

## Chapter 7.39

# Multilayered Approach to Evaluate Mobile User Interfaces

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### ABSTRACT

This chapter presents a method for the evaluation of user interfaces for mobile applications. The method is based upon an approach that combines user opinion, standard conformity assessment, and user performance measurement. It focuses on the evaluation settings and techniques employed in the evaluation process, while offering a comparison between the laboratory evaluation and field evaluation approaches. The method's presentation and the evaluation comparison will be supported by a discussion of the results obtained from the method's application to a case study involving a Personal Digital Assistant (PDA). This chapter argues that the experience gained from evaluating conventional user interfaces can be applied to the world of mobile technology.

### INTRODUCTION

As proposals for new techniques and methods emerge for the evaluation of mobile device usability, it becomes more difficult for practitioners to choose among them. To be able to evaluate the efficacy of these techniques and methods, as well as to reproduce their steps, they have to be described in a level of detail not often found in the literature. Claims are often made without solid statistical results and are usually based on superficial descriptions. This makes it difficult, if not impossible, to compare alternative choices. Given the features of these new devices (such as mobility, restrictive resources for information input and output, and dynamic contexts of use), HCI specialists may question the efficacy of the methods, techniques, and settings already known

to them from previous experiences. Thus, the major question that is addressed is whether it is possible to adapt the methods, techniques, and settings from previous evaluation experiences to this new class of devices, given their distinctive features.

The most frequent question raised in the vast majority of studies presented in the literature is whether to adopt a field approach or a laboratory approach. However, little is discussed in terms of which techniques are best suited for the specific evaluation target and its context of use. While this polemic subject may represent to the HCI specialist an import concern, it is equally important to consider the efficacy of the method, which accompanies this choice of approach (efficacy meaning the quality of the answers to the questions formulated as the basis of the evaluation). This is because the efforts employed in the evaluation may not pay off if a method is not well chosen or well employed.

This chapter presents a method for evaluating mobile devices based upon a set of techniques already known to the HCI specialist community. Each technique evaluates the problem from different perspectives: the user perspective (expressed as views on the product obtained through a questionnaire), the specialist's perspective (expressed when analyzing the user performance during the usability evaluation), and the usability community perspective (expressed in the form of standards conformity assessment). Each of these perspectives identifies evaluation problems and, when overlaid, they lead to a more reliable and complete product appraisal.

The remainder of this chapter is structured as follows. The second section gives a brief overview of the evaluation approaches currently in use for mobile devices, according to the literature review. The third section outlines the multi-layered approach. The fourth section illustrates the application of the multi-layered approach by means of a case study involving a Personal Digital Assistant (PDA). The fifth section discusses the results

of the case study and their implications for the questions posed in this chapter. Finally, the sixth section concludes with the discussion of future trends in evaluation methods and how to apply the existing experience to the evaluation of this new class of products.

## **USER INTERFACE EVALUATION FOR MOBILE DEVICES**

In the context of user-centered design processes, a significant portion of usability work involves the coordinated acquisition of valid and reliable data by a team of professionals. These specialists have varied backgrounds and skills and employ a number of evaluation methods. The expected result is an improved system design. This is achieved by the successful identification of a system's usability problems that might impact the interaction quality for a range of users.

Usability data consists of any information that can be used to measure or identify factors affecting the usability of a system being evaluated (Hilbert & Redmiles, 2000). These data are crucial for designing successful systems intended for human use. Such data are gathered by usability evaluation methods and techniques that can assign values to usability dimensions (Rosson & Carroll, 2002) and/or indicate usability deficiencies in a system (Hartson, Andre, & Williges, 2003). According to the International Organization for Standardization (ISO, 1998), usability dimensions are commonly taken to include user efficiency, effectiveness, and subjective satisfaction with a system in performing a specified task in a specified context.

Usability data are gathered via either analytic or empirical methods (Nielsen, 1993; Mayhew, 1999; Rosson & Carroll, 2002). Analytic methods, in which a system is evaluated based on its interface design attributes, are usually conducted by HCI specialists and do not involve human participants performing tasks. This means that these

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