Abstract

The aim of this contribution is to highlight a new, complex, challenging scenario involving the design discipline when working on the design of mobile applications. New challenging usability issues have to be faced, as well as the social and economic impact of the designed products. In this multifaceted context, design has the chance to play a key strategic role: relating to and cooperating with other disciplines. The concept design of a mobile application for the visitors of the XX Olympic Winter Games-Torino 2006 is taken as case study to analyze the variety of fields and the steps that the design process has to go through and work on.

1. Introduction

Due to the progressive development of wireless communication technologies, the cultural phenomena of nomadism and globalization are deeply affecting diverse aspects of our lifestyles (social relationships, nomadic communities, m-commerce, nomadic working, m-learning…), thus requiring an original approach to user centered interface design. Moreover, context-sensitive systems development, as well as new multimodal interactive interfaces, will enhance and extend communication possibilities in mobility.

In order to design usable, enjoyable, and successful mobile applications, the design discipline will need to profit from the cooperation with and the knowledge of several other disciplines. Additionally, the problem settings will need to take into account a double point of view, that is, a point of view that considers both the user experience and the economic relevance of the designed product. This double point of view implies a more strategic approach.

The concept design of a mobile application for the visitors of the XX Olympic Winter Games - Torino 2006 is taken as case study, in order to highlight the issues of the design process and to present the new and complex scenario in which the design discipline is involved when working on mobile applications.

2. The Design Mission: Definition and Goals

Human-Computer Interaction (HCI) is one of the main concerns in successful software design. It is defined as “a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them” [5]. It is implicit in the definition of HCI that the analysis of the “surrounding phenomena” is part of the design and evaluation mission. This opens a wide range of activity for the design discipline.

By cooperating with other disciplines such as psychology, sociology, informatics, and strategic marketing, design should try to foresee the user experience as much as possible and play an active, creative role in software applications development. The importance of the user and his environment is further emphasized when we take into account the definition of usability: “the effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments” [7].

The “on the move” situation, the wireless devices dimensions restrictions, battery duration limits, interaction difficulties, limited display sizes and resolutions, unreliable wireless connectivity, make the business success of mobile applications even more dependent on their usability. Design can not avoid evaluating the social and economic impact of the applications: 3G technologies have been highly expensive investments, requiring a mutual balance between business profits and user benefits. In this sense design can play a strategic role, by analyzing the user’s needs and providing innovative business solutions.

3. Mobile Scenarios for Major Sporting Events

Major sporting events provide an interesting context for the design of mobile scenarios. Considering logistical, social and economic implications of events such as Olympic Games and Soccer World Cups, whose complexity and globality are challenging aspects, we focus on the evaluation of the personalized information as
means of event management and visitor experience enhancement.

The first and fundamental step is to identify the potential value of a mobile application in the described context. According to the double front on which the application can provide benefits, the goals of the visitor and of the organization are respectively taken into account:

- for the visitor: enhanced mobility and communication, information service corresponding to the personal needs and interests, social interaction;
- for the organization: sustainable mobility, with a limited environmental impact, hosting city promotion, resources optimization.

The concept design of a mobile application for the visitors of the XX Olympic Winter Games - Torino 2006 is presented as case study in order to analyze the complexity of the design process while highlighting the need to combine the personal preferences of the user and the strategic value of the personalized information as a means of event management.

### 3.1. Analysis and Outcomes of the Design Process

The analysis concentrates on 3 main areas, in order to achieve a deeper knowledge of the issues that can contribute to accomplish the goals above:

- Intelligent Transport Systems and Services (ITS)
- Information retrieval systems for the visitors in the past Olympic Games
- The context of use and its implications in the user experience design.

The observation concerning ITS focuses on how the information delivery can contribute to optimize the traveler’s experience and the transport provider logistics tasks. ITS describes any system or service that makes the movement of people or goods more efficient and economical. The Advanced Traveler Information Systems (ATIS) and the electronic payment systems are evaluated as possible tools of mobility improvement. The ATIS analysis, referring to the results of European research projects such as Infopolis 2 [6] and Peptran [11], considers the travel as cognitive process and the traveler information needs in the different travel phases: pre-trip, wayside and on board. The outcomes of this observation confirm the need of personalized, localized and real-time information to efficiently support the traveler in his choices. Concerning the electronic payment systems, value-storing-products (which are based on the use of smart cards and network- or software-based products) provide a suitable solution for the mobile condition: thanks to SIM cards and Bluetooth technologies implementation, mobile transactions as well as enhanced wireless access to the venues are enabled.

The past 7 editions of the Olympic Games were analyzed focusing on how the routing, transportation and event information was delivered to the visitors, which means of communication were adopted and in which relevance the information provided to the visitor enhanced the event management. As result, it is remarkable how communication moved from static and one-way, to a more interactive, real-time information exchange between visitors and organization. Info points connected to an Olympic intranet, online ticketing, user profiling on the web, have been enhancing the visitor experience and the event organization.

