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Identifying a User Interface Web Design Standard for Higher Learning Institutions Using Kansei Engineering

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ABSTRACT

User interface design plays an important role in web design. Designing a user interface that satisfies the emotional needs of the users is essential as the user interface plays a crucial role in generating remarkable user experiences for websites. A poorly designed user interface leads to bad user interaction while raising the users' arousal and a displeasing user experience with a website elicits dissatisfaction emotion where consecutively results in avoidance and prevents revisit to the website. A standard emotional based user interface web design would enhance user experience which will lead to success of a website. Kansei engineering which is a popular technique in transforming users' feelings into product design is used in this research. This study tries to convert the feelings and emotions of users into design elements with the use of Kansei engineering technology in order to design an appropriate higher learning institution website by identifying a standard web design that cultivates emotional engagement. A standard user interface web design guideline for the development of the higher learning institutions' website has been proposed in this research.

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1. INTRODUCTION

Designing a good website with a great user interface has become noticeably significant as countless tasks are being done over the Internet nowadays. The user interface is the only bridge that connects a user to the particular web environment or an application and therefore, it is an interaction platform for users and machines [1]. A good design can optimize website success and improve several consumer dimensions, including information gathering, intention to return to the website, trust, and performance improvement. Whereas, a poorly designed website can lead to site failure [2]. The traditional design of the website user interface was designer orientated where only designers' thought and viewpoints were considered in designing websites. But, researchers have proved that users' opinions and viewpoints are remarkably important in designing websites in order to satisfy the users and to lead them to revisit the website [1]. The user interface has a vital role in satisfying users and establishing enhanced human computer interaction.

A success of a website depends highly on user satisfaction and the possibility of meeting the users' requirement efficiently where in turn depends on the nature of interaction between the user and the interface. Therefore, user interface design is particularly important in the development of websites. Emotion is a psychological approach that needs to be considered in website design in order to sustain the user with emotional attraction, a sense of aesthetic, or a positive impact on the website. Emotional appeals are contributed to the users through the visual design of a website where it can be delivered through images or colors [3]. Emotional reactions are prompted by a capability to captivate the user with affective and pleasant

web environment which can be elicited through visual design and interaction design. Previous researchers have argued that a website should be able to encourage emotional engagement and elicit positive impression in order to arouse revisit to the website. Poor interface design results in bad user interaction and experience which lead to high arousal and continuous anxiety of the users [4]. This results in user dissatisfaction emotion and leads to avoidance and prevents revisit to a poorly designed website [5].

A website that provides a good impression produces pleasant emotion, whereas, bad impression produces unpleasant emotion [6]. Therefore, a good website should induce the user to go through emotions such as enjoyment, pleasure, trust, interest, or contentment besides being useful and user-friendly as emotions are essential to the interpretation of experience. In order to develop a website that cultivates emotional engagement as well as elicits positive user experience, this study will perceive the understanding of how design elements control emotion so that we could implant the emotion into a website design. Higher learning website plays a significant role as a platform for higher educational institutions to provide information for prospective students, current students, faculties and alumni. It is a great challenge to present information on a higher learning institutions (HLIs) website in a way that can be easily explored by users'.

Therefore, the research on the webpage design of HLI's websites, exceptionally the appearance of the webpage is essential as only a few studies have been done on HLI's website considering the emotional needs of the users. The primary intention of this research is to explore the needs and emotion of users while utilizing a HLIs website and to convert the feelings of the users into key design parameters for Kansei-based HLIs web design. So, this study employs Kansei Engineering technology to HLI's websites in Malaysia in order to propose a standard HLIs web design that can satisfy the users' emotions by invoking emotional involvement. The proposed standard web design can be helpful for designers to design HLI's websites that can respond to the emotional needs of users' appropriately.

1.1. Emotions

Emotions are reactions to accounted actions and are associated with an individual's concerns, demands or goals as well as include physiological, affective, behavioral, and cognitive components [7]. An emotion is defined as "a mental state of readiness that arises from appraisals of events or of one's thought" [8]. Emotion is considered as a highly sophisticated affective concept. According to the classification of [9] there are six basic emotions that are ordinary throughout human cultures which include fear, disgust, anger, surprise, happiness, and sadness. Subsequently, the researcher had included few more other basic emotions to the list such as embarrassment, excitement, contempt, shame, pride, satisfaction, and amusement on [10].

According to [11] emotions are induced affective states [12], or core affects accredited to stimuli [13]. Emotions are literally responses that emerge to stimulating events in an individual's circumstance that are appraised to be related to users' requirements, goals, and motivations. Once activated, emotions initiate subjective feelings such as fear or happiness, provokes automatic arousal, stimulate the body with spontaneous reactions that prepare it for adjusting to whatever situation one encounters, and convey the emotions with various intensity externally to others [14].

