User Experience Design (UXD) of Mobile Application: An Implementation of a Case Study

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Abstract—**The success of an application is tied directly to the degree of the user acceptance. Analyzing user expectation and acceptance prior to the development process is vital to make a successful product. User experience design (UXD) is the research field which identified users' needs, expectation and acceptance when there is an interaction with a product or service. Due to the lack of UXD guidelines, we will be presenting the UXD strategy for mobile flight booking ticket application (MFBTA). MFBTA is a complex application that has various type of transaction inclusive the dynamic interaction and ecommerce component that requires perceivable UXD elements. Based on the observation, it shows that UXD in MFBTA is yet to be improved in order to achieve a high degree of user acceptance and expectation.**

Index Terms—**Booking Application; Experience Design; Use Mobile Flight.**

I. INTRODUCTION

Recently, most companies have made great efforts to utilize the mobile application in expanding their respective businesses. Designing a good mobile application however has become a primary issue for the companies which eagerly keen to maximize their profit by promoting their service and product in the competitive market. It is difficult to define a successful mobile application because it is tied directly to the user acceptance in which it may vary with each other.

User experience covers the whole product or service acceptance. It touches all aspects inclusive of pragmatic and hedonic of a product. The pragmatic or instrumental refers to the utilitarian aspects, such as usefulness and ease of use, and hedonic or non-instrumental to the emotional and experiential aspects of product use[1]. UXD has become an important role in development of mobile application because it has huge influence on product success or failure.

Airlines industry also did not leave behind in providing more convenient way for their clients to access the flight information and manage their booking ticket. More airlines company were expected to adopt the mobile application as their marketing strategy [2]. As Reported by [3], 32% of global online sales were represented by airline ticket reservation which can be the evidence the user has started to shift their preference from purchasing the airlines ticket from the agency to purchase it directly from the airlines company by using an application. Mobile flight booking ticket application (MFBTA) has become the marketing tools which provides flight bookings, baggage services and flight information search functionalities to travelers [2].

The MFBTA was taken as a case study to identify the best UXD approach that is required to achieve the high user acceptance and expectation. Producing a good mobile application is not an easy task, the designer having a hard time to identify what does the users really need by using their own judgment and perception as an application users [4][5]. It is important to the airlines company to carefully define their user experience requirement up-front before the development process commerce and the application is declared completed. Modification and enhancement of UXD requires a lot of effort when the changes need to be implemented after the system is completed [6].

With the limited source of the UXD guidelines for the application designer, we will be presenting the fundamental of UXD strategy that can be adopted by the designer in order to develop the MFBTA. Based on our finding, the UXD of MFBTA is yet to be improved in order to achieve a high degree of the user acceptance and expectation.

This paper starts with the comprehensive related works covering the user experience on various type of mobile application. It then presents the case study of the UXD on MFBTA where is this section we share the UXD strategy for MFBTA. Then, the discussion section will discuss on the improvement that is required on the UXD for MFBTA. And finally, we present the conclusion and future work in section V.

II. RELATED WORKS

Research related to user experience has gained considerable interest from both scholar and practitioner. Generally, the research field of user experience is seen to include all factor which affect the user's interaction and experience of system or product [1].

Chen's UX assessment model has been adopted in [7]. Brasil 9+ is a mobile application for BlackBerry 10 that offers a service to add the ninth digit to the left of the current mobile numbers. The UX assessment was conducted to identify the main criteria that influence the experience of Brasil 9+. The details of UX assessment were shown in Table 1. Based on the users' feedback, they were uncomfortable to leave the application running on the background while doing another task.

A study to access the children's experience after using the early education mobile application called MFolktales was conducted by [8]. The assessment was conducted among the kindergarten students aged between 5 to 7 years old with their teacher assistance. The User Experience Question (UEQ) has been adopted and modified to suit the requirement of the application and situation. Based on the result, attractiveness gives the highest score among other elements like efficiency, perspicuity, dependability, stimulation and novelty.

Table 1
Brasil9+ UX Assessment [7]

UX Elements	Description
Needs	How much the application is need to the users
Functionality	Does the application meets its functionality
Interface	Does the interface intuitive
Devices	Does the setting of the devices sufficient for the application
OS	Does the devices meets the application requirement
Task	Can the user perform other task while using the application
Environment	The place where the user is in might to use the application

In [9], a set of standard-compliant UXD guidelines to assist the visually impaired (RP) person in accessing visual data on health mobile application has been proposed. Increased data exposure, data accessibility, information acquisition and data search were the proposed guidelines to improve the UX for visually impaired person.

A research to identify UX elements requirement while performing a task on a small screen has been conducted by [10]. The research was intended to understand the impact of the user interface design and the home page design that can lead to the positive behavioral intention to use and to predict the user satisfaction with their mobile web browsing experience. Easy to use, interactivity, behavioral intent, recall, user friendliness, easy of learning and user satisfaction are the UX parameters that are used for the evaluation. Based on the result, the users prefer to perform simple and more intuitive actions and expect to find the information of interest quickly.

