

APPLYING KANSEI ENGINEERING TO DETERMINE EMOTIONAL SIGNATURE OF ONLINE CLOTHING WEBSITES

M. N. Nor Laila, M. L. Anitwati

Faculty of Information Technology and Quantitative Sciences, Universiti Teknologi Mara, Malaysia

Mitsuo Nagamachi

User Science Institute, Kyushu University, Fukuoka 815-8540, Japan

Keywords: Emotional design, Kansei Engineering, E-Commerce.

Abstract: 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 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 (EC) websites by applying Kansei engineering (KE). We proposed a Kansei EC 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 products such as 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 (EC) websites where emotional appeal is assumed to be significant.

2 EMOTIONAL DESIGN OF EC WEBSITES

Human computer issues related to EC 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. Tractinsky, et al, (2000) cited that most studies dedicated to EC 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 EC

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. Since affect has been found to influence decision making (Tractinsky, et al 2000; Norman, 2002), we argue that EC 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 EC 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). Norman, an advocator of emotional design discussed the notion of emotional design through elements of visceral, behavioral and reflective factors (2004). His views, parallel the view of Englested as cited in Aboulaflia and Bannon (2004) who discussed three temporal categories of emotions: affect, emotion, and sentiment. For EC website emotional design for desirability, we view visceral factors or affect to be more pertinent. In support of this, 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 subjective feelings as a component of emotional user reaction.

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.

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). It is then necessary to seek for a suitable design method to handle design requirements based on emotional signatures of websites.

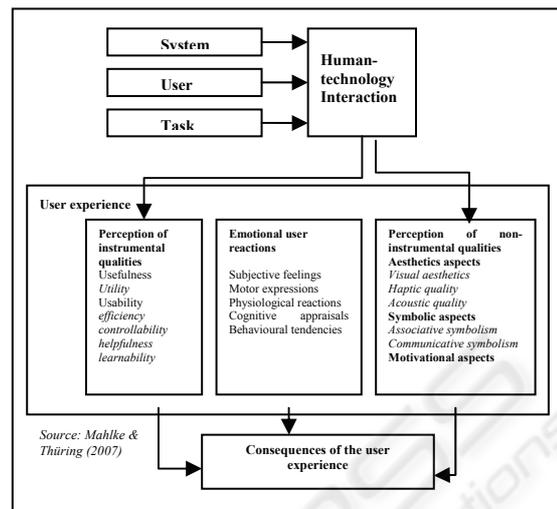


Figure 1: Components of Users Experience.

3 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, Kansei can be indirectly translated as the mental state where knowledge, feeling, and sentiment are harmonized (Nagamachi, 2003) and is able to evoke subjective pleasurable feelings from the interaction with an artefact (Nagasawa, 2004).

Kansei Engineering (KE) which is founded by Nagamachi in the seventies is a customer-oriented technology to assimilate human Kansei within the engineering realms of product design to achieve consumer satisfaction and enjoyment. KE focus on the identification of product Kansei that trigger and mediate customers' emotional response. The KE process implements different techniques to link product Kansei 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). KE has been successfully used to incorporate the emotional appeal in the product design ranging from physical consumer products to IT artifacts. KE is a well accepted industrial design method in Japan and Korea and is gaining acceptance in Europe where KE is better known as emotional design.

4 RESEARCH METHODOLOGY

4.1 The Kansei Web Design Method

In our earlier work, we introduced the concept of Kansei EC website to integrate subjective feelings, impressions and subjective emotion or Kansei with website design elements to add emotional appeal (Anitawati and Nor Laila, 2006) (Figure 2).

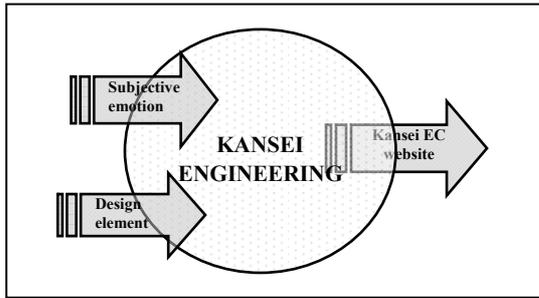


Figure2: Kansei EC Websites.

To engineer the Kansei values into website design, we proposed the Kansei EC website design method (Figure 3).

