Paper Prototyping a Social Mobile Service

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ABSTRACT

Methods for design and evaluation of interactive applications are not readily applicable to mobile services. By modifying an existing paper prototyping method we evaluated a mobile social service for providing user-based tips in a shopping mall. The evaluation showed that tips can be pushed to users and that they can accept that a complex user interface is presented on a small screen. Although the evaluation took place in an office environment, we received feedback on functionality of the service in the context of the shopping mall. Our evaluation indicates that simple prototyping techniques can be used for informative evaluations of mobile services that are heavily context dependent.

Keywords

Mobile service, social navigation, social computation, Sony Ericsson P800, paper prototyping.

INTRODUCTION

There is a lack of methods for aiding the early design phases for mobile services. While mobile services in many respects are similar to interactive services in general, they have some properties that might make it difficult to borrow methods developed for general human-computer interaction. One obvious difference is the *baby interface*. Small buttons, small screens and small interaction devices (tiny joysticks, tiny pens) require special solutions. Interaction models for mobile phones and PDAs vary from imitations of direct manipulation metaphors to handcrafted, telecom-based models.

Perhaps more challenging differences between desktop computing and mobile services can be found in the *context of use* [2], where mobile services will rely on fast interactions in noisy environments, rather than the quiet, stable office-usage. Many mobile services also exploit properties of context as part of their functionality. They might make use of the present position, the presence of other users nearby connected in ad-hoc networks, or information provided by objects (using e.g. RFID-tags) or interactive devices (e.g. Bluetooth stations) nearby.

For mobile services, small bursts of usage are often extended throughout the day, and in many different locations and settings. Some services will be useful only during a specific time span, such as when people move close to an object or to each other. The *windows of opportunity* that open up when users move between different locations and networks can be exploited to design time-based mobile services that offer very different functionality from stationary technology. These new technologies have the potential to transform how users navigate and experience places and will have a profound impact on concepts of spaces, places and presence. At the same time, differences in context of use make the design and evaluation of mobile services hard, since it is often not possible to create a realistic usage situation when confined to a controlled lab environment.

In a project aimed at exploring mobile services that implement ideas from social navigation [1], we faced many of these challenges early on in the design process. After initial studies of the context for the service and a series of brainstorming sessions, a prototype was constructed to move the discussions forward. Open questions about technology made paper prototyping an attractive choice, and the method as described in [3] was adapted to fit the situation. The goal was to quickly arrive at a design specification that the entire team could agree on, while simultaneously getting feedback on whether the overall idea would work or not.

A SOCIAL MOBILE SERVICE

What we propose is a mobile service intended to support, entertain and possibly also provoke its users when in Kista Galleria, a mall in the outskirts of Stockholm. Users will carry with them the history of where they have been, what they did at that place, and information about other users they have encountered. These history trails will be exchanged with other users, and serve as a basis for predicting or suggesting places and items to visit and explore. In other words, we aim to create an advanced recommender system on top of a physical place: the Kista Galleria shopping mall.

The exchange of information between users will not only go through servers, but more importantly also be based on ad-hoc connections between user devices. This forms the basis of making the service dependent on time, place and the people at that place. Meeting someone and getting her information transferred means being inspired by someone's past when facing the future ahead. Confining the service to run within the context of the Kista Galleria increases the likelihood that recommendations will be relevant to the user's present task.

The proposed service will run on the Sony Ericsson P800, a combined PDA and telephone. The P800 mixes two interaction models: the point-and-click model from the PDA and the dial-number-and-talk model of the telephone, which raises some interesting interface issues.

The service is intended to show two different faces to the world. It provides a personally adapted service to the user who has downloaded it to her P800 device, and a view open to the public on the web and on public displays in the mall. Users will be able to give their opinion of places in the mall using the P800 service or the web interface.

THE PAPER PROTOTYPING EXERCISE

We used the paper prototyping method described in [3]. The prototype is created by drawing the various parts of the interface on small paper sheets: windows, menus, buttons etc. The method requires all aspects of the design to be covered. To meet this requirement, we decided to prototype only the core service components.

The test is performed by letting one or a few users interact with the prototype using scenarios. The prototype is laid out on a table, and a video camera is pointed at the interface. One test team member plays "computer" by moving parts of the interface according to the user's actions, another team member facilitates the process by guiding the user through the scenario and yet another takes notes.

Purpose

The idea to be tested was to use a horoscope format for suggestions. We had arrived at this idea using brainstorming methods such as Random Words[1]. The intention was to convey that suggestions from the system are guesses, albeit informed, and may be wrong. Even if the system knows the location, the time of the day and encounters with others, there is no way that it can know for sure what this particular user wants to do next. The horoscope format would presumably encourage a more open-ended, inspirational process.

Second, we also wanted to convey the feeling that the suggestions originated not from an authority, but from your peers – fellow system users just like yourself.

A third issue was that of push vs. pull of information. What would users think of having suggestions pushed to their device? Would they find it annoying and spam-like, or interesting and inspiring?

