THE IMPACT OF DYNAMIC PROTOTYPE ON USABILITY TESTING AND USER SATISFACTION: FIDELITY AND IN-SITU PROTOTYPING

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ABSTRACT

Nowadays mobile device is one of most used recent technology being used by different types of user’s profiles. Despite of this, there is still lack of knowledge on how users of mobile application actually interact with these application because few studies conducted on usability of mobile application User Interface (UI), thus it is considered as an interesting research areas. But how much can a mobile application simplify our daily events, before it itself becomes a usability load? What are the capabilities and limitations of using mobile application with different prototyping techniques (low and high fidelity) and task complexities of the interaction items? In the context of design, iterative prototyping can be considered as the process of receiving feedback by end users for facilitating the iterative design of a system. Usually, an iterative user interface design process initiates with the production of low-fidelity prototypes and continues with higher-fidelity prototypes. In this paper we will study the impact of prototype of mobile application and complexity of task for the usability test and user satisfaction. This study will discuss the effect of mixed prototype design on usability testing, lead to affect on mobile application development industry by integrating the fidelity with In-situ model. The expected results will show how that new suggested technique for prototyping (Mixed-In-situ prototype) has significantly effects usability level than paper type prototype and there is a significant interaction between prototype and complexity. Eventually, with assigned complex task for user of mobile application by using computer prototype expected to gain highest rate while paper (Low) type prototype with simple task gained lowest usability levels which generally will affect and have directs impact on user satisfaction.

Field of Research: usability testing, high fidelity prototype, low fidelity prototype, mobile usability prototype

1.0 Introduction

Prototypes are essential of design phase tools for the design phase of interactive systems development as they pass on users and designers a clear image of a forthcoming system and can be used at a range of phases of the design process, even before any system is being developed (De & Carriço. 2011). Sauer, Franke, & Ruettinger (2008) define prototype fidelity as follows: “The degree to which a model of the system resembles the target system refers to the fidelity of the model. The fidelity of the model (or prototype fidelity) may very considerably, ranging from a low-fidelity simulation n of the system (e.g.,
paper prototype) to a fully operational prototype, which is (almost) identical to the real system”. Prototyping as usability testing techniques is to observe the human interaction with application UI even before these interfaces are designed and developed.

This paper starts with a brief review of relevant literature on prototypes and their uses, including the relative features of High and Low Fidelity prototypes for a variety of purposes and the use of prototypes in Design process phases as well as in the Research filed. It then moves on to discuss the application design problem and how High fidelity prototype iteration enhance the design process phase itself and acts as usability testing techniques. Eventually, move to discuss the suggested prototyping of mix-fidelity and Insitu prototyping to enhance the prototyping as a general and optimize the iterative of use.

2.0 Related Work

Prototypes (mock-ups or functional) of the prospect system can be consider as helpful phase in enhancement of requirements capture by enabling users to test prospect systems and provide user feedback which indicates for real user satisfaction. Low-fidelity prototypes are consider as cheap to produce, promote exploration and encourage design as they are usually poor in visual appearance or level of details (Sinha et al., 2003). On the negative they can be unrealistic; since it made most of time from paper; and are not enough interactive. On the other hand, High-fidelity prototyping requires additional skills and resource than low-fidelity techniques (e.g., sketching, paper mockups), it has the advantage of feeling users a real of what the final and expected system would be and is more realistic in term of design and interactivity. Among the drawbacks, they tend to receive more superficial criticisms due to the fact that users believe it is the real system (Sinha et al., 2003).

Rudd et al. (1996) claim that low-fidelity prototypes can have great value in the early design process stage of gathering requirements and analysis. They are useful in providing a broad brush design and various design alternatives can be quickly generated and evaluated. Sauer et al. (2008) mention that a low-fidelity prototype does not consider as efficient value in determining usability burden because they may cause various type of reactions and behavior from real systems. They found that paper (low) prototypes are not fit for gathering efficiency metrics, such as time, errors.

Bonner & Van Schaik (2004) compared effectiveness of high and low-fidelity prototypes in getting participants to evaluate a novel interface against a standard interface. Using paper prototypes, Bonner & Van Schaik (2004) used paper prototype as (low) to identify usability problems as they arise and the application designed and developed incrementally based on results from the testing with paper prototypes. However, they found that high-fidelity prototypes enable more relative usability problems to be explored and discovered. They found a combination of the two during the design process to be the solution, integrating between low and High fidelity prototyping enables to identify early and latest usability problems.

3.0 Research Approach

In the first section we describe some current difficulties in communicating about prototypes: prototype problems, complexity of interactive systems and the audiences of prototypes. Next, we explored the role of fidelity prototype in design process and usability testing.
3.1 Prototype Problems

Prototypes provide the essentials for exploring design problems and evaluating relative solutions. Selecting the focus of a prototype is the art of identifying the most important open design questions. If the artifact is to provide new functionality for users and thus play a new role in their live, the most important questions may concern exactly what that role should be and what features are needed to support it (Sinha et al., 2003). It is difficult for application designers to communicate clearly and in reliable feedback about prototypes to such a broad users (De & Carriço. 2011). It is challenging to build prototypes which produce feedback from users on the most important design questions. Even clear communication among designers requires effort due to differing perspectives in a multi-disciplinary design team (Chandler et al., 2002). Limited understanding of design practice on the part of supporting organizations makes it hard for designers to explain their prototypes to them.

