip because he went to a school in Helsinki city center and not in the suburb. He traveled by bus to school. His hobbies were floor ball, chess, football and ice hockey.

2.1.3. Jyrki, 16-years old

Jyrki was a 16-years old boy who lived in a suburb close to Helsinki. He went by bus to school that located in another suburb. His hobbies were chess and floor ball.

2.1.4. Minna, 16-years old

Minna was a 16-years old girl who lived with her parents and little brother in a suburb close to Helsinki. She travelled by bus to school that located in another suburb. Minna's hobby was playing chess.

2.1.5. Leena, 18- years old

Leena was an 18-years old girl who lived with her parents in a suburb close to Helsinki. She traveled by bus to school. Leena had a boyfriend who was in the army. Her hobby was to keep a cooking school for children.

2.2. Participant observation

The participants were observed during one day from the morning to evening. The observation was participant. In other words, the participants were asked questions while they were observed. The questions were related to their communication and social relationships because those issues were difficult just to observe. The questions were asked always when the researcher felt that context changed during the observation. The questions were:

1. With whom and how the teenagers were willing or not willing to communicate?
2. What kind of information the teenagers would like to give about themselves to people they know?
3. What kind of information the teenagers would like to get about people they know?

2.3. Identifying needs

The participant observations were video recorded. Two researchers watched the recordings and wrote down the occurred needs after agreeing together what was and what was not relevant to context-aware mobile services. Finally, the identified needs were classified into four categories, and the categories were labeled. The categories will be presented in the following chapter.

3. Results

3.1. Knowing and informing about availability

In this category there are needs that indicate that people would like to know whether their friend or relative can be called, or people would like to inform the others that they could be called.

Person	Need
Minna	In the mornings at home before going to school she needs to inform her friends and mother that she can be called to.
Minna	Need to restrict advertisement calls in the morning. Those are annoying because they don't take no for an answer.
Minna	On a lunch break everyone can call her, also those who advertise.
Minna	When school is over anyone can call her.
Leena	In the morning at breakfast her boyfriend can call her.
Leena	Need to know before calling if her mother and friends can talk with her.
Leena	Need to know if her boyfriend has a break at army in order to call him.
Leena	Need to communicate to others that in the morning before school she has got some time to talk but not after that.
Leena	Need to tell her mother and her friends how her exam went but first she would need to know if she can called them.
Leena	Need to inform others after school that she can talk.
Rami	Need to let others to know that he is outside and doesn't want to talk on the phone.
Rami	Need to let others to know that he is in a bus and doesn't want to talk on the phone.
Robin	Need to inform others that he is on a class and can not talk.
Robin	Need to know if his friends are in floor ball training so that he does not contact them during the training.
Robin	Need to refuse answering to his parents' callings when in a company of friends who use loudly bad words.
Jyrki	Need to inform his mother when he can talk with her during a school day.

3.2. Adjusting phone functionality according to availability

The needs in this category illustrate how much teenagers have to adjust the functionality of their mobile phones according to their availability. In particular, at school they cannot let the phone ringing during the classes but there are also other situations that might prevent the teenagers letting the phone ringing. The reason why the teenagers did not turn off the phone in those situations was that they wanted to see afterwards that who had called them.

Person	Need
Minna	Cell phone needs to be mute at the school except on a lunch break.
Minna	Need to keep the cell phone on but mute during school classes instead of keeping the phone off so that she can see if someone has called to her. The list of callers on the phone screen reminds her to call them back.
Leena	Need to turn her cell phone mute or beeping during a class at school.
Rami	Need to turn his cell phone mute when going to sleep and when he wakes up in the morning to turn it audible.
Rami	Need to turn cell phone mute before approaching the school.
Rami	Need to prevent disturbing phone ringing during a class.
Rami	Need to change his cell phone ringing tone audible when leaving from the school.
Rami	Need to turn his cell phone into one beep mode in library.
Rami	Need to change the beep mode of the phone to normal audible mode when leaving from the library.
Rami	Need to keep the cell phone on but mute during school classes so that he can see if someone has called to him. The list of callers on the phone screen reminds him to call them back.
Robin	Need to turn cell phone mute when going to school.
Robin	Need to turn all the cell phone's sounds silent.
Jyrki	Need to use vibration mode at school.
Jyrki	Need to remember to turn cell phone mute and vibrating before going to school in order to prevent that cell phone rings at a lesson.
Jyrki	Need to set cell phone's profiles as less as possible. (Cell phone is in audible mode in the evenings and during the night.)

