

Extended User Experience Model to Support Web Accessibility and Emotional Qualities among Visually Impaired Users

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Abstract: To date, the advancement in mobile applications and Internet technologies have changed the way on how people interact with computer software/application. Information is much easier to accessed, processes can be performed faster, and interaction can be controlled fully by users. This paper will elaborate and discuss the information and interaction processes taken between users and computer software/application according to the existing user experience model. The main objective is to present an extension of user experience model that to support the interaction between users and applications among the disabilities (visually impaired). It will include better technology understanding on both conceptual and interaction properties of the whole application domain and their associations between web accessibility, user experience, and technology acceptance. The proposed model will be focusing on two parts; user experience components, and consequences (outcome). It will be used in further empirical study on modeling the relationships between the application users, user experience, and technology acceptance. We envisage effective and comprehensive design model that could be integrated and provide positive progress from the existing literature findings.

Keywords: Web accessibility, user experience model, technology acceptance, and visually impaired users

1. Introduction

The current advancement in mobile technologies has made huge positive implications on user experience today. Through mobile applications, information is much easier to accessed, processes can be performed faster, and interaction can be fully controlled by users. As the number of available mobile applications increasing, users felt easier to perform mobile transactions to fulfill their needs – constructing processes and gathering information. On the other side, it has also become the source of major working demands such as in businesses, marketing, advertisement, learning, leisure, entertainment, etc. Due to that reasons, most researchers have agreed that user experience and its usability play a vital role ensuring the effectiveness of the mobile application and its technology (Aizpurua *et al.*, 2016). While most mobile users reap all the rewards and benefits from this technology, there is still a group of users who still struggling and facing interaction obstacles to use mobile applications (Willeet *et al.*, 2017). Users with disabilities come from wide range of incapabilities such as visual, auditory, physical, speech, cognitive, language, learning, etc. And thus, we can take this as opportunities to serve them with better application features, considering their needs and limitations among the users during the interactions with mobile applications (P. Maragathavalli, *et al.*, 2020). Looking at those limitations, World Wide Web (W3C) has taken huge initiative by producing a standard guideline known as Web Content Accessibility Guideline (WCAG). The main objective of WCAG is to provide a single shared standard for web content accessibility that meets the need of every user regardless of their disability type (Willeet *et al.*, 2017). Thus, the guidelines should able to assist users on how information can be accessed effectively. In general, WCAG offers effective guidelines for disable users in terms of easy interactions and information access. However WCAG are still lacking on its accessibility and acceptance (usability) features, as the existed guidelines still do not cover the overall problems encountered by the users (Power *et al.*, 2012). This clearly indicates that an application may have an adequate level of conformance to accessibility standard, but still not be enough for the disable users. Furthermore, application that compliant to the WCAG may not be always perceived to be accessible and vice versa (Aizpurua *et al.*, 2016). From these scenario examples, we can conclude that something is missing and enhancement should be taken into place. Therefore, we believe that by proposing an extension of user experience model, we could bring the gap closer and compliments the whole frameworks of application design and development among disabilities with web accessibility and technology acceptance.

This paper will elaborate the needs of web accessibility, user experience model, and technology acceptance towards specific mobile applications for the disable users. This will include the conceptual theories, main requirements, interaction processes that occurs between users and application, and the outcome (acceptance)

from the practices. In the next section, we will discuss and elaborate the literature reviews. Then we describe our proposed work of this research, which known as the user experience model. Each component in the user experience model will be discussed to explain its benefits, theoretical descriptions, and the internal strength for the overall application domain. We summarize our work in the final section.