Researchers have discovered and specified a range of feeling associated with emotion. Different authors recognized different emotions. A study by [15] identified anger, guilt, sadness, and fear/anxiety. Joy, fear, anger, sadness, disgust, shame, and guilt are the feelings specified by [16]. Whereas, studies [17] and [18] simplified that emotion has both negative and positive valence. Researchers have argued that emotional responses have two components which are arousal and valence. Arousal indicates the response intensity, while the valence represents the affectivity varying from positive to negative [19],[20]. Therefore, an emotion is a complex, multidimensional psychological state that encompasses three various constituents which includes a subjective feeling, a physiological arousal, and a motor expression. Physiological arousal causes physical and psychological changes to emotional events such as alteration of heartbeat and breathing rates, body temperatures and others. Motor expression is behavioral responses which can be identified through someone's facial and vocal expressions including their gesture and posture. Whereas, subjective feelings are emotions that an individual experience which they can describe it with universal emotion words when responding to an emotional event [21].

Studies [22],[23] have highlighted the necessity of emotions in human cognition and perception. Study of emotion in human computer interaction has only been initiated through recent researches to recognize its consequences [24]. Term "affective computing" [25] indicates the involvement of emotions in computer systems design as an effort to enhance the capability of computers to make decisions beside assisting humans more thoroughly [25]. Affective computing associates emotional intelligence in the machines: the ability to perceive and respond intelligently to emotion, the capability properly conveys emotions, and the ability to handle emotions of both the emotions of others and the emotions within oneself [22]. Picard has discussed the matters related to affecting computing: computing that relates to, arises and has proposed models for computer recognition of human emotions [25]. Finding [26] suggests emotional aspect

to be considered in designing interfaces for multimedia learning as positive emotions can boost learning experience of digital literate users.

One of the challenges today in website design is to design a website that is not only usable but also appealing to users as emotional appeals are elicited to the users through the visual design of a website. Visual appeal influences early decision to reject or mistrust a poorly designed website which lacks of emotional approaches. Researchers recently have argued that usability is no longer the utmost target for designers. They have recognized that a website should also have an aesthetic value and must provide emotional engagement in order to optimize the user experience and therefore increase the user satisfaction with a particular website. Studies [27] and [28] have argued that the aspect of affect and emotion in the interrogation of information and interaction should be targeted more than functional outcome such as the efficacy and user friendly. According to [29] the study of usability literally includes evaluation in the aspects of utilitarian and hedonic dimensions due to the interconnection between decision making and usability. Research findings indicate that designs need not only should be centered on functionality and usability, but also satisfies the users during the interaction. Therefore, affective or emotional components should be involved in web design for better interaction as the users are emotional beings by nature. Emotion is one of the salient approaches in user experience as it prompts instinctive reactions to a product, website, circumstance or interface and as well as have an ability to draw user's attention [29]. According to the same researcher, designing should minimize common emotions associated with poor usabilities such as frustration, annoyance, anger, and confusion.

In addition, finding [30] pointed out that a well-systematized website with a masterly, "clean look and feel", with spontaneous navigation and task-orientated functionality determines the emotional reactions that include the perception of credibility, trust, security, and perceived ease of use. Huisman and Van Hout have stated that whenever one encounters a website that has been designed with an unpleasant visual design which elicits the emotion of disgust will avoid the unpleasant interaction by hitting the back button of the browser [31]. This will eventually cause user dissatisfaction and avoidance of revisit to the particular website. Therefore, emotional approach needs to be included in website design to engage the user emotionally and attach them to the website for a longer time in order to gain user trust and satisfaction for the website.

1.2. Kansei Engineering Technology

Kansei Engineering was pioneered by Professor Mitsuo Nagamachi, the President of Hiroshima International University in 1970. Kansei engineering is a technique that specialized in converting the feelings and emotional effects into production elements. This approach has an ability to evaluate to evaluate different feelings and able to specify their correlation with the actual products. Whatever is felt about a particular product is precisely true for each specific person [6]. According to [6], it is a simple cognitive mans that can measure desired emotional reactions of a product or services. This tool was originated as a consumer-oriented technology for the evolution of a new product. It is a technology that converts a consumer's feeling and image of a product into a design element [32]. According to [8], Kansei Engineering is a method that was invented to capture consumer perception, integrate them with the existing product design element in order to outline what Kansei is related to which element so that the new product design implants the consumer emotional needs.

