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An Integrated Conceptual Model of Visually Impaired Users' Experience and Technology Acceptance of a Website

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ABSTRACT

Internet has become one of the most important needs in our daily activity. It has benefited all its users inclusive the disabled community. There are wide spectrums of Internet's disabled users. However, the aim of this paper is to present an integrated conceptual model focusing on understanding visually impaired users' experience and technology acceptance of a website. This model will be used in further empirical study on modelling the relationship of visually impaired users' experience and technology acceptance on web application. The evaluation of the model will be conducted using a pilot study. Series of questionnaire and structural equation modelling is expected to be used as tools for future data collection and analysis.

Key words: Conceptual model, user experience model, technology acceptance model, web accessibility.

1. INTRODUCTION

The advancement of the Internet has indirectly changed our daily life activity. Internet has extended its role outside the workplace-context. It has become the source of leisure, online retail and marketing, and media. As consequences, the spectrum of the Internet users has reached beyond normal users. Based on survey performed by HandiCapZero association in 2012, is was proven that there are increase number of visually impaired users on Internet usage [8]. We may take this as a positive progress, but the visually impaired and blind users are facing a lot of problems while using the computer applications [19][13][18]. Websites was designed and developed without considering human diversity. However, World Wide Web (W3C) has taken huge initiative by developing web accessibility standard called Web Content Accessibility Guideline (WCAG). The guideline's aim is be recognised as a complete standard on the accessibility of web content that caters everyone's needs regardless of their disability [25]. WCAG 2.1 was built by 13 sets of guidelines that are organized under four principles; perceivable, understandable, operable and robust. The conformance of the guidelines being measured using a three-level categorization; Level A (lowest), Level AA, and Level AAA (highest).

Research by [5][17] shows that web accessibility guidelines has yet to cover problem experienced by the disabled users. This indicates that a website may have an adequate level of conformance to the accessibility standard, but the disabled users still find it difficult to be used. This statement has been seconded by [2], where website which is compliant to the web accessibility standard may not always be perceived accessible and vice versa. This scenario shows that something is missing, and it must be beyond the compliance to the standard.

User Experience (UX) has turn up to be a holistic concept on user's interaction with technology. It has become the main concern on current design trends in order to embed intuitive and emotional qualities of interaction. UX has many different definition but most of the researcher and practitioner summarized UX as subjective, holistic, situated and dynamic [15][22]. UX was defined in ISO 9241-20 as "a person perception and responses that result from the use or anticipated use of a product, system or services" [12]. Websites should no longer provide a bundle of usability features; it should be able to deliver subjective and emotional qualities of interaction.

However, based [3] modelling UX should be combined with technology acceptance, because repeated visit to a website requires acceptance of the site. Although websites that have high usability and offer positive experiences, it might not achieve high volume of potential unless the users are willing to accept it. Therefore, UX and technology acceptance is important aspect that need to be analysed together because repeated users of website requires user acceptance of the website.

It has come to our knowledge that there still a lacking on research about the association of UX and technology acceptance for visually impaired users. Therefore, this paper presents a conceptual models that integrates Hassenzahl's UX model [9] together with components of UX (CUE) model which introduced by [21], technology acceptance model (TAM) [7] and web accessibility. The characteristics of visually impaired users, website compliant level to WCAG standard and usage mode will be the independent variable for the model. The user experience component and consequences

act as dependent variable. The conceptual model is part of bigger research where it will be used for further empirical study.

2. THEORETICAL BACKGROUND

Literature does offer a lot of theory on UX, technology acceptance and web accessibility. However, these theories have not previously extended and tested to the visually impaired users. The aim of this section is to discuss on UX model inclusive of Hassenzahl's UX model [9] and CUE model [21], TAM [7] and web accessibility

2.1 User Experience Model

Most of the theoretical works related to UX model highlighted the concept of interactive product should not only offers usable functionalities for task completion. But it should also be the source of pleasure, fun and enjoyment. According to Hassenzahl UX model [9][10], key elements of interaction are divided into (a) designer perspective and (b) user perspective as depicted in Figure 1. In designer perspective, the product features were chosen and combined in order to deliver intended product character. However, users might not perceive and appreciate it according to the designer's plans. The product character is expected to reduce the cognitive load and trigger strategy to handle product.

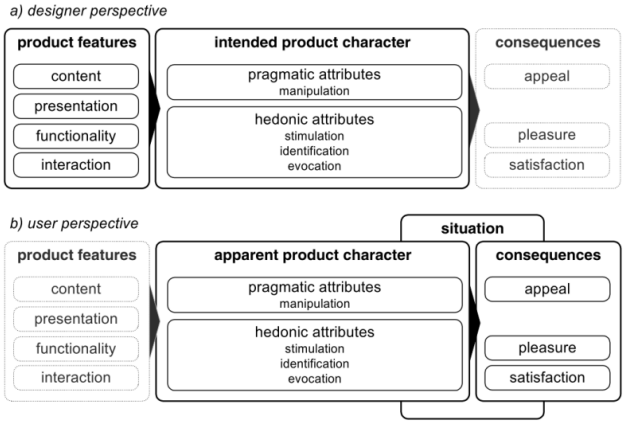

Figure 1: Hassenzahl UX Model [6],[7]

When the users interact with a product, interaction process occurred, users perceived the product features. Then, they will construct their own apparent product character. The product character is developed based on product features, personal standard and expectation. This character is divided into two groups, pragmatic and hedonic. Pragmatic attributes are related to the utilitarian aspects where it supports the effective and efficiency achievement of task. While hedonic attributes represent the non-utilitarian aspect that able to create pleasure through use.