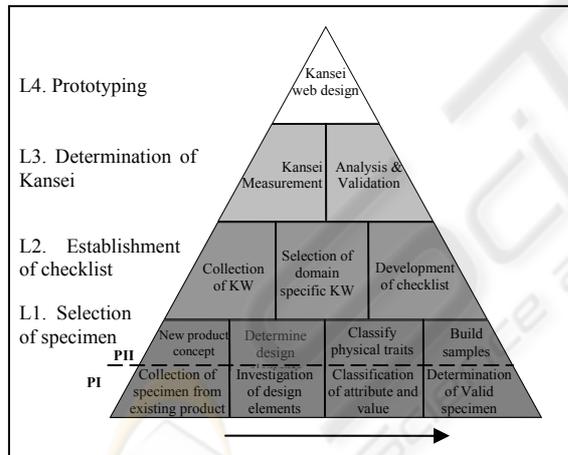


Figure 3: Design Method for Building Kansei EC Website.

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 subdivided into procedure PI and PII. PI begins with the collection of website specimens with visible differences from existing specific domain to obtain valid specimens. In P2, a new product concept is established to 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 and are synthesized by 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 through two processes. The first process is Kansei measurement involving either experts or consumers. Participants of Kansei measurement rate their impressions towards product specimen based on the Kansei checklist. Next, the participants' evaluation is analyzed and validated 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

To illustrate the Kansei EC design method, we performed process L1, L2 and L3 as prescribed in the previous sub-section on e-clothing EC websites. The visual description of the method is illustrated in Figure 4.

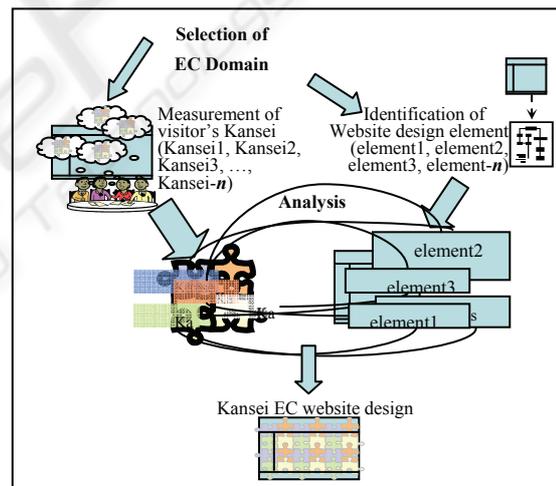


Figure 4: Research Method.

Some of the design elements considered include colour, style, menu and page orientation. The participants' Kansei and the website design elements were then analyzed separately and then mapped to produce the Kansei EC website design.

4.3 Research Instruments

One hundred and sixty three online youth clothing EC websites were selected based on visible design differences and analyzed based on rules of colour,

design elements, layout, page orientations and typography. From the analysis thirty five website specimens were finally used in the Kansei evaluation. The Kansei checklist was organized in a 5-point Semantic Differential (SD) scale and consists of 40 KW (Figure 5).

Subject ID: _____ Sample No. : _____

	5	4	3	2	1		
Adorable						Not	Adorable
Appealing						Not	Appealing
Beautiful						Not	Beautiful
Boring						Not	Boring
Calm						Not	Calm

Figure 5: The Sample Kansei Checklist.

4.4 Participants

Participants of the Kansei evaluation are undergraduates from a local university from four faculties: information technology, engineering, architecture and business management. From each faculty, thirty students consisting of fifteen males and fifteen females with prior experience as web users were selected.

4.5 Procedure

Four Kansei evaluation sessions were held for each faculty group. In each session a briefing was given before the participants began their evaluation exercise. The thirty five website specimens were shown one by one from a PC controlled projector to all participants in a systematic and controlled manner. Participants were asked to rate their feelings into the checklist according to the given scale and were given three minutes to rate their feelings towards each specimen. A ten minutes break is given after the fifteenth website specimen was shown. Each Kansei evaluation session took approximately two hours to complete.

5 RESULTS AND DISCUSSION

5.1 Reliability of Kansei Measurement

The Cronbach's alpha of the Kansei checklist was calculated to measure the internal consistency and the value obtained is 0.9512, which is higher than the common benchmark value of 0.7. This confirms the reliability of the Kansei checklist. We further

check on the participants response towards the web specimens in accordance with Kansei study by Hon and Ho (2006) who determined the average and range of the participants' Kansei score. The plot values are shown in Figure 6.

