APPLYING KANSEI ENGINEERING TO DETERMINE EMOTIONAL SIGNATURE OF ONLINE CLOTHING WEBSITES

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Keywords: Emotional design, Kansei Engineering, E-Commerce

Abstract: *In the discipline of design science, the integration of cognitive, semantic and affective elements is crucial in the conception and development of designed products. IT artefact design and development has ignored the importance of affective elements until recent years. There is now a growing interest in addressing affective elements of system design within the HCI community. Current literature reflects two main foci in the area: emotional design and its evaluation. Of the two, the later is widely researched and reported. In our paper, we present our research attempt to establish the design method for organizing the emotional design requirements of E-commerce websites by applying Kansei engineering (KE). We proposed a Kansei website design method and demonstrated the method by conducting the semantic evaluation of pre-selected online clothing websites using 40 Kansei words as descriptors of emotional sensation which was organized as a 5-point Semantic Differential (SD) scale to form the Kansei checklist. 120 participants were asked to rate 35 pre-selected online clothing websites using the Kansei checklist. Cluster analysis and Partial Least Square method were then performed to identify the Kansei word cluster and from this result we uncover the relationship between Kansei word cluster and online clothing website design.*

1 INTRODUCTION

The discipline of design science emphasizes the integration of cognitive, semantic and affective elements in the conception and development of designed products. Designers of IT artifacts have begun to address affective or emotional elements in their products and significant amount of work is seen in the design of mobile phones. However, the literature does not exhibit significant work on artifacts such as websites. In this paper, we report the results of our research to establish the design method for organizing the design requirements based on the emotional signature of websites. Here, we demonstrate the use of Kansei Engineering (KE) to identify the emotional signature of websites and presents our empirical findings in support of using Kansei as a means to incorporate the affective or emotional appeal of websites. The context of web application chosen for this work is the design of online clothing e-commerce websites where emotional appeal is assumed to be significant.

2 EMOTIONAL DESIGN OF E-COMMERCE WEBSITES

HCI issues related to e-commerce applications were formerly focused on cognitive aspects of websites. Since the early work of Nielsen in the 1990s, the emphasis was on the qualities of usefulness and usability in producing good website design. Na Li and Ping Zhang (2005) cited that most studies dedicated to e-Commerce website evaluation are based on two assumptions. The first assumption is that target customers spend at least a few minutes on a website and the second assumption is that good website features usually elicit positive cognitive evaluations and shopping experience. They pointed out that, obviously, these assumptions ignored the primary affective reaction or emotional responses towards the website. Echoing this concern, Na Li and Ping Zhang (2005) stressed that online shopping behaviour is a complex phenomena and recognized that affective reaction has been cited to be a factor that promotes online shopping. This is because e-commerce websites have gone beyond the function of conveying information to the extent of providing persuasive engagement with website visitors through the lively process of perception, judgment and action. Affect has been found to influence decision making, perception, attention, performance, cognition and etc (Tractinsky, et al 2000; Norman, 2002). Aligning with these views, we argue that e-Commerce websites should induce desirable consumer experience and emotion that influences users' perception of the websites to extend the outreach potential of the online business. Hence, we need to consider the emergence of the dimension of desirability in e-commerce website design.

Desirability emerged from the realization of the need to have new measures of users' experience driven by emotional factors (Dillon 2001, Spiller 2004). Donald Norman, an advocate of emotional design discussed the notion of emotional design through elements of visceral, behavioral and reflective factors (2004). His views, parallels the view of Englelsted (1989, as cited in Aboulafia and Bannon, 2004) who discussed three temporal categories of emotions, namely affect, emotion, and sentiment. We argue that in terms of e-commerce website emotional design for desirability, visceral factors or affect that is the emotional state that results from a response to the external stimuli is more pertinent.

