What can we get "help" to observe when it comes to mobile use and mobile user experience?

Stina Nylander
Swedish Institute of Computer Science
Box 1263, 16429 Kista, Sweden
stny@sics.se

ABSTRACT
Mobile devices and mobile services have been around long enough for the research community to start thinking about the next step in studying them: larger user groups and longer periods of time. Strictly quantitative methods are not very useful when it comes to studying user experience so we need to find scalable ways to support our qualitative methods to be able to take this next step. This paper reflects on automatic gathering of context data as one such way.

INTRODUCTION
Cell phone use is nowadays so pervasive in many parts of the world that we can no longer consider it a new technology. It is a highly integrated part of many people's lives and should be studied as such. Until now, many studies of mobile use has been conducted on rather small user groups (e.g. [3, 13, 15]). I believe that we now need to conduct longitudinal studies of large groups of participants in order to fully grasp the role of the mobile use and the character of the mobile user experience.

Most of the existing research on mobile use and user experience is qualitative work using methods such as self report and interviews. Simply extending those studies in time and including more users would not work. That would be too demanding for both participants and researchers. However, studying mobile use and mobile user experience only with strictly quantitative methods would miss many aspects of the activities.

My main interest in this is to explore scalable methods that can help us gather as much data as possible about the mobile use situation. What can we add to our qualitative methods that can help us study larger groups and still keep some of the qualitative aspects in our work?

EXISTING WORK AND THEIR METHODS
Various aspects of mobile use have been studied in the HCI domain in the last decade. Most of the published work is qualitative, and the predominant methods are different sorts of self report. For example, Palen et al. [17] used voice diaries, i.e. participants called a voice mail service to report the use of their new cell phones and Isomursu et al. [6] used experience clips where participants videotaped each other. More traditional paper diaries were used to explore text messaging among British teens [3], internet use from cell phones [11, 13], and mobile video watching [14]. Self report data can be unreliable since participants forget to report or choose to report some parts of the relevant data. However, it allows researchers to collect subjective data such as motivation and purpose for the mobile use that is not possible with strict direct observation or the use of logging software. Moreover, since mobile use takes place in a number of different places at various times of day, self report is a feasible option to direct observation that in many cases is impossible. There are examples of direct observation of mobile use though. Oulasvirta & Sumari [15] observed how Finnish information workers managed their devices when moving while working. However, their observations were mainly conducted indoors in office buildings.

Logging software is another way of gathering data on mobile usage which has become feasible as mobile devices get more powerful. One example is Kane et al. [9] that installed logging software on participants' smart phones and computers to compare their web surfing and email use patterns between the devices. Karlson et al. [10] provides an interesting study that did not exactly use logging software but software that sent a screen shot to the researchers every time the participant got interrupted when using the device. The screenshot image provided extra context to participants' own recollection of events.

Quantitative studies of mobile use are still quite rare. This is probably due to the difficulties to install logging software on a large number of cell phones, or acquire other types of quantitative material such as log data. The proliferation of cell phone brands, models, and operative systems make it very cumbersome to create and deploy logging software, and ISPs are usually reluctant to provide log data of any

kind. There are a few examples though, Kamvar & Baluja [8] conducted a large scale study of mobile search queries, and Hård af Segerstad [5] created a corpus of more than 1100 text messages to study the language characteristics of Swedish teenagers' messaging. New repositories like AppStore make it possible for researchers to act as service providers and spread and application to a large user population that can be studied and will probably be a common data source in the future. McMillan et al. [12] provides maybe the first example of this, distributing their game Hungry Yoshi through Apple Store, using the game to gather data. However, the drawback of data from logging software, ISP logs or service providers' logs are that they are quite decontextualized. They tell us very little about users' motivation to do a certain thing, if the accomplished what they wanted, or how their experience was.

To compensate for on one hand the potential loss of data in self report and on the other hand the lack of context and subjective information from logs, virtually all studies described above complement their data gathering methods with interviews. The interviews make it possible to get subjective information from participants, such as motivation, preferences, or how they experienced their use. Interviews share many of the drawbacks of self report though, such as memory loss and unwillingness to report information that is unflattering for participants themselves.

DISCUSSION OF EXISTING METHODS

Here, I will discuss the above mentioned studies from my two main points of interest, studying large user groups over time.

In the examples given in the Existing Work section, few studies have more than 30 participants. The exceptions are Lee et al. with 75 participants, and the corpora based studies [5, 8]. The methods used are heavily based on qualitative data gathering through various kinds of self report and interviews. These methods are time consuming both for participants that need to keep diaries or use other tools to report their use and experience, and to researchers that need to oversee data gathering and analyze the material. Thus, they do not scale well for large numbers of participants even though they might offer better alternatives than for example direct observation. Mobile use takes place in many locations, sessions are often short and occur when users have a moment to kill [13] and spread over the day from the moment participants wake up until after they go to bed. It is close to impossible to observe the mobile use of a large group of participants without spending an insane amount of work hours and make huge intrusions in their lives.

When studying mobile use and mobile user experience, time is an important aspect. It takes time for users to learn new applications and find out how they really want to use them, and the novelty factor can make people use a service for a short time while they in the long run stop using it. The studies described in Existing Work were rather short, ranging from a few days [15] or one week [3, 13] to a month [11]. Studies of how new applications are received by end users also typically last for a month or shorter (e.g [7, 18, 19]). Longitudinal studies raise problems that are related to those connected to studying large user groups. It is cumbersome for participants to self report their use for long periods of time and that also generates a lot of material that is time consuming for researchers to analyze. In addition, users might drop out of the study or report their use poorly during the study.