The study to investigate the differentiating aspect of left or right handed user experience on the touch mobile screen has be performed by [11]. There was a relation between user experience with the both handedness and the layout of the application in terms of entry speed, accuracy rate and inclusive interface.

Based on the review on previous research [7], [8], [9], [10], [11] the UXD for mobile application is summarized in Table 2.

Table 2
UXD for mobile application [7], [8], [9], [10], [11]

No.	UXD Elements
1.	Ease of use
2.	Learnability
3.	User interface
4.	User satisfaction
5.	Security
6.	Behavioral intent
7.	Environment

III. MOBILE FLIGHT BOOKING TICKET APPLICATION: A CASE STUDY

In the context of airlines industry, mobile application has become a new marketing tool which can provide more convenient way for the travelers to perform flight booking ticket, baggage service, flight searching, seat selection, participating in loyalty program, using the e-payment method and manage their booking [2], [12]. It also helps the airline companies to reduce cost because travel agencies' role is no longer relevant. Consequently, as a result it helps bridge the gap with customers.

It is important for airlines industry to develop a mobile application that serves their customers' acceptance and expectation. An interactive design in MFBTA is a must to make sure the sustainability of the airlines company in current competitive and limited market. Design strategy based on UXD can be adopted as a guideline to develop the MFBTA. MFBTA should be simple and focused type of application. The operation must be accomplished with ease and using only minimal number of keystroke [13]. Since the MFBTA is still in the early adoption in airlines industry, not many references were found regarding the UXD for MFBTA. We will be presenting the UXD strategy for MFBTA as follows:

A. Ease of Use

Ease of use elements can be divided into three sub elements which cover the usability, navigation and data accessibility aspects. There are many definition of usability, however we define usability as how an application can serve their user to achieve their specified goals in specified context of use. The basic functionalities of MFBTA should cover the flight search, flight selection, booking ticket, payment procedure. All of the functionalities must be designed to help the user to perform the task more efficiently compared to what they experienced before.

The navigation should be designed intuitive, predictable and consistent. Navigation pattern should be simple enough to make both new and returning users were able to figure out how to move through the application with ease. Number of steps taken to complete a transaction gives a huge impact to the ease of use elements. Designer should try to minimize the steps count to simplify the process. MFBTA users might use the application on the go which the user will not want to spend lots of time just to complete a single transaction

Data accessibility aspects always are the hardest part to be catered in MFBTA. The data must also be readily available, which means it is easily locatable, for consumption by a user at any time. The calculation of the fares and the seat availability must be real time and accurate to make MFBTA reliable.

Validation also contributes to the ease of use elements. Real time validation helps the users aware of the mistake that they did earlier before they will click the submit button. Color is one of the best tools to use when designing validation. It works on an instinctual level, adding red to error messages, yellow to warning messages, and green to success messages is incredibly powerful. In overall, the ease of use should always make the users feel comfortable and the function of the application should be able to help users in completing the task more effectively[14].

B. Learnability

Learnability is the degree of ease and speed taken for the user to get familiar with the use of a new product. With high learnability, users can intuitively learn to use a product without training or manuals, user guide or FAQ (frequently-asked-questions) list.

MFBTA is a complex application which supports online transaction. The user might require performing the flight booking in an ad-hoc situation where the user does not have any experience using the MFBTA. This scenario must be considered in the designer perspective on how to make the new users can accomplish basic task on the first time they use the application without referring to any instructions. Easiness of finding how to proceed to the next page shows more significant association with user's level of familiarity [3].

The interaction design must be very clear, consistent and

visible enough to help the users to easily infer the steps. The layout of the application must adopt the discoverability, which is the degree of ease in which the user can find all the elements and features of a new system when they first encounter it.

Learnability is important to keep the users using the application and does not give up along the way before the transaction completed.

C. User Interface

User interface is a graphical touch-sensitive display on a mobile device. It is the first thing the user sees and gives the impression of the application capability. For MFBTA, the user interface should be designed interactive, effective, intuitive and user friendly.

The use of visual aids improves the completion time and helps the user to get more understanding of the presented information. The right choice of icon is a key to convey the right information [15]. The icon must be simple and meaningful which can enhance user perception on its meaning.

The selection of fonts size and color gives huge impact on the user experience. The colors should reflect the application palette, and also meeting appropriate contracts ratios. The designer should be able to consider the limitation on the screen size of the mobile application versus the font size and type. The font size should be considered based on the average distance of users' eyes to the screen while on the move. Important information such as date and time of travel, ticket pricing should be in bold format as a highlight to get the users' attention. It is important to highlight most sought information since mobile users do not have time to review all the information

A good user interface should help the user to minimize user mistake. The input box design can be optimized with the text field determines what kind of characters are allowed to be filled in. Zooming function should be in place for MFBTA to help the user locating and enlarging information for details. Zooming function on the input box has a significant affect to the users when they see their inputs data

Mobile devices have a limited view compared to pc screen, it is important that the interface layout maximize this constraint. Vertical alignment can be adopted for the layout compare to horizontal because there is a tendency that not everything will be fitted into the screen display.