Pragmatic and hedonic attributes will mediate the consequences of the overall judgement of product. It may influence the potential judgement about the product general goodness, emotional consequences and behavioural consequences. However, the consequence may also depend on the situation where the interaction occurs. It was proposed by Hassenzahl to give attention on the metamotivational state of users (usage mode) compare to the situation. Goal mode and action mode is used as the metamotivational state. In goal mode, user has a goal to be achieved and goal fulfilment is important. While in action mode, determining goals happen on the fly and action is the fore.

Series of experiment has been conducted by Thüring and Mahlke to find the relationship between usability, aesthetics and emotion towards the overall judgement which influence users' future decision and behaviour of an interactive system [21]. Component of user-experience (CUE) model is the output of the research. The model integrates most of the human-computer interaction components. The models highlighted the interaction experience encompassed with three components: (1) perception of instrumental qualities, (2) the perception of non-instrumental qualities and (3) user's emotional response to a system. The instrumental qualities hold ease of use attribute and usefulness attributes which corresponding to the pragmatic in UX Model. User interface of the system falls under the non-instrumental qualities which corresponding to hedonic attributes in UX Model. The CUE model claimed the instrumental and non-instrumental quality is likely to influence the emotion that accompanies the interaction process. Emotion can be defined as a personal feeling conveyed by physiological reaction and expression behaviour. This will outline the users' emotional experience with an interactive system.

In CUE model, the human interaction process was composed of three variables which are the system properties- such functionality and interface design, user – such as knowledge or skill and task/context. However, there are no details has been specified by the authors on variable of task/context component.

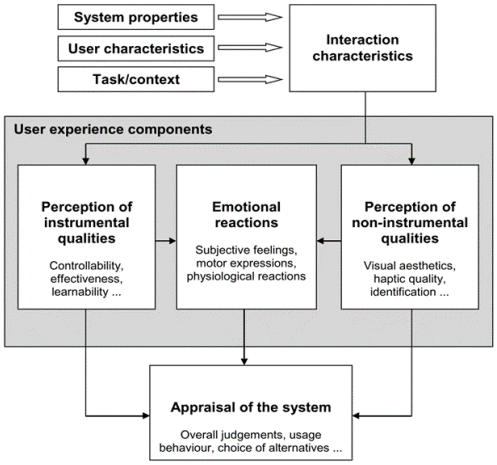

Figure 2: Component User Experience Model (Thüring & Mahlke, 2007)

2.2 Technology Acceptance Model

Technology acceptance model (TAM) was first introduced in more than quarter of century ago by [7]. It has now grown into an important model to understand and predict the potential acceptance or refusal of technology [14]. TAM is originally emerged from researches and theories in the field of psychology.

Based on [6], perceive usefulness and perceive ease of use are two independent construct which determinant of an individuals' use of a system. As per depicted in Figure 2, the mediator is the behavioural intention to use. Perceived usefulness relates to how much a person trust that using a system can improve their job performance. While perceived ease of use is related to the extent of user's trust when using the system is straight forward and effortless. It is an antecedent to perceive usefulness. When a system is easy to use, less effort is needed, and it will increase the performance.

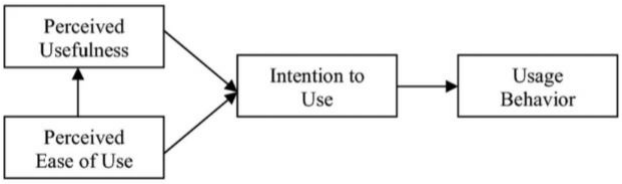

Figure 3: Technology Acceptance Model

TAM has undergone several improvements over the years. TAM 2 was introduce by [23] by extending the variables that influence the perceived usefulness constructor. TAM has become comprehensive and has been adopted is several areas.

2.3 Web Accessibility

Web accessibility in a fundamental approach to achieve universal access to web application. It was understood that the definition of web accessibility is difficult to quantify, define, or agree upon [26]. However, based on most widely known definition is the one from World Wide Web (W3C), people with disabilities should be able to use, interact and contribute to the web application.

Another definition of web accessibility was summarize in [16] by analysing about 50 different definition from various sources. It has been conclude that, everyone inclusive disabled and older people should be able to use websites in their context of use. Design and development of websites should support usability across human diversity.