3.3. Group awareness

Besides knowing when they can call to their friends, the teenagers wanted to have context information about their friends in general. Just to be aware what the others are doing or where they are. Assumably this kind of need enhances social relationships and helps to organize meetings.

Person	Need
Minna	Need to inform her friends where she is going during the school trip and need to know where her friends are going.
Leena	Need to inform her boyfriend and friends that she is going towards school and what will be her schedule today.

Leena	Need to know where her friends are if she can't see them front of a class room, and need to inform her friends that she is already front of the class room.
Leena	Need to inform her friend with whom she is keeping a cooking school that she can get out of the school in half an hour and meet.
Leena	Need to tell what has happened during the day to her friends.
Leena	Need to inform classmates that she went for a cigarette break.
Leena	Need to inform her friend that her school day ends after one hour so that they can meet.
Robin	Need to ask his parents to pick him up if he is too tired to walk home.
Robin	When friends call the first question is usually "where are you?"
Robin	Need to know if his friends don't have anything special to do.
Jyrki	His friends had a need to know where he is playing table tennis during sports class.
Jyrki	Need to inform his friends about where he is going during a school trip.

3.4. Reminders

This need category illustrates how the teenagers would need to have memory-aid in their daily life. Some of the teenagers tend to forget items at home when leaving to school. Moreover, some of them needed to be reminded about things to do during the day.

Person	Need
Minna	Need to know that she has everything with her when leaving home to school.
Leena	Need to know that she has a bus ticket with her when leaving home to school.
Robin	Need to be reminded that he has a bus ticket and a cell phone with him when leaving home to school.
Robin	Need to be reminded that he needs to tell his teacher today that he is going to dentist tomorrow.

4. Discussion

Our study indicates that in the daily life of teenagers there are several situations where a caller could benefit from knowing whether a person on the other end is available or not (need category 3.1.). This finding is in line with Ljungstrand (2001), Schmidt and Gellersen (2001), and Milewski and Smith (2000). Teenagers might be the callers or the person on the other end.

Currently, there is no service in commonly use that could provide availability information automatically. Therefore, the teenagers needed often to adjust their mobile phone functionality (need category 3.2.) according to the context they were. Assumingly they would benefit from automatic tracing of context information that would be used both for informing friends and relatives about availability and adjusting the phone functionality. However, as Ljungstrand (2001) pointed out, there should be a way of "manually override" the automatic information. For example, Robin who did not want to be available for his parents when being in a company of friends but the calls of other friends he could accept might benefit for manual selection of context information.

Our study does not directly give answer to the question of what kind of context information teenagers and their closed ones would need in understanding when the person they are about to call is available. However, location seemed to be the most important determinant whether a teenager can answer to the call or not. Namely, they could not speak in a classroom or in a library. Sometimes location information attached with schedule information could work. For example, in case of Minna who preferred to talk with friends on lunch break outside the classroom.

The teenagers did not need context information only for making decisions about calling to somebody but also to be aware of others (need category 3.3.). Location information seemed to be relevant in many group awareness situations. For example, knowing where class mates are would help in organise ad hoc meetings on school breaks or school trips. Moreover, Robin had a very interesting need to know when his friends have nothing to do. It would be challenging to provide such kind of context information. How would Robin know when his friends don't have anything to do? Could a context-aware mobile service, for example, inform automatically Robin when his friend is watching TV or is just lying on his bed?

Finally, the teenagers seemed to have a need also for memory-aid (need category 3.4.). They tend to forget to take things with them when leaving from home to school. Could there be a system that would detect what items a teenager is carrying with her/him when about to leave home and would inform the teenager that what is missing?

Although we have criticized that there are no context-aware mobile services studied on the basis of daily needs of ordinary mobile phone users, our user study indicates that the current research on context-aware mobile services – especially those designed for enriching social interaction - is on the right track. What are missing from our data are needs for services designed for special events, such as football matches and tours. For example Kaasinen's (2003) study focusing on location-aware services supported services for special situations, and many researchers (Ciavarella and Paternò, 2003; Cheverst et al., 2000; Opperman and Specht, 2000; Abowd et al., 1997), as mentioned before, have focused on tour guides. The reason why our study does not drive towards them is that during those days that we observed the teenagers they did not do anything special. They went to school and after that back to home or to a hobby. Therefore, one might ask whether services for special situations are "killer applications" or there is a need for services that are used daily. Perhaps, both are needed for meeting the needs of mobile users.

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