The context of use, the mobile situation, the sport features, and global proportions of the event, the weather conditions, the multicultural environment, the transport and access to the venues have an important relevance in designing the user experience. Because of the complexity of the context, the design activity faces different issues and deserves therefore to be discussed more deeply in the following paragraphs.

### 4. The Design Problem Statement

Designing a mobile application requires one to look for solutions referring to different fields of the design discipline itself, as well as to other disciplines, in order to cover multiple kinds of issues.

**Product design:** what device features can best suit the target needs, preferences and the context of use? What display sizes, hardware controls, device semblances are to be provided? Can wearable technology solutions enhance the user’s interaction?

**Interaction design:** how will context variables, such as temperature, weather, sport equipment, affect the interaction? What information about the user and the context can be relevant in order to make the system aware of and adaptable to it? And how can they be sensed and measured? Which are the most suitable user input controls (keyboard, pointing, gesture, speech…)? How can the information be retrieved in a suitable usable way and in which modality (audio, video, physical behavior…) considering the condition on the move and the specific context? Can embodied agent enhance the interaction with the system and play as collaborators?

**Information architecture:** what information can be most relevant to the user and should be most easily accessible? How can the user reach the information quickly and easily while “on the go” (searching navigation vs. browsing, horizontal vs. hierarchical information structures)? Should forward and backward options be provided or rather a window system with
open/close options be applied? How can labeling be consistent, intuitive, short and clear at the same time?

Graphic design: given the limited screen sizes, how can the graphic interface best exploit the available space? How big should icons and text be, in order to be readable and easily selectable with a touch screen pen when necessary? Which metaphors could be effective? How can branding and usability issues be combined in the layout?

5. Design Solutions for a Personal Digital Assistant for the Visitors of the XX Olympic Winter Games - Torino2006

The concept design proposed in the present paper attempts to provide answers to the questions above, referring to the particular outlined scenario.

On one hand the core is to provide the visitor with a tailor-made means of communication, enhancing way finding, m-commerce, nomadic communities building, and electronic fast access to the venues. On the other hand the event organization, the Olympic Organizing Committee in this case, can follow the goal of customer relationship, transport and logistics management, thanks to the network of localized, personalized and real-time information concerning the users.

In this concept the visitors can register and buy the device and the application on the Olympic Organizing Committee website, providing personal data concerning their visit to the Olympic event (length and purpose of stay, hotel, competitions and events they are going to watch, etc.). The device is based on GPS, UMTS, and Bluetooth technologies, enabling Localization Based Services, high-speed data transmission and wireless communication with other devices. This enhances context-sensitive information delivery, concerning, for instance, the best way to reach a venue according to weather or traffic conditions. At the same time, easy access to the venues is possible thanks to the Bluetooth technology, which allows wireless data transmission between the portable device and the access control terminals.

In designing the device features, we opt for a wearable solution (see Fig.1) in order to enhance the interaction on the move and contact less access to the venues. In this sense we also take into account the handling constraints due to the probability that the user wears gloves and would be convenient to have the hands free when possible.

Considering the same issues, the adoption of a multimodal interaction provides the possibility to adapt to the context. In our design the interaction takes place through touch screen pen and speech recognition input command, while the information is retrieved graphically and via audio channel: the user might need to have the hands free and visually concentrate on the environment, or could be disturbed from the noise around him/she. In this sense a context-sensitive multimodal interface can shift from visual to audio modality according to the context or positively combine the two of them, for instance during navigation, paying attention to cognitive overload avoidance and user performance enhancement.

![Figure 1. Wearable technology solutions, suggested for a more convenient interaction on the move.](image-url)
forward and backward options through the pages of one category are also provided.

Figure 2. Screenshots of the application displaying the different system functionalities

The graphic design aims to display a simple, color coded user interface that should be coherent with the Olympic Corporate image so as to strengthen the event organization’s brand. The icons are designed ad hoc for the application, in order convey consistency and avoid labeling when possible, so as to spare space on the screen.

6. Conclusions

Usability tests would be necessary to evaluate the effectiveness of the solutions proposed in the concept design. The main aim of this paper, though, is to highlight the complexity of the mobile application design and to bring out the need to deeply analyze the specific scenario the application is designed for and in which context it will be used. Context-sensitive systems can play an important role in this sense, and support the user-centered design in a relevant way.

In addition, this paper emphasizes the issues that have to be kept in mind while creating mobile applications, and the new strategic potential of the design discipline. In this sense there are no right and wrong solutions for the questions posed above, but rather a growing awareness of the need to pose that kind of questions in the design community.

7. References