Mahlke and Thüring (2007) studied affect and emotion as important parts of the users' experience with interactive systems, aiming to consider emotional aspects in the interactive system design process. While admitting that emotion cannot be designed, they assert the importance of deriving a method for recognizing users' emotion from emotional evaluation procedures. In addition, they developed the users' experience framework illustrated in Figure 1 that clearly illustrates objective feelings as a component of emotional user reaction.
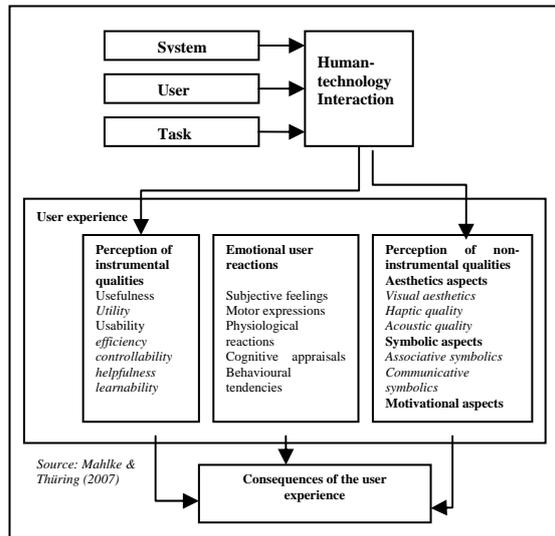

Figure 1: Components of Users Experience

Despite the gained recognition, the subject of emotional appeal of websites or desirability is often neglected as designers tend to pay more attention to issues of usefulness and usability (Buchanan 2000) due to the availability of established design methodology that addresses aspects of usefulness and usability. The design method that enables the incorporation of emotional design requirements is lacking. In addition, numerous studies conducted on emotional design tends to look at minimizing irrelevant emotions related to usability such as confusion, anger, anxiety and frustration (Norman 2002). Therefore, it is necessary to seek for a suitable design method to handle design requirements based on emotional signatures of websites.

4 KANSEI ENGINEERING

Kansei is a Japanese term that is used to express one's impression towards artifact, situation and surrounding. Deeply rooted in the Japanese culture, direct translation of Kansei is difficult but means the mental state where knowledge, feeling, and sentiment are harmonized (Nagamachi, 2003). When adopted by other culture, Kansei is simply described as the sense and sensibility that evoked subjective

pleasurable feelings from the interaction with an artefact (Nagasawa, 2004).

Kansei Engineering (KE) is a technology that combines Kansei and the engineering realms to assimilate human Kansei into product design with the target of producing of products that consumer will enjoy and be satisfied with. The focus of KE is to identify the Kansei of products that trigger and mediate emotional response. The KE process implements different techniques to link product emotions with product properties. In the process, the chosen product domain is mapped from both a semantic and physical perspective. In terms of a design methodology, the approach of KE is to organize design requirements around the emotions that embody users' expectations and interaction (Spiller, 2004). Since it was first introduced by Nagasaki in the seventies, KE has been successfully used to incorporate the emotional appeal in the product design ranging from physical consumer products to IT artifacts. Due to its success in making the connection between designers and consumers of products, KE is a well accepted industrial design method in Japan and Korea. In Europe KE is gaining acceptance but is better known as emotional design.

5 RESEARCH METHODOLOGY

5.1 The Kansei Web Design Method

To develop an emotional website design, a technique to translate subjective feelings, impressions and emotions must be used. We proposed the Kansei website design method following the approach of integrating subjective emotion through Kansei as important design elements of e-commerce websites (Anitawati and Nor Laila, 2006) as shown in Figure 2.
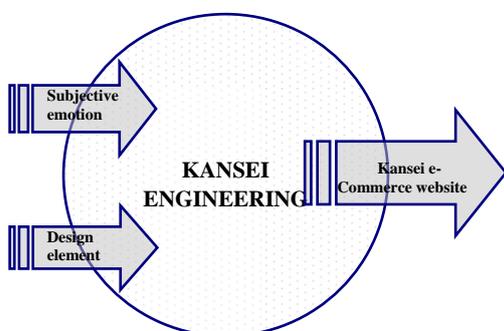
Figure2: Kansei E-Commerce Websites

To engineer Kansei values into the website design, we organized the KE steps to arrive at the Kansei website design method shown in Figure 3. The method is divided into four levels: L1, selection of website specimen, L2, preparation of Kansei checklist, L3, determination of Kansei, and L4, prototyping of Kansei website design. L1 is sub-divided into procedure PI and procedure PII. In PI, the procedure begins with the collection of website specimens with visible differences from the existing specific domain to obtain valid specimens.
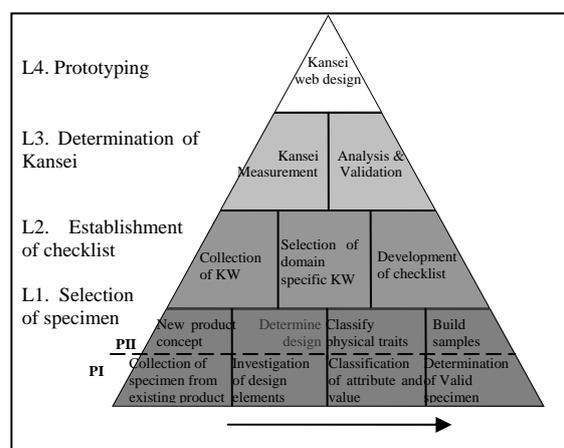
Figure 3: Design Method for Building Kansei Website

