ABSTRACT

In order to develop easy-to-use multimodal interfaces for mobile applications, effective usability evaluation methods (UEMs) are an essential component of the development process. Over the past decades various usability evaluation methods have been developed and implemented to improve and assure easy-to-use user interfaces and systems. However, most of the so-called ‘classical’ methods exhibit shortcomings when used in the field of mobile applications, especially when addressing multimodal interaction (MMI). Hence, several ‘classical’ methods were broadened, varied, and changed to meet the demands of testing usability for multimodal interfaces and mobile applications. This chapter presents a selection of these ‘classical’ methods, and introduces some newly developed methods for testing usability in the area of multimodal interfaces. The chapter concludes with a summary on currently available methods for usability evaluation of multimodal interfaces for mobile devices.

INTRODUCTION

Designing and developing usable interfaces and interaction techniques is one of the main goals in the area of human-computer interaction. The goal of easy-to-use interfaces is achieved by applying iterative and user-centered development. During the various stages of the product development several forms of evaluation take place, aiming to inform the product design to increase the usability (and today also the user experience) of the product.

The classical forms of usability evaluation methods were developed starting in the early 1980ies. Main goal was to increase the usability of desktop applications. These applications were typically used by a more or less clearly described user group, used in a fixed (working) environment.
with the goal to support the productivity of the user by achieving goals fast, efficient and easy. Today the rapid development of mobile services and devices asks for new forms of usability evaluation: mobile applications are used by “almost” everyone, in all kinds of places—public or private, for business, leisure or entertainment, to achieve clear goals or to simply be entertained during a waiting period, together or with a group of people—in the same location or even shared remotely.

This multitude of usage scenarios explains why mobile devices today try to use multimodal interaction techniques. Multimodal interaction techniques and interfaces (MMI) are seen as a good way to increase customer satisfaction, user experience and comfort by providing a more natural interaction (Boldt, 1992). Besides that, multimodal interaction can increase the bandwidth between the user and the system. Modalities are often complementary, thus multimodal interfaces can help to clarify and reinforce the communication between the user and the system (Oviatt, 1999).

Mobile devices and services on the other side suffer sometimes from limited communication bandwidth like small screens or non-availability of keyboards, and communication between user and system is extremely influenced by contextual factors, like usage location, usage alone or in groups, usage time or users pre-knowledge. Based on the benefits multimodal interaction is promising, it has become common to use multimodal interfaces in mobile applications to extend the sometimes limited communication bandwidth, for example Pirhonen, Brewster and Holguin (2002) using gesture and non-speech iconography to improve the user interface.

To develop easy-to-use multimodal interfaces for mobile applications continuous usability evaluation within the (most often) user-centered and iterative development process is a necessity. When evaluating multimodal interaction with mobile devices the specificities of mobile usability evaluation and multimodal usability evaluation have to be taken into account.

The evaluation must take into account that usability problems might be influenced by the current location of the user, a multimodal interface including sound (e.g. earcons) as feedback might not be appropriate if the current environment is noisy. Thus new forms of evaluation are needed to investigate the real usage of the system. In-situ methods can help to investigate the real usage of the system in the field. Using prototypes in the field might help to discover new forms of usability problems – on the other side a fully functional prototype must be available to use this kind of usability evaluation methods.

This chapter will describe these specificities of evaluating multimodal interaction techniques and interfaces for mobile applications and devices and how the possible methodological shortcomings can be coped with by using a mix of methods and approaches. The next section will give an overview on usability evaluation methods used for mobile applications, next an introduction on usability evaluation for multimodal interfaces is given. A short case-study shows how to apply a methodological mix of usability evaluation methods for the development of a mobile tourist guide including multi-modal interaction. Finally the chapter is concludes summarizing the most important decision criteria for choosing the right kind of evaluation method.

**Usability Evaluation of Mobile Applications**

During the evaluation of mobile applications and services it is typical to focus on providing solutions for technical problems. In-depth studies on what kind of classical methodologies for usability evaluation can be used and how these classical methods have to be adopted for usage in mobile