

USER EXPERIENCES ON LOCATION-AWARE MOBILE SERVICES

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ABSTRACT

This paper describes the user experiences gained from the use of a location sensitive mobile services in urban environment, collected with a diary study and user interviews over one summer. In this study users' perceived problems and the resulting frustration and difficulties in use were mainly caused by slow or unreliable data connections and lack of content in mobile services. On the other hand, users identified the future potential of these mobile services.

KEYWORDS: *Location-awareness, mobile services, mobile handheld devices, user experience.*

1. INTRODUCTION

Use of mobile handheld devices has grown rapidly during the recent years. Today people commonly carry a number of mobile computing devices, e.g. mobile phones and personal digital assistants (PDAs), with them everywhere they go. The usage of mobile handheld devices has been investigated from various viewpoints, including the communication culture, mobile workers, and collaboration supported by the mobile technologies. The research in mobile computing has also emerged to fields utilizing context- and location-awareness, where the device is, to some extent, aware of its usage situation or location. These fields have gained increased attention, and applications implementing these features are an expected future trend.

Location-aware services have been estimated to increase in the future, and a number of studies have looked at location-aware tourist guides, such as the GUIDE tour guide at Lancaster (Davies & al., 2001), or shopping assistants (e.g. Bohnenberger & Jacobs, 2005). An example of a location-sensitive messaging systems is the on-campus location-aware messaging application E-graffiti, where users can create and access location-associated notes, and the system employs laptop computers and wireless network-based location detection (Burrell & Gay, 2001). In the PDA application InfoRadar the user interface displays location-based messages in a radar view, showing their orientation and distance from the user (Rantanen et al., 2004). The widespread use of mobile phones has allowed the extension of experiments to large user groups, as standard mobile phones can be used as the experiment platform, removing the need to distribute specific platforms. This approach is used in the work of Koch and Sonenberg (2004), where a Multimedia Messaging Service (MMS) based location-sensitive museum information application utilises Bluetooth sensing technology.

This paper describes the user experiences gained from the Rotuaari project, summarizing the results of the users' expectations and perceptions when using the system over a summer.

2. ROTUAARI PROJECT AND THE USER EXPERIENCE STUDY

The Rotuaari project was carried out in the city center of Oulu, Finland, where location-aware mobile services were offered for public usage. The earlier version of the system utilised WLAN positioning using PDAs as mobile platforms. This was later accompanied by Bluetooth and GPRS connectivity and positioning enabling the use of mobile phones. This paper describes a user study carried out in the latter phase. The technical details and description of the implementation can be found in (Aalto et al., 2004).

The location-aware mobile services consisted of several modules, including *Event Calendar* containing information of local current events, *Guidance Service*, where the user could search information of different places and have them shown on the map, *Service Directory* of local services and also guidance on the map, and *the Advertising Tool*. With the advertising tool, service providers could create and manage mobile advertisements, including sending criteria, which could contain e.g. receivers personal interests, gender, age, location, sending time and period of validity. With mobile phones, the advertisements could be received via short message service (SMS) or multimedia messaging service (MMS).

Participation to the study was open to the public, and anyone could register as a user via internet, or from the information booth located in the city center. The participation times between users varied from a few hours to several months. The participants could either use their own mobile phones or PDA, or borrow one from the project.

This paper describes the user experiences reported in a diary study and interviews carried out with a group of users participating in the study for a long period, i.e. summer 2004. The 20 participants (6 male, 14 female, aged 22-53 years) from different fields and backgrounds filled out a diary reporting on their usage, including the used services, general usage behaviour, and the perceptions and feelings of the usage. The estimated duration of this data collection was 5-15 min for each occasion. In the end of the experiment period, an additional written survey and in-depth interviews were executed. Five participants used a PDA and 15 used a mobile phone as the experiment platform.