2. Literature Reviews and Related Works

The existence of various categories of users nowadays, requires application designer and developer to focus thoroughly about the interaction effectiveness, usability acceptance and satisfaction. One of the major research fields that to tackle this issue is called user experience (UX). UX is a new theoretical concept that provides a holistic standpoint on users' interaction to web/mobile application with the uses of assistive technologies (Partala and Saari, 2015; Hussain et al. 2017). It has become the main concern among researchers on current design trends in order to emerge abstract, subjective, and emotional qualities involved in any interaction processes (Taylor *et al.*, 2011). According to ISO 9241-20, UX can be defined as a person perception and responses that result from the use or anticipated use of product, application, or technological services (Minge and Thuring, 2018). From this definition, it is clearly to argue that web/mobile application should no longer be simply by delivering a bulk of information or functional features/processes, but it should also be able to deliver effective elements of abstract, subjective, and good emotional qualities of interaction. To achieve this, however, UX should not only works on its own definition and implementation, but it will require an effective and efficient combination with web accessibility guidelines and technology acceptance (Aranyi and Van Schaik, 2015). Figure 1 illustrates the relationship between these three components.

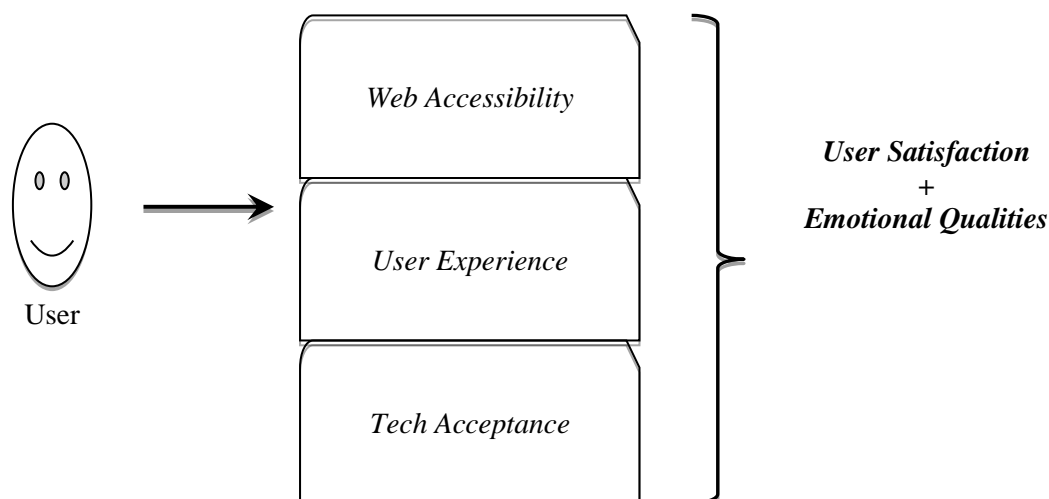


Figure 1.The Relationship and Association Between User Experience, Web Accessibility, and Technology Acceptance

This is supported by an argument from (Taylor *et al.*, 2011), where the model was more focusing on the interaction experience, not addressing the users' acceptance and satisfaction. It is agreed that even if an application is receiving positive feedback and good delivering quality of experience, its usage potential benefits might not be achieved if the users are not willing to returning back to use the application or employing it in the future purposes. Therefore, UX, web accessibility, and technology acceptance are important aspects that complement each other to offer effective and efficient interactive experience and users' satisfaction. It is important to observed that most applications are no longer means only to deliver information and functionalities, but it also take the responsibilities to offer pleasure of use and enjoyment to the users. According to UX model (Hassenzahl, 2018) as depicted in Figure 2, there are two perspectives in the UX model; namely (a) designer perspective, and (b) user perspective. In designer perspective, the product features were all selected and predetermined in order to design and develop application according to the intended product features. There is no guarantee that users will perceive and use the product the way on how designer wanted it to be. On the other side, user perspective is more focusing on what is offered to the users during the interactions. For example, if a user performing interaction processes, a process is triggered and they could perceive the product features (it might slightly different to what is defined in designer perspective). Users could able to construct their own apparent product character based on the product features and their personal standard and expectations.