Reference [32] has categorized Kansei Engineering technology into three types: Type I is a category classification on the new product toward the design elements, Type II utilizes the current computer technologies such as Expert System, Neural Network Model and Genetic Algorithms and Type III is a model using a mathematical structure. [6] mentioned that Kansei measuring is a complicated method and it can be done through four suggested methods which can be assessed through the behavioral actions, words, body gestures and facial expressions as well as through physiological reactions which includes heart rate and brain waves. According to [6], some proponents would suggest physiological means which measure Kansei directly. On the other hand, some other would choose to use methods such as Kansei words and analysis method of motor expressions and some Kansei practitioners would choose both evaluation methods to find better solutions [6]. [33] mentioned that there are four main approach in measuring the emotion for Kansei engineering, which involves statistical scaling, magnitude estimation, Likert scale and semantic differential method. Kansei engineering is utilized in the automotive, electrical appliance, construction, clothing and other industries and acknowledged companies using this technology profited from good sales relevant to the new purchaser-orientated products.

2. RESEARCH METHOD

The HLI's websites of both public and private universities in Malaysia are the specimen for this research. Content analysis has been conducted on a total of 63 (20 public and 43 private) universities in

Malaysia. This analysis has been done in order to select HLI's websites with more different designs. Only a number of universities' websites have been selected as subjects due to the large number of private and public universities in Malaysia. Content analysis has been done based on a common standards and methods of web design in previous studies, where 13 physical features were adapted from [1] for evaluation of the HLI's websites which includes background color, header color, footer color, gallery, logo, main menu, multilingual feature, search bar, utilities bar, news section, other categories, link type, font sizes, and font color. The websites with different designs were chosen based on these 13 physical features.

2.1. Specimen Selection

Table 1 contains the data obtained through a content analysis process for selected HLI's websites with more different designs. Table 1 is filled with 1 and 0 where 1 represents the existence of the particular physical feature on the university's website and 0 represents the absence of the physical feature.

Table 1. Physical Features of Selected HLI's websites

Specimen	Page Background Color				Header & Footer Color							Image Section						Logo		Main Menu			Multi-language Feature		Search Box		
												Size			Location			Location		Drop-Down	Vertical Text	Horizontal	Yes	No	Location		
	White	Red	Gray	Image	Blue	Black	Red	Orange	Gray	Yellow	Image	s	m	l	T	C	B	L	R						L	C	R
UM	1	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	1	1	0	1	0	0	1	1
USM	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1	1	0	0	1	0	0	0	1
UPM	1	0	0	0	0	1	0	0	1	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	1
UiTM	1	0	0	0	1	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	1	0	1	0	0
UUM	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	1	0	0	0	1	1	0	0	0	1
UTHM	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	1
UMS	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	0	1	0	0	0	1
MEDIU	1	0	1	0	0	0	1	0	1	0	0	0	0	1	1	0	0	1	1	1	0	0	1	0	1	0	0
LIMKOKWING	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	1	0	0	0	1
UCSI	0	1	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	1	0	1	0	0	1	0	0	0	1
HELP	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	1	0	0	0	1
SEGI	1	0	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	1

Table 1. (Continue) Physical Features of Selected HLI's websites

Specimen	Utilities Bar		News Section			Other Section			Links						Font Size			Font Color							
	Yes	No	Location			Location			Text	Colorful Image			Same Color Image			9-11	11-13	> 13	Blue	Green	Red	White	Black	Orange	Pink	Gray
			L	C	R	T	C	B		s	m	l	s	m	l											
UM	1	0	0	1	0	0	0	1	1	0	1	1	0	0	0	0	1	1	0	0	0	1	0	1	0	1
USM	1	0	0	1	0	0	1	1	1	1	1	0	1	0	0	1	1	1	0	0	0	1	0	1	0	1
UPM	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	1	0	1	0	0	0	1	0	0	1	1
UiTM	1	0	0	1	0	0	1	1	1	1	1	0	0	1	0	1	1	0	1	0	0	1	0	0	0	1
UUM	1	0	0	1	0	0	0	1	1	1	1	0	0	1	0	1	1	1	1	0	0	1	0	0	0	1
UTHM	1	0	0	1	0	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0	1	1	1	0	0	1
UMS	1	0	0	1	0	1	0	1	1	1	0	0	0	0	0	1	0	1	1	0	0	1	0	0	0	1
MEDIU	1	0	0	1	0	0	1	1	1	1	1	0	0	0	0	1	0	1	1	0	0	1	0	0	0	1
LIMKOKWING	1	0	1	1	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	1
UCSI	1	0	1	1	0	0	0	1	1	0	1	0	0	0	0	1	1	0	0	0	0	1	1	0	0	1
HELP	1	0	0	1	0	1	0	1	1	1	1	0	0	0	0	1	0	1	0	0	1	1	0	0	0	1
SEGI	1	0	0	1	0	1	0	1	1	1	1	0	0	0	0	1	0	1	1	1	1	1	0	0	0	1