3.2 Prototype in design phase and usability testing

In (Frishberg, 2006) study, he mentioned the importance of low-fidelity prototypes to drive design and evaluate ideas with low cost is identified. Rosenberg (2009) mentioned that low-fidelity prototypes provide a method for application designers to assess and evaluate user satisfaction at early design stages. This type of prototype is easy to use and highly configurable prototypes is particularly interesting for early design stages since they can be quickly built using inexpensive material (Chandler et al., 2002). High-fidelity prototypes, opposed to low-fidelity prototypes, are generally composed by functional software components that can be examined on the targeted platforms (Cheong et al., 2007). Software prototype is crucial since some of problems and design issues addressed with low-fidelity prototypes, especially the improvement of the prototypes, can also be practiced with software prototypes (De & Carriço. 2011).

4.0 Research Method

In our study we suggested two enhancements on Low/High Prototype; we introduced the enhancement in on prototype design iteration in two dimensions, enhancing Mixed – fidelity prototype or Regional Model (Petrie et al., 2011) technique for User Interface (UI) by In-Situ Mobile Prototyping (De Sá et al., 2009). In next sections we will discuss more about Mixed-fidelity, Insitu Prototyping and proposed enhancement on both sides of previous prototyping methods.

4.1 Mixed Fidelity prototyping

Mixed-fidelity prototyping involves combining multiple fidelities within a single prototype. Mixed-fidelity prototyping allows designers the opportunity to focus on a specific interface issue, by exploring it at higher-fidelities and making refinements as needed. In the mean time, other aspects of the prototype may be left at a lower-fidelity, delaying decisions while allowing designers to redirect their time and efforts to the more pressing design issue(s). Also, by leaving other elements at lower-fidelities, designers are able to explore the higher-fidelity elements while keeping them within the context of more complete screen designs (Petrie et al., 2011).

Petrie et al. (2011) proofed that Mixed-fidelity prototyping varies from the traditional process, which limits iteration to occur within the current fidelity. Also, traditional practice does not encourage advancing to the next higher-fidelity until ideas have been refined at the current fidelity and does not encourage skipping fidelities. Figure 1 show the iterations possible with our mixed-fidelity approach limited iterative nature of the traditional prototyping process.
4.2 In-situ Mobile Prototyping

De Sá et al., (2009) introduced In-situ prototyping, which allows designers/developers to quickly create prototypes materializing their visions and concepts, extension framework’s scope to the usage of these prototypes in actual devices also focusing data collection and its analysis, can aid designers when providing users with realistic user experiences at early stages. In In-situ prototyping technique, once a prototype is created, it is stored in an XML file (Dynamic) that can be copied into a mobile device. Here, a runtime environment recreates the prototype and allows end-users to freely interact with it, overcoming issues related to realism and even interactivity. In-situ tool is embedded into the runtime environment and can be instantiated through the push of a button. Running mode and editing mode can be alternated at will. Once the editing mode is selected, every element that composes a screen (e.g., picture-box, drop-box, and button) is copied into an invisible container which allows users to resize it, move it around the screen, edit its content and delete it and add any new element.

5.0 Discussion of Integrated Mixed-Insitu prototyping

By introducing functionalities that allow designers to adjust prototypes on-the-spot, the tool promotes creativity and end-user participation. During field tests, when faced with new situations and requirements, designers frequently created additional sketches or adjusted existing ones for prototype to match the needs of that situation. End-users were actively involved both in the sketching process (most of the times using simple the drawing software available on the dev ice) and on the actual construction and arrangement of the sequence and navigational constraints that bring the prototypes to life. By proposed Mixed-insitu technique, we can Mix multiple fidelities in a single prototype, in the mean time, use of realistic prototypes that can be used on actual mobile devices and on real world situations has proved to have great impact on the design of mobile applications. Figure 2 shows the proposed enhancement of Mixed-Insitu where is the user set in progress sketching process and prototype construction.

(a)Traditional prototyping process

(b) Mixed fidelity prototyping-fully Iterative

Figure 1: Traditional prototyping and mixed prototyping iterative process.
Designers will particularly pleased with the ability to immediately correct and test adjustments that were made to (button or GUI interface component) sizes and location, evaluating their adequateness to different situations (e.g., walking, seating). In comparative view we will expect that the new proposed approach will come up with mobile application prototyping design and development mentioned in section 3.1, moreover, the designer of mobile application will avoid user misled happening in usability lab testing. By offering the ability to design in-situ, collecting data and adjusting designs to the current context and overall results were much more positive than previous experiences with traditional paper-based prototypes De Sá et al., (2009).

6.0 Conclusion and Future work

This research presented a new approach to user interface prototyping called mixed-insitu fidelity prototyping. Mixed-insitu prototyping allows designers the flexibility to focus on one specific aspect of a prototype at a time, by exploring that aspect in the various fidelities. The use of realistic prototypes that can be used on actual devices and on real world situations has proved to have great impact on the design of mobile applications. Now, the ability to overcome the challenges of in-situ design and evaluation, through the use of mobile devices and their potentialities clearly provided benefits at various levels, namely allowing designers to build and test design concepts out-of-lab and avoid user misled in usability testing. Our proposed approach expected to allows user with design experts in a specific fidelity to be involved in that fidelity prototyping earlier on. Next step in this research is to develop a fully functioned XML tool and doing a field study to further evaluate proposed prototyping approach.

References


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