Finally, we were also interested in finding out if it was possible to squeeze the imagined interaction into a small device like the P800.

The proposed service and its user interface

First, the interface was drafted using paper, pen and some ready-made pictures of the P800 and typical buttons and sliders from its interface. The session ended with the creation of computer-made drawings of the interface to replace the hand-made sketches.

The prototype focused on two parts of the service: presentation of the suggestion and a means for users to grade or vote on places in the domain of the service. A map of the Galleria was also included to provide a different view, and make the service a little more inviting. The horoscope-like

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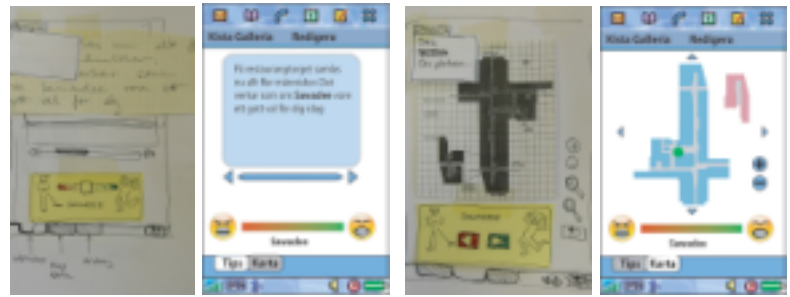[1] See e.g. http://www.randomwordgenerator.com/ (last visited September 24 2003).

Fig. 1. Two paper screens at different points of the design process (in Swedish)

system suggestion was named the *Tip*, and *Tip* and *Map* were placed on different tabs. Figure 1 shows the evolution of each tab from hand-written to final design.

Tips are pushed (accompanied by an unobtrusive buzz) onto the user's screen as she walks through the Galleria. Thus, whenever the user happens to glance at the phone (a behaviour observed in the ethnographically inspired pre-study) there will be a tip on the screen representing ideas and opinions of other visitors in Kista. When switching from the tip to the map, the location of the tip is shown as a dot on the map (modelled on the official map of the mall).

Below both screens, a slider for providing quick feedback is placed. By moving the slider users can input their explicit opinion, positive or negative, on the recommended item (be it a restaurant, shop, event, or route through the galleria). The meaning of the scale is conveyed by the symbols at the ends of the scale and by a positive (handclapping) or negative (booing) sound accompanying slider movement. In addition to this explicit input, the system is also silently logging user actions in the interface, locations passed and encounters with other users.

The mystical, horoscope-like format of the tip was one way of conveying that suggestions were not produced by the Kista Galleria storeowners. An explanation of the reasons behind each tip was also provided, giving information on what people and action had caused it to be presented. The public display was not prototyped.

Bringing in an end-user to test the prototype

The test subject was a typical representative of the intended user community: a frequent visitor of the mall, also familiar with more advanced mobile phones (although not with the P800). The scenario was adjusted to what we knew about this subject's taste and habits.

A full scale image of the phone was taped onto the table, allowing us to film the interaction with a fixed camera.

All screen items had transparent handles, and were placed on the base image as the interaction went along (Figure 2). The prototype included a slider, implemented by sliding a thin paper tongue between two slots in the paper screen.

The test session lasted for 35 minutes: introducing the real device, a P800 phone (7 minutes); going through the scenario (17 minutes); and discussion and follow-up questions (11 minutes).

The scenario included two tips from the system, triggered by two different situations. After briefly describing the service the first usage situation was introduced:

Fig. 2. A menu flying in

The time is 11.55 am and you are heading down to Kista Galleria to have lunch. When entering through the doors, the phone buzzes.

The following tip was displayed on the interface:

At the food court more and more people are gathering. It seems as if Sawadee would be a good choice for you today.

The user was allowed to interact with this message as pleased. When interaction faded, the scenario continued with the user following the tip but getting disappointed with the quality of the food, thus creating a need to set or adjust the grading of the restaurant in question. Once this interaction was finished, the situation was set up for the second tip:

Once you are finished, you start walking back towards the office. There are quite a lot of people around you. Bzzz, says the phone again.

This time the tip was pushed after encounters with others, in particular with someone who had already had lunch and then bought some movie tickets:

Don't forget that there is more to life than food. Tonight there is a re-run of the first Matrix movie at the cinema.

RESULTS

The results from the session are divided into those that concern our design idea for social navigation in the real world, interface problems for the P800, ideas for new functionality arising from the session, how multimedia may be used differently on a device that is both a computer and a phone, and finally, some results on context of use.

Understanding the tip and who is behind it

Our subject had no problems understanding what the service offered. When presented with the first suggestion – where to go for lunch – and asked to comment on what he saw he stated:

I have received some kind of recommendation from someone on some unknown basis.

However, the proposed interface failed to convey the feeling that suggestions were based on the opinions of other users. We found two main reasons for this failure. First of all, the mystical format was designed to work together with its explanation. Our subject was almost unable to locate the explanation where the source of the tip was revealed to be other users. We had designed for three sources of information: an explanation, further information about a place, and general help. Not even when (eventually) finding all three did the subject get what he needed.