Through the content analysis, 12 university's websites with different designs have been chosen which includes Universiti Malaya (UM), Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM), Universiti Tekonologi Mara (UiTM), Universiti Utara Malaysia (UUM), Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Malaysia Sabah (UMS), Al-Madinah International University (MEDIU), Limkokwing University of Creative Technology, UCSI University, HELP University and SEGI University (Table 1). These 12 higher learning institutions' websites have been used in order to identify standard education website design using Kansei engineering technology. The selected websites are shown in Figure 1.

Figure 1. Selected Different Design Higher Learning Institutions' Websites

2.2. Experimental Setup

An online survey (https://goo.gl/forms/WS15W27cKDWgah0u1) was conducted in order to identify a standard Kansei-based user interface design for a university website. A questionnaire was distributed through online to respondents who were students currently pursuing their higher education in Malaysian universities. The questionnaire was designed in two sections; Section A: Demographic and Section B: Kansei Checklist. Section A was designed to collect demographic information, whereas Section B was designed to obtain the participants impression towards the 12 selected university websites. A total of 16 Kansei words related to university websites was adopted from [1] and were used in the Kansei checklist section. The 16 Kansei words are convenient, simple, professional, unique, beautiful, efficient, appealing, perfect, creative, messy, waste-of-time, confusion, lovely, modern, disappointment, and up-to-date. Snapshots of the selected university websites were displayed along with the URL of the websites in the Section B and the 16 Kansei words were organized right below each of the websites in 5-point Likert's scale as a Kansei checklist. The scale values were 1 to 5. The participants were requested to rate their impressions towards the 12 selected university websites according to scale.

3. RESULTS AND ANALYSIS

A total of 125 respondents was involved in this research on user's emotion model for the standard user interface design of university website using Kansei engineering. The respondents involved were students in Malaysia who randomly answered the questionnaires. They were 74 female and 51 male. The majority of them with 95.2% were students who are currently pursuing bachelor degree in Malaysian universities. The majority of the participants were from University Teknologi Mara (UiTM) with 31.2%. 24.8%of them were from Universiti Tenaga Nasional (UNITEN), 16% from Universiti Putra Malaysia (UPM) and Universiti Malaysia Sabah (UMS), 8% from Universiti Utara Malaysia (UUM), 2.4% from Universiti Kebangsaan Malaysia (UKM) and 0.8% from Universiti Teknikal Malaysia Melaka (UTeM) and Universiti Malaysia Sarawak (UNIMAS). The majority of the respondents with 64% were agreed that they are skillful in using a university websites and visits university website two to three times a week with 36%. 39.5% of the respondents use the internet for the purpose of searching information.

A standard Kansei-based user interface design was identified from the analysis of responses obtained from students on their impressions towards the 12 selected websites with the visible designs. The website of Limkokwing University obtained the highest score in the words convenient, simple, professional, unique, beautiful, efficient, appealing, perfect, creative, lovely, modern and up-to-date. Whereas, the website

of Universiti Teknologi Mara (UiTM) was chosen the most for the word convenient and Universiti Malaya (UM) was chosen the most for the Kansei word simple. A standard Kansei-based user interface web design for HLIs website has been identified based on the impressions of students towards the 12 different design university websites. The standard Kansei-based user interface design guideline has been proposed in Table 2 below.

Table 2. Standard Kansei-Based Guideline for Web User Interface Design

Physical Features	Value			
Page Background Color	White			✓
	Image			✓
Header & Footer Color	Blue			✓
	Gray			✓
	Black			✓
Image Section	Size	Large		✓
	Location	Top		✓
Logo	Location	Left		✓
Main Menu	Drop-down			✓
	Vertical			✓
Multi-language Feature	Location	Top Right		✓
Search Box	Location	Top Right		✓
		Top Left		✓
Utilities Bar	Location	Top Right		✓
		Top Left		✓
News Section	Location	Center		✓
		Left		✓
Other Section	Location	Center		✓
		Bottom		✓
Links	Text			✓
	Colorful Image	Size	Small	✓
			Medium	✓
	Same Color Image	Size	Medium	✓
Font Size	9 – 11			✓
	11 – 13			✓
	> 13			✓
Font color	White			✓
	Orange			✓
	Gray			✓
	Black			✓
	Blue			✓

4. CONCLUSION

This research aims to identify a standard HLI's web design by exploring the needs and emotions of the users through Kansei engineering. Users' emotion on the HLI's website interface has been evaluated using Kansei engineering and the emotional features have been transformed and translated into product characteristics which can be used as a guideline for designing Kansei based HLI's website that elicits emotional engagement. The 12 selected HLI's websites with more different designs have been used in the Phase I of this research which involves Kansei engineering method to identify a standard Kansei-based HLIs web design. A standard Kansei-based HLI web design has been proposed (Table 2) in Phase I of this research.

