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Mobile Personalization in the Context of Large Sports Events

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Abstract: The paper reports a study of mobile personalization in the context of large sport events, specifically with Chinese users. The study compared the user experience obtained by Chinese spectators at a large sports event when using a prototype mobile application that either did, or did not, allow personalization. The study found that mobile personalization could play an important role in enriching the user experience at large sport events, but also had some potential drawbacks. In addition, limitations were identified with existing user centred design methods with Chinese users and suggestions for appropriate evaluation methods for these users are made.

1. Introduction

Nowadays, technology plays a major role in sports [1] and enables mobile devices to serve a multitude of purposes in sports events. Previous research introduced a mobile personalization concept which helps to enhance the user experience at large sporting events (LSE) [2]. Large sporting events are characterized by large numbers of spectators gathering within a wide spatial distribution to co-experience a lively atmosphere and exciting moments within sports events [5]. Both the LSE context and the specific Chinese culture make the user experience unique in this research.

This paper assesses the impact of *personalization* of a mobile device on the user experience within a LSE. It focuses on the Chinese user experience from a social and cultural perspective. From a methodological point of view, it contributes by researching methods for studying the Chinese user experience with personalized mobile applications.

1.1 Concepts in Research

User initiated personalization and system initiated personalization are the only scalable approaches to design of personalization [2]. Personalization is where the information/services provided by a device to a user are tailored according to the user and their context. This research started to study user initiated personalization during which a mobile device provides personalized information and services tailored to users' setting of preference and interest in order to provide an enhanced user experience [3].

To study the user experience, the theoretical components of user experience were first considered. There is considerable interest and effort to define user experience in this subject [4, 5, 6, 7, 8, 9, and 10]. Those studies are useful at a general level. However, they are too general to be used as a practical tool in product design and evaluation. Summarized from those studies, the user experience refers to the subjective experience that a visitor obtains when interacting with the mobile personalization application in the LSE context. This paper examines five aspects of user experience which cover almost all aspects mentioned by the earlier studies (refer to table I): user (e.g. expectations, mood) [4, 7, 8]; the context of LSE (e.g. physical context and social context) [4, 6]; the culture (e.g. tradition, belief) [5]; the social interactions occurs within context (e.g. interactions) [8, 9]; and the characteristics of the designed mobile device (e.g. usability, functionality) [10].

Table I. Theoretical components of user experience

User Experience Components	Meaning	Source
User factor	expectations, needs, motivation, mood;	Dewey, J. (1980), Norman, D. A. (1998), Kankainen, A (2003)
LSE Context factor	physical context, social context, interactions;	Mäkelä, A. & Fulton Suri, J. (2001), Dewey, J. (1980)
Culture factor	value, belief;	Buchenau, M. and Fulton Suri, J. (2000)
Social factor	social user and creativity in use;	Koskinen, I., Battarbee, K. and Mattelmäki, T. (eds.) (2003)
Product factor	usability, functionality;	Nielsen, J (2001), Davis F D. (1986).

1.2 Background Information

Earlier research [2] observed that the current audience experience at LSE could be improved. There was often an inability for the audience to select from information available, and put the details observed into the broader context in of the event at the stadium. Moreover, much social interaction that occurred was limited and inactive. The experience should be enhanced since spectating is assumed to be a rich, social experience. For the Chinese user, events in sport are important not just in themselves but as resources for social interaction amongst groups. The users showed a high level of acceptance toward mobile personalization based on users' rating (the mean acceptance rating on a scale ranging from 1 'not accepted' to 5 'accepted' was 4.5).

A prototype application allowing mobile personalization was built up to support different aspects of the user experience in a stadium. This prototype potentially promoted engagement in the event by providing the personalized event information and enhancing relations with a social network by creating the virtual groups with personalized image. Those designs were derived from the previous field studies at sporting events [2].