Second, we had named the service after the shopping mall:

If the name of the service is Kista Galleria, I suppose that it is those who own Kista Galleria [...] who are providing the service. Who feed data into it too.

Reactions to push and pull

We were very much concerned with the service relying on information push. To our surprise, the subject was very open to push:

I am quite prepared to accept some junk… hints. You never know if you might find new stuff that way.

When the service suggested a lunch restaurant, the subject immediately started looking for another, similar suggestion, a combination of push and pull that we had not considered. He was also interested in other pull mechanisms, such as retrieving suggestion for where to buy certain products.

Interface design issues

Great care was taken in the design to keep the screen as uncluttered as possible. As seen in Figure 1, no buttons were placed on the suggestions screen. All commands related to this were placed in a menu. This caused problems finding available commands. Adding buttons for each command would probably be better in the trade-off between cluttering the screen and burying commands in menus.

Minor problems were also experienced with the map. A green marker was used to point to the location of the object currently open for grading. Our subject pointed to the possible misinterpretation that the marker showed the user's location, since he was assuming that this mobile service would be location aware.

Ideas for new functionality

In the scenario, we wanted the user to react to a given recommendation by first having lunch at a recommended restaurant and then later not being happy with the meal. The reaction was to first tell the personnel he was disappointed, and then demonstratively give the restaurant a negative vote. To vote he had to slide the rating scale, but was reluctant to do so since he regarded that value as his long-term opinion about the restaurant. His long-term opinion was still positive despite today's disappointment, so instead the user wanted to be able to express an opinion with another time frame than that provided in the interface.

During the post-scenario discussion, the user also suggested that we would allow for different modes or profiles, connected to the phone's profiles, so that e.g. tips were blocked when the phone was in "work" mode.

Utilizing the device's mixed interaction models

Our end-user imagined that it would be too hard to write comments on a small device like the P800 when in the mobile setting. Our suggestion that this could be done at some other time and place using the web got a positive response. A suggestion to use voice comments was also positively received. The idea of voice comments does probably not come naturally unless you really understand that device is a mixed phone and PDA. Since it is a phone, it has microphone and speaker, and thus voice messages would be appropriate.

Context of use

One of the shortcomings of paper prototyping for mobile services is that the method is designed to be used in a controlled environment. In our test, context of use was introduced only in the scenario. To our surprise and delight we still received some feedback regarding the use of the device and the mobile scenario. The possibility to interact with the device in a public and demonstrative way was observed in the "bad food" part of the scenario. The misinterpretation of the green dot on the map showed that our test user expected the service to be location-aware.

DISCUSSION

Using paper prototyping

Hand-drawing the interface components was helpful in the creative process, but the drawings were difficult to use for the test due to the level of detail and the small size of the P800 screen. The final drawings were computer-made in order to fit all details.

We were concerned with not being able to test the prototype in the context of use that it was designed for, and aimed to amend this problem by careful design of the scenario. The subject wilfully played along and provided some valuable feedback on the context issue, but he was also too aware that his task was to test and evaluate the interface.

The way the scenario was written added to this problem. The first part described that he had just downloaded the system to his mobile device. The subject answered to this by exploring the interface:

> I would start by "clicking around".

However, the scenario did not include such a session but instead went on directly to the introduction of the first tip. Tip and explorative interaction were thus intermixed.

Our subject showed in several ways that he was aware of the device by using the stylus for pointing and for moving the slider (Figure 3). Once the test was over, he even carefully (albeit playfully) put the stylus back on the "side" of the two-dimensional paper prototype, i.e. in a dimension that did not exist.

Fig 3. Test Subject moving a slider using the P800-stylus

Social and Mobile Computing

We had not understood the extent to which context such as location and presence of others becomes prominent in a social mobile service. For our domain we had to be extra careful: if tips or recommendations concerning places and items are not presented with a clear reference to who is giving them, they might be perceived as commercial information. To make fellow users more present in the interface, we are now considering presenting the actual others who gave rise to the tip by alias, and providing a window where other users currently or previously present at a location are visible and possibly contactable.

The exercise also made us aware of how users might be interested in getting other tips related to the situation they are in. The push-model presented in the prototype triggered an interest in getting more tips. Context awareness of time and place, others nearby, and recently presented tips opens up an opportunity to do informed pull.

We observed our test subject taking advantage of the fact that he was *there* in time and place: he used his phone demonstratively to give an opinion of a restaurant. Such public display of actions is another interesting result that drew our attention to the difference between providing feedback in the privacy of the home and providing feedback in a public environment. If the restaurant knows that there is an on-going evaluation of its performance, the possibility of taking out one's phone to give feedback provides the customer with some consumer-power.

It must be possible for users to enter new items that can be rated and used in tips. We are also working with other dimensions of opinions, such as the meaning of the rating scale, and allowing for different scales for different categories of items. This follows from the discussion in the study around providing feedback on the restaurant as a whole, compared to providing feedback on a specific course on the menu on a particular day.

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