

Three Layers Design Guideline for Mobile Application

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Abstract

User interface is one of the main challenges for designing mobile application. The importance of user interface is all about to retain user's loyalty which can be gained by offer user friendly interface and usability. The research focus on main issues of designing mobile application which is "how to display all the information and elements on the small screen of mobile device?". This research aims to study and understand mobile human-computer interaction and other issues associated with mobile commerce application by understanding the mobile commerce environment to propose framework for mobile application. In terms of designing for mobile application, the authors has adopt the four existing guideline. There are Shneiderman's Golden Rules of Interface Design for Mobile, Seven Usability Guideline for Mobile Device, Human-Centred Design and W3C Mobile Web Best Practices . This paper ends with future work that based on the proposed framework.

I. INTRODUCTION

Technology of wireless and mobile networks made electronic commerce to the new application which is mobile commerce. Mobile commerce is rapidly becoming the new standard for buying goods and services (Anastasis et al, 2006). Due to this, increase the opportunity of an enterprise and company offers mobile services that easily access by user at anytime and anywhere. Some of the mobile services nowadays are mobile commerce, mobile banking, mobile messaging, mobile gaming, mobile entertainment and mobile ticketing. Before the existence of mobile commerce, electronic commerce uses a network computer to connect to the network. This situation made the people on the move limit the usage. Due to this situation, the smaller device such as laptop, PDA and others handheld made commerce easy to conduct by using mobile device. Then, a replacement of wire to wireless made it even better for the mobile user. The value-added of mobile commerce that agreeable for mobile user are such as mobility, broad reach, ubiquity, convenience, instant connectivity and personalization.

In this paper, the topics cover on the mobile application and its user interface. Besides, it focused on the guideline of user interface since it's important to determine how easy user interacts with the application and to fulfill user satisfaction while use the application.

II. MOBILE APPLICATION AND ITS USER INTERFACE

According to Turban, Leidner, McLean and Wetherbe (2007), mobile commerce or m-commerce is commerce (buying and selling of goods and services) in a wireless environment, such as through wireless devices like cellular telephones and PDAs. Also called "next generation e-commerce," m-commerce enable users to access the internet without needing to find a place to plug in.

User Interface defined as a set of commands or menus through which a user communicates with a program. The user interface is one of the most important parts of any program because it determines how easily you can make the program do what you want. A powerful program with a poorly designed user interface has little value (Patrick Joseph, 2004). In order to design a good user interface, there have some existing guideline that useful for developer and also to ensure of using the same standard. A good user interface can definitely attract user to use that application and avoid user frustration and never use that application anymore. According to Suliman Al-Hawamdeh (2005), some of the limitation of mobile device that restrict user from perform mobile commerce activities are such as limited memory, simplicity of user interface, screen size and small keyboard or input method. Small displays and limited input methods increase the need for better user interface [9]. Furthermore, the attributes such as limiting user input, displaying only minimal and relevant information on the screen, and the use of context should be considered specifically from the perspective of mobile application [3].

Human Computer Interaction (HCI) is concern with investigating the relationship between people and computer systems and applications. A few consideration should emphasis while design mobile system. The considerations are identify what users want to use the mobile device, characteristic of users, understand the environment, develop system that meet the user's need and testing the system either meet user's satisfaction [8].

III. FOUR EXISTING GUIDELINE

In this paper authors managed to review and adopt four existing guideline which is Shneiderman's Golden Rules of Interface Design, Seven Usability Guideline for Mobile Device, Human-Centred Design (ISO Standard 13407) and W3C Mobile Web Best Practices as a starting point to develop proposed framework for this research.

According to [6], there have no similar guideline developed for mobile device. Due to that efficiency, as a starting point, they use Shneiderman's Golden Rules of Interface Design which developed for desktop interface into adjusted certain features and element to adapt with the benefits and limitation of mobile device. More over, this research was developed guideline for mobile application that not only focuses on the user interface but also others consideration and criteria such as user requirement and the industry.

TABLE I. FOUR EXISTING GUIDELINE FOR MOBILE APPLICATION

Existing Guideline	Characteristics
Shneiderman's Golden Rules of Interface Design (adjusted for mobile Interface design)	Carry over four elements:- 1. Enable frequent users to use shortcuts 2. Offer informative feedback 3. Design dialog to yield closure 4. Support internal locus of control Made some modification:- 1. Strive for consistency 2. Permit easy reversal of action 3. Offer simple error handling 4. Reduce short-term memory load Seven additional elements:- 1. Design for multiple and dynamic contexts 2. Design for small devices 3. Design for limited and split attention 4. Design for speed and recovery 5. Design for "top-down" interaction 6. Allow for personalization 7. Design for enjoyment
Seven Usability Guideline for Mobile Device (Abid Warsi, 2007)	1. Meet user's need quickly 2. Don't repeat the navigation on every page 3. Clearly distinguish selected items 4. Make user input as simple as possible 5. Only show essential information 6. Place basic browsing controls on the page 7. Design mobile-friendly page layout
Human-Centred Design (ISO Standard 13407)	1. Understand and specify the context of use 2. Specify user and organizational requirements 3. Produce designs and prototypes 4. Undertake user based assessment
Mobile Web Best Practices 1.0 (W3C)	1. Navigation and links 2. Page layout and content 3. Page definition 4. User input

Table II show the comparison between four existing guideline for mobile application development. Further, authors manage to select appropriate elements that can adapt to mobile

devices capabilities. The selection elements divide into three phases which are Analysis, Design and Testing. The description of each phases are describe in Table III.