2. Methodology

User centred research encompasses lots of methods, such as, survey, persona, scenarios, contextual inquiry and so on [10, 11]. Although each method can be used alone, it is not a single all-purpose method [11]. Moreover, most existing user centered research methods were generated based on the premise that participants will find it easy and comfortable to articulate their thoughts and feelings about what works for them and what does not [12]. However this assumption is biased heavily in favor of certain cultures, and is not compatible with Chinese culture because of the language and traditional beliefs [13, 14]. The Chinese language is a non linear pictorial-based language that may not be as efficient for verbalizing thoughts as linear language [13]. As well as a language barrier, the communication with Chinese users might be influenced by the traditional Chinese value of discouraging speech, as quoted by Lao Tzu: 'he who knows does not speak, he who speaks does not know' [14]. In light of those concerns, user centred research methods were developed which were more compatible with Chinese culture and values.

The research approach applied different kinds of user centred methods, which included going to the field where the device would be used; carrying out task-oriented usability testing; working and comparing with two kinds of prototypes; and interviewing and surveying user experience in the field setting as users interacted with the mobile prototypes. The approach applied multiplicity of methods, namely: field study, scenarios, usability testing, questionnaires and context interview.

Field study was chosen as the context of use is important for mobile evaluation [15], and particularly where the usage environment is a key aspect of the user experience, such as at a LSE. Scenarios were developed as a script providing a concrete example of a task the user would perform with the prototypes. Usability testing was applied to ask users to perform scenario-based tasks with the mobile prototypes in order to measure the usability and user experience. A questionnaire was to collect users' opinion of "what", such as what they felt about using the device. Context interviews helped discover more about users' experience than just what problems they have found out during the usability testing and questionnaire. It explained why they considered it problematic by interacting with the researchers in a conversation. It provided insights into why users expressed those views when working with the prototypes, and provided flexibility.

In light of the Chinese culture of discouraging speaking [13, 14], the study used emotion cards [16] to facilitate the communication with Chinese users.
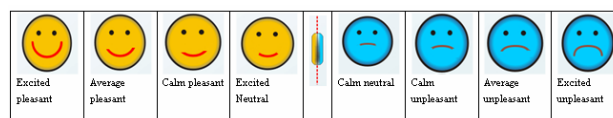

Figure 1. Emotion Cards.

Emotion cards are a group of cards depicting cartoon faces with eight distinct emotional expressions (Figure 1). These expressions vary on the basis of 'pleasantness' and 'excitement' dimensions. In psychology, these are the two most accepted dimensions of emotion. Some emotions are neither pleasant nor unpleasant [17]. The Emotion card was used to help Chinese users objectify their experience and to serve as an aid for starting a conversation with the researcher. Typically, a participant would select a card that best expresses his or her experience in relation to mobile personalization, which would initiate a deeper conversation with the researcher.

3. Case Study

Field Study. The user studies took place in a sport stadium at Shanghai University in China from 1st Oct, 2006 till 6th Oct, 2006. There were football competitions

organized by the football clubs in this stadium during the evaluation. These generated a typical LSE user experience, and enabled a contextually realistic study of how mobile personalization of a mobile device could impact on the user experience at this LSE (Figure 2).

Figure 2. User Studies at Sport Stadium at Shanghai University, China.

Test subjects. 18 users, with different gender, ages and professions, were invited to take part in the study. See figure 3 for a demographic summary. All the participants had experience of personalizing mobile devices and had watched a LSE in an open stadium within the last half year.
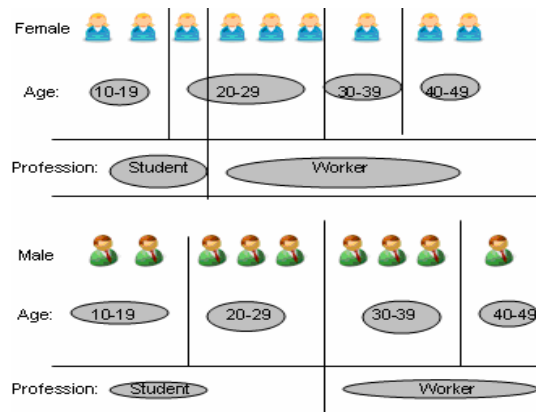

Figure 3. User Profile.