In P2, new product concept is established to finally produce website samples for eliciting the emotional design requirements. In L2, the Kansei checklist is established through the process of synthesizing Kansei words (KW) that are directly related to the product domain. KW can be an adjective or a noun such as 'calm', 'sophisticated' and 'natural', and are synthesized using the help of language experts. The Kansei checklist produced is in the form of the Osgood Semantic Differential scale which is used to measure Kansei in the next level. In L3, the determination of Kansei is done through two processes.

The first process is Kansei measurement which involved either experts or ordinary consumers. Participants of Kansei measurement have to rate their impressions towards product specimen based on the Kansei checklist. The participants' evaluation is analyzed and validated in the next process to interpret the Kansei responses against design elements identified in L1. Finally, the outcome from

L3 will be used as the emotional design requirements in L4, the design of Kansei product.

4.2 Research Method

We conducted two data capture: the online visitors' emotional feelings (Kansei) towards online clothing websites and the website design elements. For the Kansei capture, we followed the Kansei web design method described in the previous sub-section. The visitors Kansei and website design elements were then analyzed separately. Then Kansei and the design elements are mapped to arrive at the Kansei e-Commerce website design. Some of the design elements considered include colour, style, menu, page orientation and others. The visual description of the method is illustrated in Figure 4.
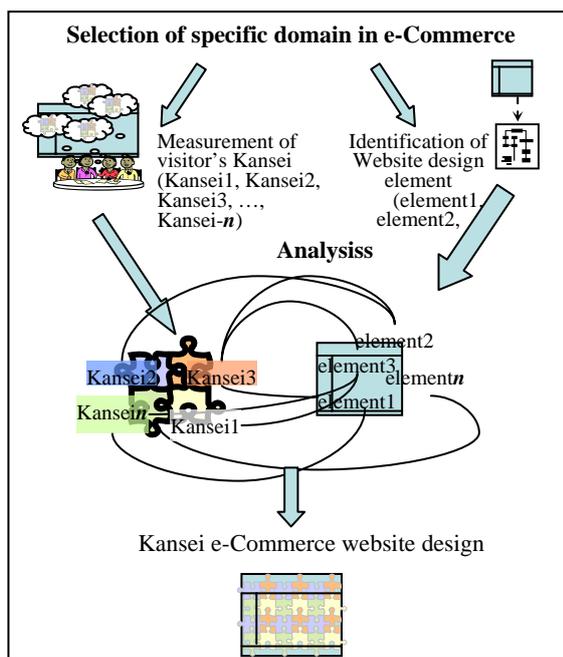

Figure 4: Research Method

4.3 Research Instrument

Initially, one hundred and sixty three online youth clothing websites were selected based on their visible design differences and were analysed following predefined rules on colours, design elements, layouts, page orientations, and typography. From the analysis, 35 website specimens were finally used. Examples of the website specimens are shown in Figure 5.

The Kansei checklist developed was organized in a 5-point Semantic Differential (SD) scale and consists of 40 KW (Figure 6).

Figure 5: Some of the Website Specimens Used in the Study.

Figure 6: The Sample Kansei Checklist

4.4 Participants

One hundred and twenty undergraduate students from the Faculty of Information Technology and Quantitative Science, Faculty of Architecture, Building, Planning and Survey, Faculty of Business and Management and Faculty of Elecrical Engineering from the researchers' university participated in the Kansei evaluation. From each faculty, exactly thirty students consisting of fifteen males and fifteen females. All of them have prior experience as web users.

4.4 Procedure

The participants were grouped according to their faculties. Four Kansei evaluation sessions were held separately for each group. During each session a briefing was given before the participants began their evaluation exercise. The thirty five website specimens were shown one by one in a large computer screen to all participants in a systematic and controlled manner. Participants were asked to rate their feelings into the checklist according to the given scale. Participants were given three minutes to rate their feelings towards each specimen. The is a ten minutes break after the fifteenth website specimen was shown. Each Kansei evaluation session took approximately 2 hours to complete.