3. RESULTS

In several points of the diary study study, users were asked to choose a 'smiley face' from a selection that best described their feelings about the system, and give comments about their impressions. In the analysis, the 'smiley face' expressions were divided into positive, neutral, and negative categories, and the results for the beginning and end of the study are presented in Table 1. In the beginning of the study, the general feeling among the participants was curiosity and eagerness to try out the system, and generally the expectations were quite high. Before starting the actual testing, three participants wondered in their comments if the system would be of any use for themselves personally. One person doubted if the mobile phone would offer a good user interface because of the its small size, and one criticized the slow registration process.

Table 1. Perceptions of the system before and after the test period expressed with a 'smiley face'.

Perception	Before	After
Positive	9	7
Neutral	5	5
Negative	3	4
No answer	3	4

The written comments in the end of the survey typically included both positive and negative feedback. The negative comments could be categorized in the following categories A) Poor reliability or functionality and technical limitations (mentioned by 7 participants); B) Lack of content (6); C) Difficult or uncomfortable to use (3); 4) Lack of interest or boredom (2). The following categories could be recognized from the positive comments: A) Has future potential (mentioned by 6 participants); B) Fun (4);

C) Useful (1); and D) Interesting (1). The event calendar was perceived as the best service. An example of a user comment is the following:

“I believe the testing will be interesting and the services will bring me new experiences and insight to mobile services and their use. With the greatest enthusiasm I am looking forward to the mobile advertisement service.” (Comment before testing period, Subject #11).

“I believe that with further development both the services and technology become more functional and reliable. The device and services were fun to test and I believe that when having an opportunity, I will user and exploit especially ‘mobile advertisement’ and ‘event calendar’ type of services.” (Comment after testing period, Subject #11).

The diary notes clearly showed feelings of frustration during the study. Every participant criticized the long downloading times, which seemed to be the biggest reason for frustration. Unreliability with data connections was another reported annoying system feature. A lot of users commented on the lack of content, as people found it difficult to find personally useful functions, were expecting more of the spontaneous information delivery, or were disappointed by the insufficient information provided by the service.

“It’s just way too much work to access them [the mobile services], and the content is too minimal. It’s more efficient for me to use my computer or the yellow pages, or to call a live person to help me.” (#3)

“The services themselves are surely good, but they do not work well enough when the connection is not functioning. If the connection succeeds, the downloading takes too long.” (#19)

In the diary study, the participants were also asked to express their feelings by drawings. Examples of illustrations describing the current feelings with the systems are presented in Figure 1.

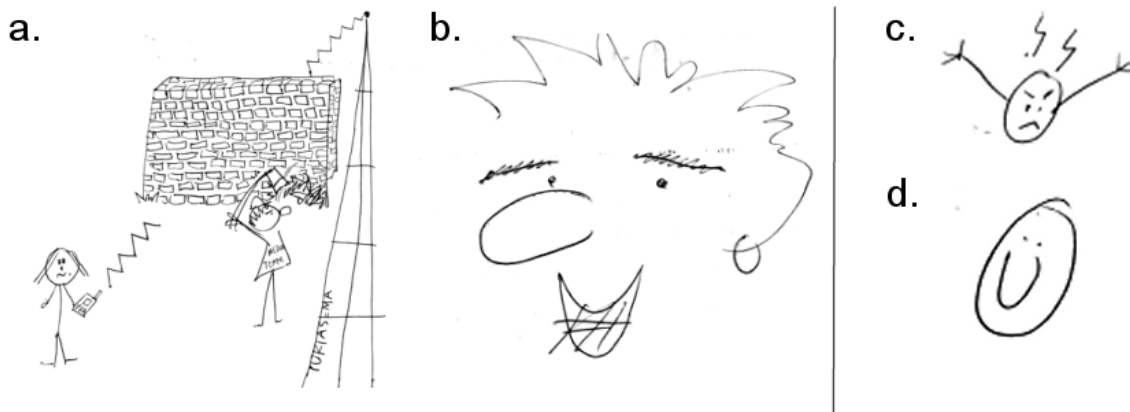


Figure 1. The feelings of frustration and joy of success with the system illustrated by subjects #7 (a and b) and #19 (c and d) during the experiment period.

