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# Methods for understanding the mobile user experience

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## ABSTRACT

Evaluating the user experience is often done in a laboratory. Methods for observing what happens in the wild are nonetheless being employed because they bring results that the traditional methods of evaluation do not yield. In this paper we describe and discuss methods used at our lab for understanding the mobile user experience. These methods range from quantitative to qualitative evaluation, and encompass diverse aspects of the design process. Finally we argue the need for combining different methods to obtain a better picture of real mobile usage.

## 1. INTRODUCTION

Observing the mobile user experience is a challenge. Situations change, and outcomes of tests are highly context dependent –eg. a person sitting on a bus will use a mobile device differently to one who is cycling. The social context also matters, since usage will not only be influenced by what you are doing but also who else is present and what your relations are. In this paper we provide an overview of different methods and discuss experiences, pros and cons of the methods we have used in our lab. Given our experiences, we argue that no single method is enough, and suggest that one needs to make use of a "smorgasbord" of techniques – both qualitative and quantitative.

Observing in the wild usually takes more effort than doing lab studies. To assess the utility of this additional work, in [1] the authors compared the evaluation in the laboratory and in the real world. Although the evaluation steps were exactly the same, the field study gave different and unique results compared to the study in the lab. The benefit of getting unique information from a field study then justifies that researchers consider the trouble of observing outside of the controlled environment of their laboratory. In the following we describe and discuss different methods used at our lab to make observations of users in the wild or at least in more real settings.

## 2. LOGGING

In several studies such as [2] and [3], logging has been used to keep track of what is happening during the experiment. One can log queries made to the interactive device as well as values taken from sensors. It is also possible to add some processing to recognize specific actions or usages (context sensing). In our studies we have mainly used logging as a support for the qualitative observations made during the test, but some data such as time to complete or number of

turns lends themselves well to statistical analysis. The advantage of logging is that it is automatic, while the main disadvantage is that it can be difficult to interpret the recorded data. Context sensing can potentially help, but for more complex activities it is a true challenge to implement.

## 3. SEMI CONTROLLED OUTDOOR TESTS

To get feedback on basic components of the interface we have done a kind of test we call a semi controlled outdoor test. This type of test has a more lab type setup, where one takes care to randomize the order tasks are performed in. The test is also done on a specific location which mirrors some relevant aspects of the real world. Quantitative measures are recorded (such as time to complete, number of turns etc) and analyzed statistically. In addition an observer walks alongside (but slightly behind) the test person in order to make qualitative observations of gestures and behavior [4].

The advantages of this type of test is that it is less time consuming than setting up and performing a full scale study of mobile use. Another advantage is that one can focus on a single interaction component in a more full scale study a more complete interface usually needs to be implemented.

Problems with this approach is to know how relevant the results really are for the real usage situation, and also the lack of control over external factors like weather. It is also difficult for a person that walks slightly behind to observe all aspects of the interaction. Logging may help to some extent, but it is hard to extract more complex gestures from logs of magnetometer or gps data.

When testing GPS based applications one also has to consider the problem of GPS accuracy. Even at the same location this can vary from day to day. A workaround that can sometimes be used is to avoid connecting the GPS positions to real locations, and instead focus on how well the user is able to reach a virtual position (specified by the GPS coordinates).

## 4. REAL TIME LO-FI WIZARD OF OZ

Another method, as in [5] is to have a person acting as the mobile device, and observing the interaction. The questions posed by the user as well as the system responses provide valuable input early in a design process. The advantage of this method is that it is very easy to implement (no technology development needed) while the downside is that results depend heavily on the performance of the person playing the system. An additional problem is that there is a difference between talking to a person and using a mobile device.

A particular issue in our tests done with this method, was how to record the dialog without disturbing the situation too much. We ended up recording sound with a mobile phone – something which was seen to work well.

## 5. SIMULATIONS

When looking at mobile behavior one can also consider making use of computer simulations. In a simulation it is possible to investigate the effect of different parameters without external disturbances, and it is also possible to run very large numbers of tests. Thus simulations can be a useful tool for analyzing test results, or provide initial recommendations for certain interaction parameters [6].

The downside is that the usefulness of the simulation depends entirely on how well it is implemented. Factors important in real life may be missing, and unless the simulation design is carefully grounded in observed usage one runs the risk of getting useless results.

## 6. INTERVIEWS (SITTING DOWN)

To gain an insight into what happened during interaction, as well as into the context of use (skilled or novice user, intentions when using the device...) we need to ask the users. Interviews can be controlled or more open, but the researcher should avoid questions that can lead to confusion or use too technical. We often use a semi-structured interview approach: we have a set of pre-defined questions, but allow for follow up questions and discussions depending on the user answers.

The interviews can be done both before and after use, to gain insight in the context of use, the background of the user, and to obtain reflections on the test.

Interviewing is a standard technique and has been used in most of our studies, and also in many of the studies made by other researchers as mentioned in [1].

## 7. INTERVIEWS IN MOBILE CONTEXT

Interviews can also be done in the mobile context. We have noted that answers given while on the move are often different than those elicited when inside in a laboratory or an office. For this type of interviewing it is important to consider the recording. Just as in the previous method mobile phones or small recorders may be suitable. Video is more disturbing, but may be necessary if actions are to be recorded properly. One strength of this method is that events in the environment may trigger the discussion – something which may also be a weakness in case the external events are disturbing.

## 8. FOCUS GROUPS

During focus group discussions the researcher moderates the discussion while the end-users bring in their ideas. The discussion can be open or semi directed. To avoid missing important topics, or to give more concrete ideas to the group, some technology samples or prototypes can be brought to support the discussion.