6 RESULTS AND DISCUSSION

6.1 Reliability of Kansei Measuement

The Cronbach's alpha of the Kansei checklist was calculated to measure the internal consistency and the analysis yielded an overall Cronbach's alpha value of 0.9512, which is higher than the common benchmark value of 0.7. This confirms the reliability of the Kansei checklist The participants' Kansei responses were then computed to determine the average response and the range for each website specimen. These computation values are plotted in shown in Figure 7.
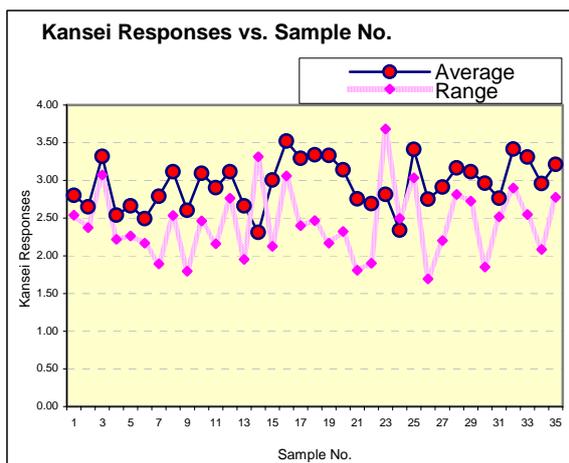

Figure 7: Averaged value and range of evaluation results between subjects

In general, the average value of the Kansei responses for each website specimen are well distributed where the values are above and below the value three, which is the neutral response point. This indicates that subject's Kansei are well distributed to both negative and positive value. This is further supported by the range values between the average Kansei responses for each website specimen. The range values are more than one, which indicates that subjects are responding well to the specimens. Hence, from both readings we could conclude that participants are sensitive to Kansei value.

6.2 Cluster Analysis and Partial Least Square (PLS)

The participants' Kansei responses were then analyzed using cluster analysis and the Partial Least Squares (PLS) method to identify the Kansei word clusters (Appendix I) to uncover the implicit relations between KW and website designs. The cluster analysis was performed to identify semantic space of Kansei words. The result of the PC loadings for the first and second principal components from the evaluation result is shown in Figure 8.
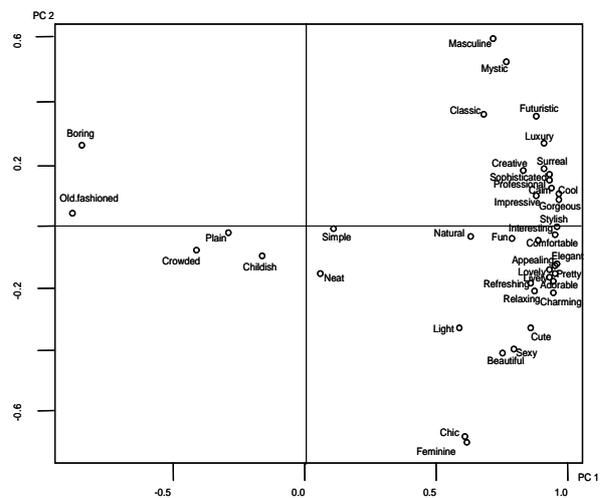
Figure 8: PC Loadings result

The PC loadings show how much the evaluation on a Kansei affects variables, which we used to obtain semantic structure of KW. The KW that produced large positive first PC loadings (x-axis) are "Elegant", "Gorgeous", "Stylish", and so forth. The dense area of the right hand side of the chart is corresponding to such KW. On the other hand, KW that produced large negative PC loadings are "Boring" and "Old-fashioned". We represent this PC

as the axis of "Attractiveness". We can expect that websites with a higher score on this component is likely to have higher sense of attraction and conversely. In the second PC loadings (y-axis), KW that have positive large loadings are "Masculine", and KW that have negative PC loadings are "Feminine", and "Chic". We can represent this PC as the axis of "Masculine-Feminine". We can expect that websites with a high score on this component will tend to have high characteristic of masculinity and conversely.

The PLS analysis reveal the relationship between design elements and the Kansei cluster (Appendix II). For example for the Kansei cluster simple, the design elements related includes page orientation: content, page colour: brown, logo location: centre, main background colour: blue and so on.