When the participants were asked if they had browsed or used the information given by the services later or in other place than when received, 11 out of the 14 participants responding to the question answered affirmatively, four users indicating that most of the browsing was done at home. Two of the positive answers included a comment that a lack of time prevented them from using the service while in the city.

4. DISCUSSION AND CONCLUSIONS

In this paper we have presented the experiences of location-sensitive mobile services gained from a field study during summer 2004 at Oulu, Finland. The test period included both the feelings of frustration and happiness of succeeding with the system. The positive feedback was more related to the novelty of using and experimenting than to the personally perceived usefulness of the service. In principle, the usefulness of the services was appreciated, but current system functionality did not fully meet the end user needs. The results indicated that from the user experience point of view, their expectations were relatively high and were not fully met. The most commonly referred negative experiences were the slowness of the

connection, lack of content, and complicated access. The complexity of the user interface and technical unreliability also caused some negative feedback. Despite these detractors, the future potential of the system was acknowledged and was generally perceived valuable and useful if further developed. The diaries also demonstrated a common problem of diary studies, i.e. the participants occasionally either forgot to answer or neglected some questions.

When examining the results, one has to take into account that the users were required to register for the participation. The material received cannot thus be considered as ‘spamming’ in strict manner. The push messaging was allowed by the end-user, and so the experiences do not offer direct information on that phenomenon. Spamming is however perceived very negatively, especially with respect to email (Cerf, 2005) and there exist indications that the same is valid for mobile spamming (Häkkinä & Mäntyjärvi, 2005). This shows that the research methodology used in this study does not give realistic information about the acceptability of the mobile advertisement, but enlightens the potential problems, e.g. easy of access and download speed, that should be taken into account in system design.

The results indicated that many issues with service were related to the time constraints people often had when in the city. The downloading times and connection speed were frequently criticized, and accessing to the information was perceived often too slow and complicated. The services or the information they provided were surprisingly used much later than when they actually were received, e.g. browsed at home. This is a novel finding, as the location-sensitive services have so far strongly aimed on ad-hoc information delivery right into the spot and situation the user currently is. Also the commonly used use cases often assume the information to be used immediately in the same location when the message is received.

The results indicate that in order to create usable mobile services for a large audience, access to the services must be made easy and quick. The threshold to use the application should be made low: not requiring too many prerequisites such as filling out the forms etc., user interface design to support quick access to the applications, and content download times should be short. Also, field testing in real usage situations is essential.

REFERENCES

- Aalto, L., Göthlin, N., Korhonen, J., & Ojala, T. (2004). Bluetooth and WAP Push Based Location-Aware Mobile Advertising System. In *Proc. of MobiSYS'04*, 49-58.
- Bohnenberger, T., & Jacobs, O. (2005). Decision-Theoretic Planning Meets User Requirements: Enhancements and Studies of an Intelligent Shopping Guide. In *Proc. of Pervasive 2005*, 279-296.
- Burrell, J., & Gay, G. K. (2002). E-graffiti: Evaluating Real-World Use of a Context-Aware System. *Interacting with Computers*, 14, 301-312.
- Cerf, V. G. (2005). Spam, Spim, and Spit. *Communications of the ACM*, Vol. 48, No. 4, 39-43.
- Davies, N., Cheverst, K., Mitchell, K., & Efrat, A. (2001). Using and Determining Location in a Context-Sensitive Tour Guide. *IEEE Computer* 34, (8), 35-41.
- Häkkinä, J., & Mäntyjärvi, J. (2005). Combining Location-Aware Mobile Phone Applications and Multimedia Messaging. *Journal of Mobile Multimedia*, 1, (1), 18-32.
- Koch, F., & Sonenberg, L. (2004). Using Multimedia Content in Intelligent Mobile Services. In *Proc. of the WebMedia & LA-Web 2004*, 41-43.
- Rantanen, M., Oulasvirta, A., Blom, J., Tiitta, S., & Mäntylä, M. (2004). InfoRadar: Group and Public Messaging in the Mobile Context. In *Proc. of NordiCHI 2004*, 131-140.

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