ABSTRACT

This study compared usability testing results found with low- and high-fidelity prototypes for mobile phones. The main objective is to obtain deep understanding of usability problems found with different prototyping methods. Three mobile phones from different manufacturers were selected in the experiment. The usability level of the mobile phones was evaluated by participants who completed a questionnaire consisting of 13 usability factors. Incorporating the task-based complexity of the three mobile phones, significant differences in the usability evaluation for each individual factor were found. Suggestions on usability testing with prototyping technique for mobile phones were proposed. This study tries to provide new evidence to the field of mobile phone usability research and develop a feasible way to quantitatively evaluate the prototype usability with novices. The comparisons of paper-based and fully functional prototypes led us to realize how significantly the unique characteristics of different prototypes affect the usability evaluation. The experiment took product complexity into account and made suggestions on choosing proper prototyping technique for testing particular aspects of mobile phone usability.

Keywords: Fidelity, Mobile Phone Design, Prototyping, Task-Based Complexity, Usability Evaluation

1. INTRODUCTION

Low-fidelity prototyping technique, such as paper prototyping, enables designers to work through every detail of the user experience as early as possible (Sauer et al., 2008). It produces a cheaper and flexible set of mock-ups of target interface that simulate certain aspects of a system, typically of its user interfaces and interaction solutions. In this way paper prototyping enables a ‘user first’ approach, facilitating and promoting UCD activities before any software engineering approach begins (Sharp et al., 2007). Therefore, paper prototyping enables mobile phone designers to model and craft user experience according to real users’ needs and
complete the interfaces that will match those needs before a fully operational prototype is available.

Although paper prototyping is a very useful tool for usability design for the mobile phone, the effectiveness of finding usability problems with paper prototypes is still a major concern for mobile phone designers. Sometimes the use of low-fidelity prototypes has been found as effective as high-fidelity prototypes (e.g., functional prototypes or final products) for identifying usability problems (Rettig, 1994; Virzi et al., 1996). However, in some other cases, the higher-fidelity prototypes have been found to reveal more problems which gave greater feedback about the problems in the original design, but at the higher resource cost of time to create the interfaces (Hall, 2001). Thus, when choosing an appropriate prototyping technique, there may be a trade-off between the design information gained and the resources expended to gain that information. Since the systems that Rettig, Virzi, and Hall used for the evaluation were all GUI-based systems which were different from mobile phone devices, those claims need to be retested in the field of mobile phone design.

Based on the above reasons, the present study aims to conduct a comparative analysis of paper-based and fully functional prototypes. The purpose is to help designers to determine the choice of prototypes for mobile phones, and more importantly, help them to interpret the results gained from the testing with different prototypes. A better understanding of the test results will help them keep the correct ones, get rid of the faulty ones and make good decisions about how to improve the original design.

2. LITERATURE REVIEW

2.1. Addressing Users’ Perception of Mobile Phone Usability

To most users today, a mobile phone is not only a tool with which they can perform a task, but also a decoration and representation of their lifestyle and personality. However, in spite of how impressive the “smart” capabilities and value-added features can provide, the designers can also make the design and evaluation more complicated and the device more difficult to use. The mobile phone development professionals need to carry out careful user-centered designs with special attention to particular mobile phone characteristics that suit the user’s capability, limitation, and preference.

Therefore, the usability goals for mobile phones have been changed. Mobile phone usability is a measure of quality of use, not just indicating whether a task could be performed accurately and quickly, but also determining a difference between enjoying the process and getting frustrated. The objective measurements such as effectiveness and efficiency are not sufficient to describe the usability of a mobile phone. The feeling of the use of mobile phones is more like a subjective and personal view than an objective measure, especially from the perspective of end-users. This brings new interests and challenges to usability professionals and practitioners. They have agreed with each other that traditional usability measurements that were developed for software usability engineering are worthy of reconsideration before they are applied in mobile phones design projects (Han et al., 2000; Ji et al., 2006; Ling et al., 2007). So attempts were made to extend usability concepts to emphasize subjective aspects. Lots of research has been carried out and methodologies for evaluating the usability of mobile applications have been applied to emphasize subjective aspects and extend the concepts of usability (Han et al., 2001; Jordan, 1998). But it is still quite a challenge because there are a number of aspects of the interfaces and interactions with mobile phones that are much different from the traditional computer-based systems. It is essential to refine the measurement of usability, particularly in regard to the unique mobile-related usability issues.

2.2. Testing with Prototypes

Effective and efficient evaluation methods and measurements are essential to the success of the iterative design process, and to find out if the
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