Designer/User perspective

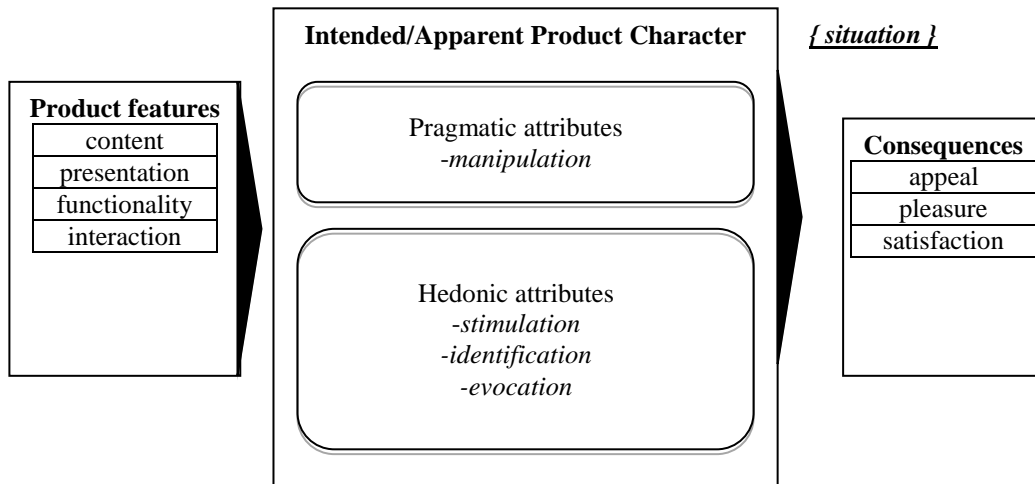


Figure 2.User Experience Model by (Hassenzahl, 2018)

As illustrated in Figure 2, all elements in pragmatic and hedonic attributes somehow could mediate the consequences or the overall expectations. It may give various kinds of design views and the expectations about the application overall satisfaction, emotional implications, and behavioral outcomes. The consequences may also depend on the situation – what type of interactions, who is the user, where the interactions took place, when it happened, and which elements were affected. Different interactions characteristics may results different type of consequences and outcome.

3. The Proposed Extended UX-Model

The main focus of this research is to discuss the approaches of user experience (UX), web accessibility (WA), and technology acceptance model (TAM). According to the literature, each approach has its own roles in the application design and development and thus, we decided to propose an extension model of UX that could provide a comprehensive and effective design model for application design amongst the visually impaired users. We aim to proof that the integration of these approaches could produce a better outcome not only for the design and application implementation, but it could also give positive impacts to the users, both in their satisfaction of uses and emotional qualities.

3.1.The Web Content Accessibility Guidelines (WCAG)

Web accessibility is an important approach to achieve successful universal access to application among the disability people. According to the World Wide Web (W3C), web accessibility can be defined as an approach to ensure users with disabilities can use the web with its main features such as perceive to use, easy to understand, systematic navigation, and quick interaction processes, and that they can also contribute to the web/mobile application”. Align with the objective to support accessibility in application design and development; we have chose to select Web Content Accessibility Guideline (WCAG) as part of our main components in the proposed model. WCAG is mainly to provide a single shared standard for web content accessibility that meets the need of our target users. For simplicity purpose, the description of WCAG is not covered in this paper.

3.2. Technology Acceptance Model (TAM)

Technology acceptance model (TAM) was first introduced by (Fred, 1989) and it has evolved to become a key model in understanding prediction of human behavior towards potential acceptance or rejection of the technology (Nikola, 2015). According to (Venkatesh and Davis, 2000), perceive usefulness and perceive ease of use is two independent construct which determinant of an individuals’ use of a system. Perceived usefulness can be defined as the degree that a user believes that using particular application would enhance his job performance while perceived ease of use can be defined as the degree to which a user believes that using a particular application would be free of effort. Perceived ease of use has a direct influence on perceived usefulness. If a system is easy to use, less effort will be taken, and it will certainly increase the performance. In this paper, we will focus these two construct to strengthen our proposed model, which to ensure users not only benefits the accessibility feature, but the satisfaction of use as well.