Just as for ordinary interviews, we have found that bringing such a group outside is very useful. The group may talk about more technical issues in an office and then switch their focus to more situated topics when outside in the real context. Again the environment is both beneficial and problematic – it can not only trigger useful discussions.

Just as for situated interviews the documentation needs to be thought through – video is valuable, but audio may be enough depending on the context.

## 9. USER WORKSHOPS WITH DEMONSTRATION WALK

In participatory design, design workshops with potential stakeholders are a commonly used type of activity. The workshops are usually centered on scenarios which form the context for the prototype use. We have carried out workshops in which the scenarios are the users themselves, and their wishes and needs. After they have designed their paper / lo-fi prototype, they have been asked to act out the functionality of the prototype, and since the prototype in all cases has been navigation devices, the acting has included walking while demonstrating. This has led to a richer and more detailed dialogue around the actual functions and at what times you are interested in what kind of information. A potential problem is that users are not designers – they may find it quite hard to generate good designs, and the activity needs careful design and also often a moderator to ensure a useful outcome.

## 10. DIARIES

One way to get more long term and rich information about how persons use technology, or what kinds of needs they might have, is to ask them to fill in diaries over a period of time. This has been explored by eg. Gaver et al., who used it together with other sampling material in the Cultural Probes that he described in [7]. We used diaries together with scenario walks, contextual interviews and workshops as one method among others, not as a stand-alone tool. The diaries were mainly to collect travel information and to ask users about technology they might or might not use when planning or undertaking a trip. Every day had preprinted data to be filled in, such as the number and nature of trips, plus one or two preprinted questions from a larger collection of questions and also additional space to fill in any comments. In one case, the diary was filled in between two meeting occasions, in the other case after a larger workshop. The answering frequency was 100% in the first case, and only 5% in the latter, which shows that it might be better to send out diaries to be filled in before a meeting, rather than after.

## 11. VIDEO OBSERVATIONS OF ACTUAL PRACTICE

To have an insight into what people are really doing, it is possible to go out in the real world and try to video tape examples of use of the targeted technology. At our lab we have used such observations to obtain a better understanding of how users use their mobile phones when biking or walking. Those methods give information about what is happening in the real life. One disadvantage is that it doesn't inform the observer about the use of devices that are not yet possible to use. Another problem is that it can be really hard to catch the person to ask him or her why they did what they did.

Ethical questions can also arise from this kind of observation, and the observer should ask whenever possible if the video recorded can indeed be used.

Such video clips are also useful for bringing developers and designers closer to the complexity of real use. This type of videos provide the kind of richness which tends to be lost in methods like personas [8].

## 12. SIMULATED USE IN THE WILD

Most of our work has been to evaluate some aspect of interaction with a prototype that has limited, but accurate functionality in those parts that we intend to investigate. However, we have also recently carried out an evaluation sequence with a simulated functionality in context, where the test users had to perform actions that were not part of the future interaction. The task was to compare different navigation image types and decide which was most preferred [9]. The prototype was entirely without navigation functionality; instead it was the user who flipped between navigation images cued by the test leader and observer, who followed the test person. The unnecessary flipping of pictures seemed not to disturb the users much, and they were able to walk with speed. Aside from the drawbacks mentioned previously, the simulated use and the observation by following made it doubly difficult to be able to know what information the user really received. It occurred more than once that the user flipped the image at an incorrect time or accidentally flipped twice.

## 13. DISCUSSION AND CONCLUSION

The above discussed methods probe different aspects of the mobile usage situation. On the whole we agree with what was already stated in [10] that one needs to make use of several methods in combination in order to obtain a good understanding of the user experience. Although longitudinal methods are good for existing technology, they tend to be hard to use in the design process due to the times involved. Instead one often has to probe potential future use by shorter tests and design activities. In doing so we have found it important to use a variety of methods, and to make use of both qualitative and quantitative approaches.

A problem common in many of our studies is how to observe what the user is doing. If you are walking a little behind (which you have to in order not to influence the test person) it becomes hard to observe everything that happens. The actual activity of having to walk outdoors also introduces some specific problems:

- It isn't possible to carry out tests in all weather types
- You can't expect people to walk very far, especially not when you are working with elderly persons or persons with mobility problems
- You need to find safe test environments for persons with visual impairments
- People have different walking speeds

One particular problem we have noted is the difficulty of observing the interaction if feedback is given through ear-phones or vibration. In several studies we have made use of the loudspeaker of the phone just to allow the observer to gain access to the same output that the user is experiencing – but this is for many use cases quite artificial, and it could be worth exploring to have the observer get the same

feedback as the user through an external device. A possible setup would be if both users have mobile phones and the user phone sends messages to the observer phone to generate the appropriate feedback.

We also note that simulations based on observed user behavior can be quite useful. Since simulations take much less time than real outdoor tests, we have found them a valuable complement when it comes to understand navigational behavior. How useful it is of course depends on the type of interaction studied, but (just as [6]) we find simulations a tool which should be considered.

In any design process the role of the user study is also to allow the users to participate in the design process. Thus, methods need to be combined in such a way as to help give the users the appropriate concrete grounding (by allowing them to experience existing technology) as well as to give them visions and suggestions of future solutions [11]. Most persons find it hard to know what kind of future technology they want and how they think it should be designed. In fact, when faced with the question what do you want the most common answer is what can I get. Thus, it is the responsibility of the researcher or designer to work together with the users in order to explore the future design space.

To conclude: there is no single best method observing the mobile user experience. Instead one has to put together a set of probes to try to obtain an accurate understanding of the situation and the usage. Which combination is used depends not only on the kind of usage studied, but also why it is studied – are we observing existing technology, or trying to understand how possible future technology is to be designed?

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