Prototype. Two prototypes (one that supported personalization, and one that did not) were built up. Both prototypes share the same user interface look and feel as well as the functions to aid users at the sports events (Figure 4). The prototype was designed to provide information on athletes and event schedules. It also enabled additional services, such as being able to order food and building up a virtual community within the stadium by tracking users' profiles (e.g. location, interests, history) on the mobile device.
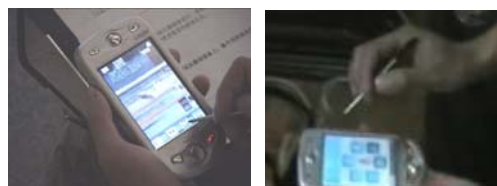

Figure 4. Snapshots of Personalized and Non-personalized Mobile Prototypes

The personalized prototype asks users to set their preference in relation to the sports items and athletes (Figure 5) from a tree structure menu. As a result, the event information, for example event schedule, will be presented based on the users' setting (Figure 6). In the same way, users were asked to set their interest for the purpose of building up virtual communities with groups of spectators sharing similar interests.

Figure 5. Snapshots of Personalized User Interface

Figure 6. Snapshots of Personalized Information based on User's Settings.

Figure 7. Snapshots of Non-personalized Information.

In contrast, the non-personalized prototype does not require the user to set their preferences, and as a result presents more general information and services (Figure 7).

Test Tasks. There were four tasks developed into scenarios: 1) read the events schedule recommended on the mobile device and select one you are going to attend; 2) order food on the mobile device; 3) view the athletes' information

presented on the device and select one to read in detail; 4) create a virtual community and join a community activity on the mobile device.

The scenario based tasks were composed in such a way that they reflected the initial user requirements discovered during the previous study [2]. They enabled the testing of the main personalization features of the prototype, in relation to the impact on the user experience in the sport stadium environment.

Criteria. Summarized from the literature [4,5,6,7,8,9,10], the evaluation criteria was derived from the collaborative factors of user experience, which include factors of product, users, culture, context and social experience (refer to Table I). The *product factor* was measured by the perceived usefulness, ease of use, navigation of the prototype; *users and their culture factors* were evaluated by studying users' expectation, and emotional response to the mobile personalization; *context and the social components* were assessed according to the sense of user fulfillment and engagement when using the prototypes in context. The criteria formed the basis for a tool for gathering user experience of mobile personalization in context.

Data collection. During the study, there was a video camera mounted behind the user to record their interactions with the mobile prototypes. Users' comments and ratings toward their experience with the prototypes were recorded on the paper based questionnaires. Interviews were taped for later analysis. All the video and audio recordings were taken with the authorization of the participants and were used only for the purpose of this research.

Procedure. At the beginning of the study, subjects were introduced to the mobile personalization concept and given a brief instruction on how to operate the prototypes. The evaluation was then structured by scenario-based task assignments. The within group design was applied which asked each user to use the two different mobile prototypes. Users were randomly apportioned to complete a task using either the personalized or non-personalized prototype first. After the user finished, the alternative condition (e.g. non-personalized prototype) was used to solve the same task.

After each task, subjects were presented with the Emotion cards to encourage them to rate and think aloud about their experience regarding the two different mobile prototypes in the LSE context. At the end of the tasks, users were given a questionnaire, which was designed based on the studied criteria. They completed questions regarding their experience in collaborative perspectives of product, user, culture, LSE context and social experience with the mobile prototypes.

Finally, they were interviewed to determine their attitude toward the mobile personalization concept. The study lasted around 60 minutes for each user.