Align with the objective to support and promote accessibility in web development, guidelines and legal regulations for Web Accessibility have been applied in several countries [24]. The most popular guideline is the Web Content Accessibility Guideline (WCAG) developed by W3C under the Web Accessibility Initiative (WAI) program. The guidelines was aimed to serve as a complete standard on the accessibility of web content that caters everyone's needs regardless of their disability [25]. WCAG 2.1 has 13guidelines which adopted from four design principles namely perceivable, operable, understandable, and robust. It has 61 success criteria. The conformance was measured using a three-level categorization; Level A (lowest), Level AA, and Level AAA (highest).

An initiative to improve web accessibility has been carried by reconciling the adapting preferences between the low vision users and the designer of web pages [4]. The author introduced an approach that works with HTML which able to provide adaptation for specific user preferences.

3. PROPOSED CONCEPTUAL MODEL

The aim of this paper is to present a conceptual model for better understanding visually impaired users' experience and technology acceptance of a website. CUE Model is being used as a framework for this model. CUE Model [21] arranged the variables into three groups: (a) interaction characteristic which have the user characteristic, system properties and task/ context variables (b) component of user experience, comprising of perception of instrumental and non-instrumental qualities and emotional response (c) outcomes. The proposed model is intended to examine how the UX and technology acceptance theory can be extended to the visually impaired user in web environments. The proposed conceptual model is presented in Figure 4.

Interaction characteristic act as an inputs attributes for an interaction to be happened. In order to contextualize UX and technology acceptance theory to visually impaired user; disability level, experience level and expectation being introduce as the measurement variable covering the visually impaired users' characteristic. Web accessibility level will be used as the measurement variables for the system properties attribute. WCAG standard will be adopted to access the web accessibility level. Usage mode also be part of the interaction characteristic to cover the task/context variable. It was suggested by [9] to use the mental state in order cover the widely spread of situation variable. In goal mode, user has certain goal to be achieved. The fulfillment of the goal is the fore. While in action mode, user don't have any specific goal to achieve, goal come on the fly.

The instrumental quali*ties* are related to the usability and utilitarian attributes perceived when users interact with a website. Perceived usefulness and ease of use are two variables that is taken from the technology acceptance theory where it is expected to be the determinant to the behavioral intention to use [20][11][8]. While for non-instrumental qualities, stimulating and trust were derived from UX Model. Stimulating is related to feeling of excitement or causing great emotional feeling. Based on [2] visually impaired users perceive web accessibility as stimulating. Trust or credibility has a significant relationship with web accessibility [1]. It was

expected that both instrumental and non-instrumental qualities will be the antecedent to emotional response. Emotional response in the model are characterized in multiple components.

Component user experience act as the mediator to the consequences. The consequences will be measured based on the behavioral intention to use, satisfaction and goodness of the website. The interaction characteristic will be used as moderator to test the relation from component user experience to consequences. The conceptual model will be used in further empirical study to model the relationship of visually impaired users' experience and technology acceptance on websites. The evaluation of the model will be conducted using pilot study. Series of questionnaire and structural equation modelling is expected to be used as tools in the future analysis.

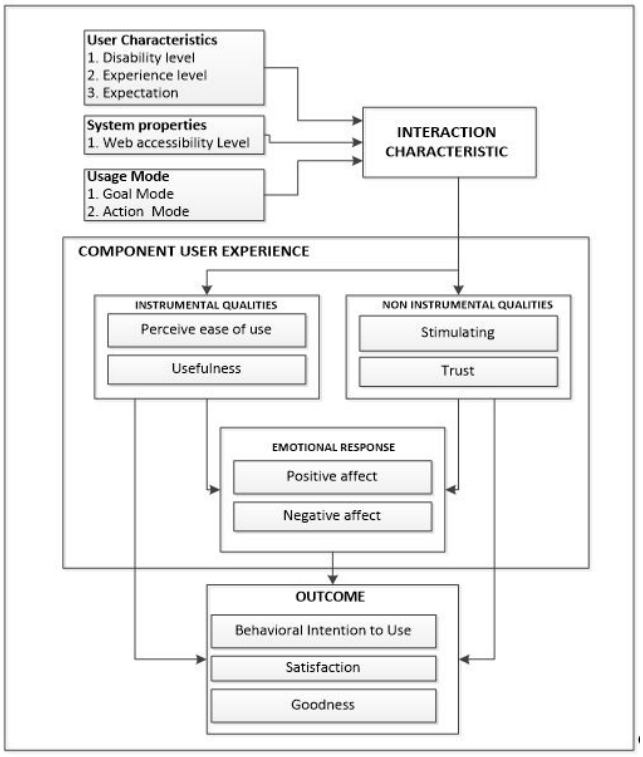

Figure 4: Conceptual model of Visually Impaired Users on UX and TAM of web application (based on CUE Model)

5. CONCLUSION

This paper has presented a conceptual model for better understanding visually impaired users' experience and technology acceptance of a website. The conceptual model uses CUE Model as the framework to initiate the idea of interaction process. The conceptual model will be used in further empirical study to model the relationship of visually impaired users' experience and technology acceptance on websites. The evaluation of the model will be conducted using pilot study. Series of questionnaire and structural equation modelling is expected to be used as tools in future analysis.

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