TABLE II. COMPARISON OF THE EXISTING GUIDELINE

Existing Guideline	HCD	SGR	7UG	W3CBP
Specify context of use	√			
Specify user & organizational requirement	√			
Produce design solution	√	√	√	√
Evaluate design against user requirements	√			
Enable frequent users to use shortcuts		√		√
Offer informative feedback		√		√
Consistency		√		√
Reversal of actions		√	√	√
Error prevention and simple error handling		√		√
Reduce short-term memory load		√	√	√
Design for multiple and dynamic contexts		√		√
Design for small devices		√	√	√
Design for speed and recovery		√		√
Design for “top-down” interaction		√	√	√
Allow for personalization		√	√	
Design for enjoyment		√		
Don't repeat the navigation on every page			√	√
Clearly distinguish selected items			√	

HCD – Human-Centred Design

SGR – Shneiderman’s Golden Rules

7UG – Seven Usability Guideline

W3CBP – W3C Mobile Web Best Practices

TABLE III. SELECTED ACTIVITIES TO ADAPT INTO PROPOSED FRAMEWORK

Phase	Existing Guideline	Activities
Analysis (Context of Use)	Specify user and organizational requirement	<ol style="list-style-type: none"> 1. Identify and document user’s tasks 2. Identify and document organizational environment 3. Define the use of the system
Design (Context of Medium)	Produce design solution	<ol style="list-style-type: none"> 1. Enable frequent users to use shortcuts 2. Offer informative feedback 3. Consistency 4. Reversal of actions 5. Error prevention and simple error handling 6. Reduce short-term memory load 7. Design for multiple and dynamic contexts 8. Design for small devices 9. Design for speed and recovery 10. Design for “top-down” interaction 11. Allow for personalization 12. Don't repeat the navigation on every page 13. Clearly distinguish Selected items
Testing (Context of Evaluation)	Evaluate design against user requirements	<ol style="list-style-type: none"> 1. Quick and dirty approach 2. Usability testing 3. Field studies 4. Predictive evaluation

IV. THREE LAYERS DESIGN GUIDELINE FOR MOBILE APPLICATION

Table IV shows the proposed framework named Three Layers Design Guideline for Mobile Application that derived from the Table III. In this study, authors managed to adopt the main elements into the proposed framework that need to consider during the designing of mobile application which are context of use and context of medium. After reviewed, authors agreed to add one context element which is context of evaluation into the proposed framework. The proposed framework shown as below:-

TABLE IV. THREE LAYERS DESIGN GUIDELINE FOR MOBILE APPLICATION

1	ANALYSIS	CONTEXT OF USE (Specify user and organizational requirements)
		1. Identify and document user's tasks
		2. Identify and document organizational environment 3. Define the use of the system
2	DESIGN	CONTEXT OF MEDIUM (Produce design solution)
		1. Enable frequent users to use shortcuts
		2. Offer informative feedback
		3. Consistency
		4. Reversal of actions
		5. Error prevention and simple error handling
		6. Reduce short-term memory load
		7. Design for multiple and dynamic contexts
		8. Design for small devices
		9. Design for speed and recovery
		10. Design for "top-down" interaction
		11. Allow for personalization
		12. Don't repeat the navigation on every page
13. Clearly distinguish selected items		
3	TESTING	CONTEXT OF EVALUATION (Evaluate design against user requirements)
		1. Quick approach
		2. Usability testing
		3. Field studies
		4. Predictive evaluation

V. PHASES IN THREE LAYERS DESIGN GUIDELINE FOR MOBILE APPLICATION

Based on the Table IV above, shows the proposed framework that consist of three main context element which is context of use, context of medium and context of evaluation. Each context element represents their own phases as shown below:-

A. Analysis (Context of Use)

According to Lucas Pettini (2007), the most concepts to master designing mobile devices interfaces is context, the context in which an application is used and the context of how information is display. Based on that statement and also the findings, authors manage to add the element context of use in the initial framework that need to be consider by the developer while in the phase analysis. The objective from this phase is in order to specify users and organizational requirements.

B. Design (Context of Medium)

The second element that authors manage to add into the framework is context of medium which is developer need to take into account while designing. According to Lucas Pettini (2007), the mobile device itself may present with challenges and opportunities not present in the desktop. Based on that statement, shows that design for mobile applications need to consider about the medium (mobile device). Developer need to consider on how to display the information into the small screen of mobile device. The objective from this phase is in order to produce design solution that can meet the requirements of users and organizational.

C. Testing (Context of Evaluation)

Based on the methodology of Human-Centred Design, that methodology is focus on user. Means that, in order to produce a usable application, developer needs to fulfill user's requirement and ensure their satisfaction while use the application. Based on that, authors manage to add context of evaluation into the framework in order to work close with user by conduct various testing for evaluate the application based on user's requirement and satisfaction. The objective from this phase is in order to evaluate the designs against the requirements of users and organizational.

VI. CONCLUSION

We reviewed and analyzed the related issues in designing for mobile application in order to proposed framework which is three layers design guideline for mobile application. The future work is to develop prototype of mobile application to test the effectiveness of the proposed framework. Further, the authors will distribute a set of questionnaire to selected user to validate the proposed framework and prototype.

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