4. Results and discussion

Both quantitative data (users' rating) and qualitative data (users' comments) were gathered during the study. Quantitatively, the Wilcoxon signed rank test [18] showed that the user experience with the personalized prototype was significantly higher ($p < 0.05$) than that of non-personalized mobile prototype in the LSE context based on users' rating on the questionnaire.

Qualitatively, comments were gathered from interviews and analyzed using an open coding technique [19]. It validated the quantitative results that the user experience was different using the two mobile prototypes. The comments based interaction with the two mobile prototype are summarized in table II.

Table II. User Experience (UE) comments of personalized and non-personalized prototypes during the evaluation.

UE Factors	Personalized Prototype	Non-Personalized Prototype
Product Factor (ease of use)	It provided relevant information with less interaction steps.	It required more interactions to find information of interest in LSE context.
LSE Factor (engagement)	It saved users' time and attention in the stadium by providing information and services of interest.	Information presented was general without focus, which can distract users' attention in stadium.
Social Factor	It greatly enhanced social interaction by building up virtual community with group of users sharing something in common.	It enhanced social interaction by building up virtual community in stadium.
Culture Factor	It helped to assign users to a group of people in common and emphasized the group image during the events [20].	It did not consider the cultural emphasis on group relationship and image.
User Factor	It was very enjoyable to have a device which could interact with users' preference and interest. However it required too many settings.	It did not response to personal preference and interest. Yet, it sometimes presented new and broader information.

Generally, the personalized mobile device enriched the user experience in the stadium by presenting relevant event information with less interaction steps. It also helped to enhance social interaction, especially opportunities for group interaction amongst people sharing a common interest. This is consistent with the Chinese culture that emphasizes group relationships [20]. Moreover, it could facilitate other non-sports services to support the sense of engagement of spectatorship, such as ordering food according to personal preference. However, the study also revealed that the personalization of a mobile device required time and energy. In addition, personalization was not able to support preferences that were likely to change from time to time in the stadium, for example, a sudden interest in an athlete that could not have been anticipated.

Although the non-personalized prototype had the same functions, it lacked a sense of entertainment without personal characteristics. In addition, it was, it was not able to minimize interactions between the user and device, and could not support the group interactions suggested by cultural consideration of Chinese users. However, by providing a wider range of information to the user, a non-personalized device could was able to bring a sense of freshness and breadth of coverage in comparison to the personalized device. This was demonstrated by two users who discovered unexpected items of interest (including athlete information and the restaurant information) during the process of searching for information with the non-personalized device.

To consider the cultural aspects of interaction, Chinese users acted politely throughout the study. They were uncomfortable expressing negative feelings about the applications. However the emotion cards were found to be useful in overcoming these inhibitions. For example, when interviewing the Chinese users about aspects of their user experience, they generally stated it was 'okay'. However, when presented with the Emotion cards, they started to pick up one emotion face and talked more. It has to be remembered that 'user experience' is a much more complicated construct than the expressions conveyed on the emotion cards; therefore although extremely useful, the cards can be further developed for more accurate portrayal.

5. Conclusions

The field-based study evaluated the effect of user initiated personalization vs. non personalization when Chinese participants used a mobile device at a LSE. This study focused on assessing the differences in user experience, through extended usability testing, with a mobile application within a LSE context. The study found that mobile personalization could play a role in enriching the user experience by providing information/services tailored to each individual and the LSE context.

The study also considered methods for studying the Chinese user experience for mobile applications used in context. It was found that typical western methods needed to be adapted in order to work well with Chinese users. In particular, Emotion cards, which visually represented aspects of user emotions, helped the Chinese users to express their views and engage in a dialogue with the researcher.

Future research will study the role that user or system driven personalization should play with mobile applications designed to enrich the user experience at large sports events. This research will also develop and test user centred design and evaluation methods that are suitable for Chinese users.

Acknowledgement

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