From the PCA and PLS performed, we are able to identify the Kansei semantic space and relationships between Kansei and web design elements. From the results of our findings, we can conclude that Kansei structure on online clothing website design has two components, which are attractive and masculine-feminine. This provides us with empirical evidence that Kansei e-commerce website design method that we proposed can produce the intended Kansei semantic space, similar to other Kansei Engineering studies in other product design.

6   CONCLUSION AND FUTURE WORK

Work on the application of KE in website design is still at the infancy stage. The dimension of desirability draws on the new paradigm of producing desirable websites as opposed to current focus on website functional usability and performance. Our study aims to explore whether the Kansei web design method is applicable in determining the emotional values to generate emotional signatures of online clothing websites. Here, we proposed a Kansei website design method to incorporate emotional values in websites. From our findings we are able to show empirical evidence to that the Kansei e-commerce website design method that we proposed can produce the intended Kansei semantic space, similar to other Kansei Engineering studies in other product design. In addition, our results also showed the presence of Kansei appeal in existing e-Commerce website.

However, the adoption of KE is not risk free. Since Kansei is highly dependent on the indigenous characteristics of the cultural race, engineering Kansei into e-Commerce websites may not produce globally accepted features. Consideration on the universal and localized Kansei features will be considered in our future work.

ACKNOWLEDGEMENTS

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APPENDIX I

KANSEI WORDS CLUSTER

CLUSTER NAME	KANSEI WORDS
PLEASING	Adorable, Appealing, Beautiful, Calm, Charming, Comfortable, Cool, Elegant, Gorgeous, Impressive, Interesting, Lively, Lovely, Pretty, Professional, Refreshing, Relaxing, Sexy, Stylish
OLD-STYLE	Boring, Old-fashioned
ADVANCE	Chic, Classic, Creative, Cute, Fun, Futuristic, Luxury, Sophisticated, Surreal
STRONG	Masculine, Mystic
FEMININE	Feminine
SIMPLE	Simple
CHILDISH	Childish
CROWDED	Crowded

APPENDIX II

RELATIONS BETWEEN KANSEI RESPONSES AND DESIGN ELEMENTS

Design Element	PLEASING	CHILDISH	CROWDED	FEMININE	SIMPLE	ADVANCE	OLD-STYLE	STRONG
Bg Color	Dk Brown	Lt Blue	Grey	Lt Blue				Black
Bg Style		Texture	Texture	Texture				
Page Shape				Sharp				
Page Menu Shape				Mix				
Page Style							Table	None
Page Orientation	Content		Banner-Content	Content	Content			
Dominant Item			Advertisement				Text	
Page Color	Grey		Not Specific	Pink	Brown	Grey	White	Black
Page Size	Small			Small				
Page Border Existence				Yes				
Logo Location	Center			Right	Center	Center		Center
Header Bg Color	Grey		Red	Black		Grey	Blue	Grey
Header Bg Picture			Picture					
Header Font Size							Medium	
Header Menu Link Style		Button	Button					
Header Menu Bg Color	Grey		Mix	Grey		Grey	Blue	Grey
Main Bg Color				Grey	Lt Blue			Black
Main Text Alignment			Not Specific					
Main Font Color							Brown	
Main Font Size				Medium			Large	
Main Font Family								Cursive
Main Font Style			Mix	Bold		Bold-Italic		Bold-Italic
Top Menu Bg Color			Lt Pink	Lt Pink	Black			
Top Menu Font Color			Black	Blue	Lt Grey			
Right Menu Existence			Yes					
Right Menu Link Style		Picture	Text	Picture				
Right Menu Font Size		Medium	Small					
Left Menu Link Style			U-Text	Button				Picture
Left Menu Bg Color		Mix	Blue	Pink		Mix	Blue	Mix
Left Menu Font Color	White		Blue	Grey			Blue	
Left Menu Font Size			Medium			Medium		
Footer Menu Bg Color	Grey	Lt Blue	Black	Brown		Grey		Grey
Product Display Style	Filmstrip					Filmstrip	Catalog	
Picture Dimension		3D						

Product Try On								Yes
No of people in picture			Mix	One		2 or more		2 or more
Picture Focus	Breast	Product		Breast				
Body Representation				Model				Mannequin
Picture Arrangement				Horizontal				Center
Picture Style	Artistic			Runway		Artistic		Artistic
Artistic Menu?						Yes		Yes
Empty Space?							More	
Other Images?		Kids						Animal
Image of?							None	Mix
Face Expression	Mix					Mix	None	Mix
Product view angle			Rear	Rear			None	Side