D. User satisfaction

A good application should attract the satisfaction feeling that accompanies the sense of completion when something meets or exceed the expectation in a good way. User should be having a pleasant and wonderful experience during the interaction with the application.

For MFBTA a progress bar can be used to increase the user satisfaction when a long form can feel daunting, but seeing a progress bar fill up at the top of the page encourages users to complete the transaction. Progress bar also important to indicate the process status is still active.

By adding a little treat to celebrate the user's success when the action finally completes, it can deliver the jolt of satisfaction to the users. For example, instead of displaying a scrolling page with 15 form fields on it, break the form into multiple chunks, creating moments of satisfaction after each section the user complete.

User satisfaction can be enhanced by making some visual

change to the interface whenever the interaction occurs. For an example, button might change color or a message box pop up on the screen. Brief friendly and positive message can be used such as "Congratulations!" at the top of a screen can encourage users.

E. Security

Security and trust has been important factors in many e-commerce user studies [4]. Same goes to the MFBTA where there is a financial transaction required while booking the flight ticket. MFBTA must be designed with secured transaction and environment. Security pin must be implemented when the transaction requires the connection to the third-party application outside the control of MFBTA.

A login credential must be in place for MFBTA to ensure only the real person with an account with the airlines company accessing the application.

QR (Quick Response) code can be adopted as the output of the process. All the passenger details and flight information were encrypted in a QR image. User should not be worried on the security of the information because only the QR reader can decrypt the information.

F. Behavioral Intent

Behavioral intent is a subjective norm that predicts the determination of the customers to continue to use an application. A good UXD is able to provide user with relevant information and fulfil their expectation so that the user will bookmarks the system and revisit again in the future[14].

Reducing user errors and application errors can influence the users' intention to use the application. Having a suggestion tools such as listing the attractive places and activities on the destination is one of the method to attract the users to use the application.

G. Environmental

A good mobile application should be able to be adapted with various platform of mobile phone. Same goes to MFBTA where it should support various types of mobile devices regardless of the screen size and operating system (OS). The MFBTA design should be adaptive enough to differentiate the difference types of the mobile devices.

The MFBTA should allow user to perform transaction through their mobile device anytime and anywhere. It is easier to carry a mobile phone compared with carrying a notebook, to perform any online transaction [14].

The above seven UXD strategy can be adopted to develop the MFBTA. The UXD strategy touch on the various elements that can be the guidelines for the designer to develop a good MFBTA

IV. DISCUSSIONS AND FUTURE WORK

Quite extensive research has been done to identify the best approach of UXD in the development of a mobile application. It is critical for the application designer to understand the UXD to ensure the application achieve the highest level of user expectation and acceptance.

Based on the previous study, we have derived the UXD strategy for MFBTA. There were seven elements that has been explained under the strategy which were the ease of use, learnability, user interface, user satisfaction, security, behavioral intent and environmental. All of these seven elements play a significant role to develop a good user

experience for MFBTA.

However, it is better if we can extend more efforts to understand the ease of use, user interface and environmental elements compared to other elements that has been highlighted in the dotted box in Figure 1. Those are the elements that have the highest influence on users' needs, expectation and acceptance of the MFBTA. Designer also neglected those three elements in their design. More characteristic of ease of use, user interface and environmental elements should be identified in order to improve the MFBTA design.

Airline companies are competing with each other to sustain in the industry. As the competition is so cruel, there is a need to continue improving the MFBTA services.
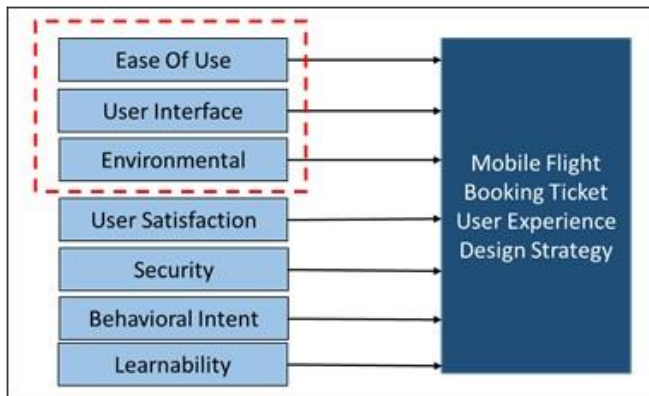

Figure 1: UXD for MFBTA Strategy

V. CONCLUSION

The airlines industries are currently in transition to adopt the MFBTA as their main tool to attract customers. Many airlines companies may not have sufficient knowledge on building up a good MFBTA that caters all user expectation and acceptance. Therefore, in this paper, we have concluded with seven UXD strategies for the MFBTA that can be used for the designer who are involved in developing the mobile application for airline industry. It is critical that the product designers, developer and product managers understand the best ways to make this process really simple for users and with minimal fuss.

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