To be able to conduct longitudinal studies of mobile use and mobile user experience in large groups of users we need to find new methods or new combinations of methods to avoid killing both participants and researchers.

LOOKING FORWARD

There is no such thing as a free lunch, so we will probably not find simple or automatic methods that can gather high quality data that is easy to analyze from many users during long periods. However, we should explore the possibilities to combine our existing qualitative methods with automatic data collection since that provides us with structured data that is easy to handle large amounts. For example, context strongly impacts mobile use and use experience and can thus provide valuable information. Here, I believe that we should take inspiration from other areas such as context aware services where automatic detection of for example position [7], ambient sound and movement [4], or proximity of fellow motorcyclists [2] has been used to create service functionality. Moreover, there are examples of services that are not strictly context aware but still automatically collect context information and can inspire: the Affective Diary system [18] that serves as a diary where users can add notes and pictures during the day and records messaging activity, Bluetooth presence and body metrics to add more content to the diary notes; the Ubifit system [1] that automatically recognizes various exercise activities, logs them, and presents them to the user. These examples show us that is is possible to collect meaningful data automatically and should inspire us to go further.

It is also important to simplify the user part of self report. Good examples of this are the voice diary from Palen et al. [16] and the sending of screenshots from Karlson et al. [10] even though they do not provide data that is structured and easy to handle. Providing participants with simple and efficient report methods is essential for longitudinal studies.

A more farfetched thought might be to to combine self report data with automatically gathered context information and try to predict the self report data, assuming that there are contextual situations that reoccur and calls for the same self report data. It is perhaps not so likely, but an interesting idea.

CONCLUSION

Automatic collection of context data will not make it easy to conduct longitudinal studies of mobile use and mobile

user experience on large user groups, but it might be a helpful tool. I believe that we need to find fruitful combinations of qualitative and quantitative methods to continue to study mobility.

REFERENCES

1. Consolvo, S., McDonald, D.W., et al. Activity sensing in the wild: a field trial of ubifit garden. In Proceedings of CHI, (2008), 1797-1806
2. Esbjörnsson, M., Juhlin, O., et al., Motorcyclists using Hocman - Field Trials on Mobile Interaction. in *Mobile HCI*, (2003).
3. Grinter, R.E. and Eldridge, M. y do tngrs luv 2 txt msg? In Proceedings of European Conference on Computer-Supported Cooperative Work (ECSCW), (2001), 219-238.
4. Håkansson, M., Gaye, L., et al. More than meets the Eye: An Exploratory Study of Context Photography. In Proceedings of NordiCHI, Oslo, Norway, (2006).
5. Hård af Segerstad, Y. Language Use in Swedish Mobile Text Messaging. in Ling, R. and Pedersen, P.E. eds. *Mobile Communications - Re-negotiation of the Social Sphere*, Springer Verlag, 2005, 313-333.
6. Isomursu, M., Kuutti, K., et al., Experience Clip: Method for User Participation and Evaluation of Mobile Concepts. in *Participatory Design Conference*, (2004), 83-92.
7. Jung, Y., Persson, P., et al. DeDe: design and evaluation of a context-enhanced mobile messaging system. In Proceedings of CHI, Portland, OR, (2005), 351 - 360.
8. Kamvar, M. and Baluja, S. A Large Scale Study of Wireless Search Behavior: Google Mobile Search. In Proceedings of CHI, Montréal, Quebec, (2006), 701-709.
9. Kane, S.K., Karlson, A.K., et al. Exploring Cross-Device Web Use on PCs and Mobile Devices. In Proceedings of Interact, Uppsala, Sweden, (2009), 722-735.
10. Karlson, A.K., Iqbal, S.T., et al. Mobile taskflow in context: a screenshot study of smartphone usage. In Proceedings of CHI, Atlanta, GA, (2010), 2009-2018
11. Lee, I., Kim, J., et al. Use Context for the Mobile Internet: A Longitudinal Study Monitoring Actual Use of Mobile Internet Services. *International Journal of Human-Computer Interaction, 18* (3). 269-292.
12. MacMillan, D., Morrison, A., et al. Further into the Wild: Running Worldwide Trials of Mobile Systems. In Proceedings of Pervasive, Helsinki, Finland, (2010).
13. Nylander, S., Lundquist, T., et al. ”It’s Just Easier with the Phone” - A Diary Study of Internet Access from Cell Phones. In Proceedings of Pervasive, Nara, Japan, (2009), 354-371.
14. O'Hara, K., Slayden Mitchell, A., et al. Consuming Video on Mobile Devices. In Proceedings of CHI, San Jose, CA, (2007), 857-866.
15. Oulasvirta, A. and Sumari, L. Mobile Kits and Laptop Trays: Managing Multiple Devices in Mobile Information Work. In Proceedings of CHI, San Jose, CA, (2007), 1127-1136.
16. Palen, L. and Salzman, M., Voice-mail diary studies for naturalistic data capture under mobile conditions. in *CSCW 2002*, (New Orleans, Louisiana, 2002), 87-95.
17. Palen, L., Salzman, M., et al. Going wireless: behavior & practice of new mobile phone users. In Proceedings of CSCW, (2000), ACM Press, 201-210.
18. Ståhl, A., Höök, K., et al. Experiencing the Affective Diary. *Personal and Ubiquitous Computing, 13* (5). 365-378.
19. Sundström, P., Ståhl, A., et al. In Situ Informants Exploring an Emotional Mobile Messaging System in Their Everyday Practice. *International Journal of Human-Computer Studies, 65* (4). 388--403.