The research has been outlined to undergo three phases as a future research. The Phase I have identified and proposed a standard Kansei based HLI's web design with the involvement of Kansei engineering technology. Universiti Malaysia Sabah website will be adapted in Phase II based on the proposed standard Kansei based design as a future work. The adapted website will be evaluated in Phase III using the self-report method in order to justify the identified standard Kansei based HLI's web design. Geneva Emotion Wheel (Figure 2) will be used in Phase III to study the users' emotion towards the adapted HLI's website. The standard Kansei-based user interface web design which has been proposed in Phase I will be justified in Phase III in order to decide to be preferred in the process of designing a user interface for a university website.

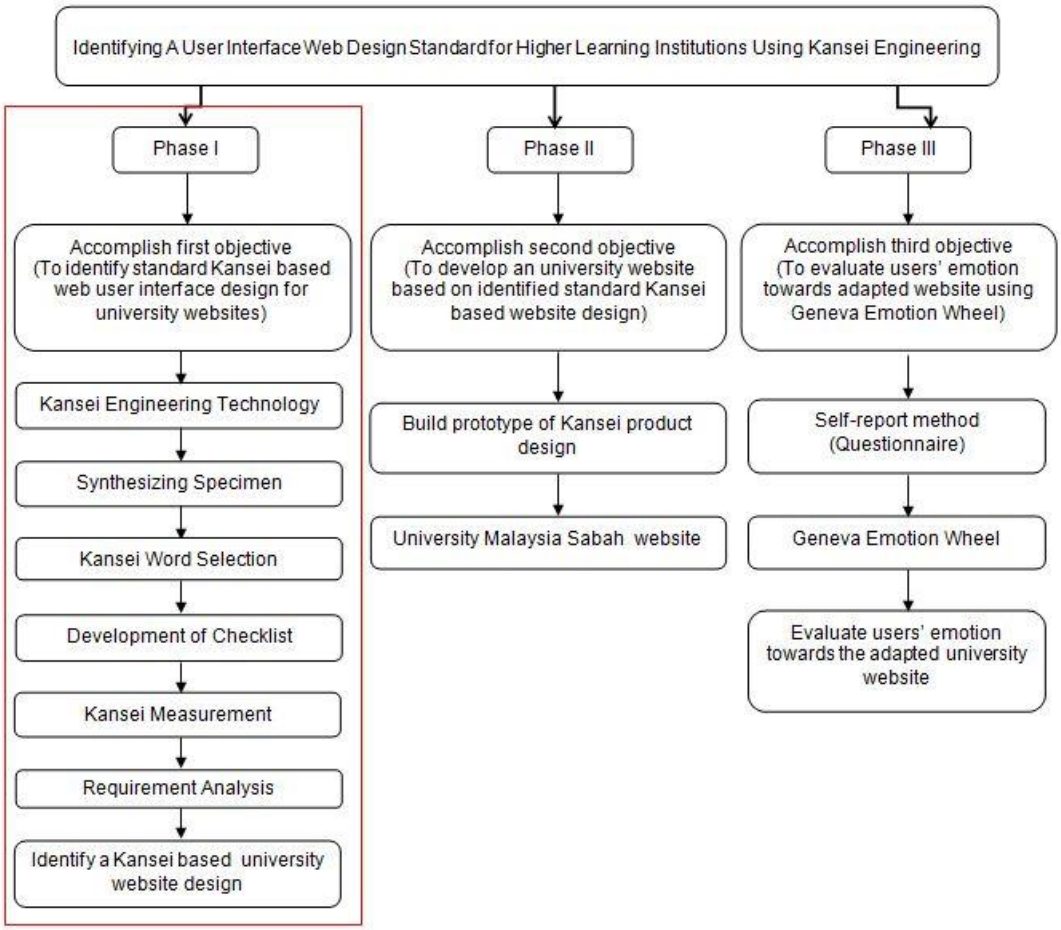

Figure 2. Proposed Research Method

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