3.3. The User Experience (UX) Model – Our Approach

In this section, we will describe four components defined in our proposed UX model. Those components are experience attributes, non-experience attributes, emotional qualities, and usability satisfaction. Besides UX model, we also define input profiles' and the consequences and system's appraisal. Figure 3 illustrates the proposed model. In Input Profiles, we combine the profiles of users, their interaction ability, and accessibility guidelines, depending on the interaction types. We summarize their description as the following:

Interaction characteristic – defining the target users, their profiles, disability category, user's expectations, system characteristics, and the goal/objectives of usage.

Web accessibility – we adapted the web accessibility standards from the existing literature (WCAG), in order to provide the full guidelines of navigation accesses and properties of the system. The web accessibility feature should offer systematic navigation properties and could assist users to achieve their objectives.

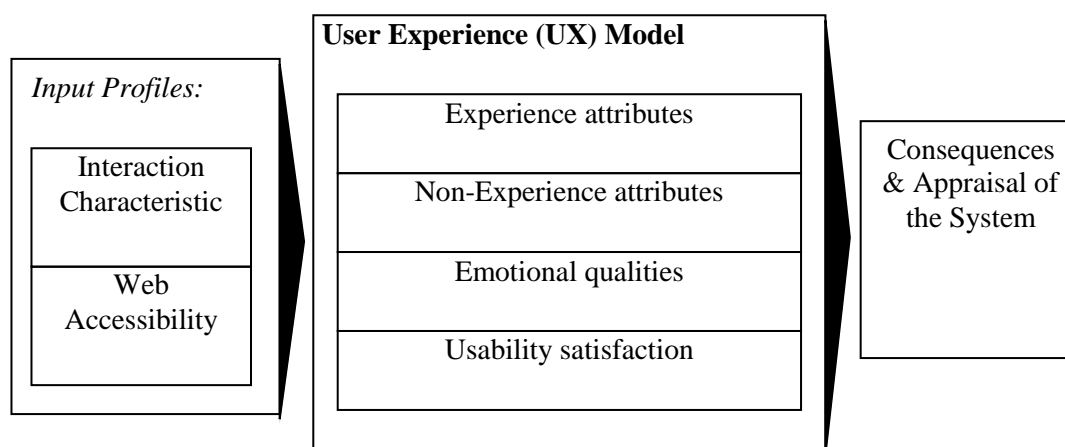


Figure 3. The Extension of User Experience Involving Specific Attributes, Emotional Aspects, and Usability Properties

Our proposed UX model will trace information from Input Profiles' characteristics, where all the inputs will affect the remaining components in the model. We identified four major components in the UX model.

Experience attributes – design elements that could influence the performance and effort from the users while using the system. We defined two main sub-components for this category, namely perceived usefulness and perceived ease of uses.

Non-experience attributes – less affected elements in experience model. The elements in this category focus on the technical aspects of the system such as the logical/physical presentation, user interface elements, and system's complexity.

Emotional qualities – the subjective feedback and response (feeling) from the users during/after using the system. It will describe the effectiveness of delivery mechanism from the system that will at least contribute into a positive or negative impact.

Usability satisfaction – closely related to the usability measurement of user satisfaction. The satisfaction includes enjoyment, achievement, feedback quality, information responses, and system smoothness – no error and bugs.

Finally we identify the outcomes from the UX model in terms of its consequences and the system's appraisal. This will explain the positive or negative overall feedback of the system uses. If a system were able to fulfill all the requirements from the users, including all the components in the UX model, there would be higher possibility the user will return back to the system in the future. In contrast, any system which not able to fulfill the requirements, will lost its users' attentions and interests in the future.

4. Discussions and Conclusion

This paper has presented an extension user experience (UX) model to support systematic web accessibility and better user satisfaction/technology acceptance. The target users would be among visually impaired people. The proposed UX model integrates the benefits of web accessibility guidelines (WCAG) and technology acceptance (TAM) as the initial framework to initiate the main idea of research contributions in this paper. The

outcome from the proposed model promises a better systematic interaction processes between users and the application, and at the same time it improves the user satisfaction through the emotional qualities and usability acceptance. The model will be used in further empirical study to establish the relationship of user experience and both WCAG and TAM on application being used. Series of questionnaire and structural equation modeling are expected to be used as tools for the data verification and validation in the future.

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