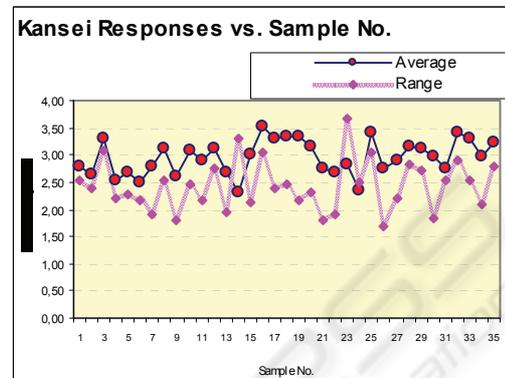


Figure 6: Averaged value and range of evaluation results between subjects.

The Kansei scores for each specimen is well distributed above and below the value 3, which is the neutral response point. This indicates that subjects are responding well to the specimens. Hence, from both readings we could conclude that participants are sensitive to Kansei value.

5.2 Cluster Analysis and Partial Least Square (PLS)

The participants' Kansei score 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 elements. 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 7.

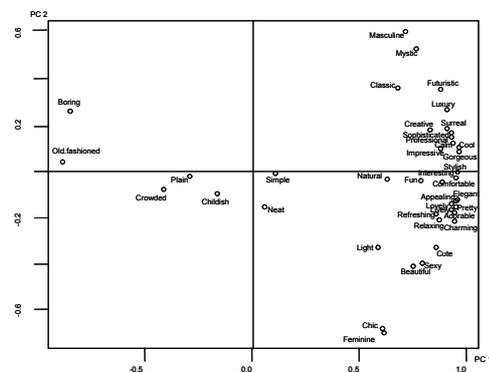


Figure 7: PC Loadings result.

The PC loadings were 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 corresponds to such KW. On the other hand, KW that produced large negative PC loadings is "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 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 identified the Kansei semantic space and relationships between Kansei and web design elements. From the results of our findings, we can conclude that Kansei structure of online clothing website design has two components: attractive and masculine-feminine. This provides us with the empirical evidence that Kansei EC website design method 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 can determine the emotional values to generate emotional signatures of online clothing websites. From our findings we are able to gain evidence that the proposed Kansei EC website design method can produce the intended Kansei semantic space, similar to other Kansei Engineering studies in other product design. In addition, our results also showed that the presence of Kansei appeal in existing EC 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 EC websites may not produce globally accepted features. Consideration on the universal and localized Kansei features will be considered in our future work.

ACKNOWLEDGEMENTS

The research was supported by grants from the Ministry of Science, Technology and Innovation, Malaysia, under the e-Science Fund research grant scheme [Project Code: 01-01-01-SF0029].

REFERENCES

- Aboulafia, A., and Bannon, L. J. (2004). Understanding affect in design: an outline conceptual framework. *Theoretical Issues in Ergonomics Science*, 5(1), 4-15.
- Anitawati, M. L. and Nor Laila, M.N. (2006) Kansei engineering concept in EC website. *Proceedings of the International Conference on Kansei Engineering and Intelligent Systems 2006 (KEIS '06)*, Aizu-Wakamatsu, Japan.
- Buchanan, R. 2000. Good Design in the Digital Age. *AIGA Journal of Design for the Network Economy*, 1(1), American Institute of Graphic Arts: pp: 1-5.
- Dillon, A. (2001). Beyond Usability: Process, Outcome and Affect in human computer interactions. Paper presented as the Lazerow Lecture 2001, University of Toronto, March 2001
- Hon, Y.S. and Ho, K.L. (2005). Visual Design of Web Page. *Proceedings of CybErg 2005. The Fourth International Cyberspace Conference on Ergonomics*. Johannesburg: International Ergonomics Association Press
- Li, Na and Ping Zhang (2005), Consumer Online Shopping Behavior, in *Customer Relationship Management*, Fjermestad, J. and Romano, N. (eds), Series of *Advances in Management Information Systems*, Zwass, V. (editor-in-chief), M.E. Sharpe Publisher.
- Nagamachi, M. 2003. The Story of Kansei Engineering (in Japanese), Japanese Standards Association, 6. Tokyo.
- Nagasawa, S. 2004. Present State of Kansei Engineering in Japan. 2004 IEEE International Conference. Vol.1. pp:333-338.
- Norman, D. A. 2002. Emotional Design: Attractive Things Work Better in *Interactions: New Visions of Human-Computer Interaction*, IX: pp. 36-42.
- Norman, D. A. 2004. Emotional Design: Why We Love (or Hate) Everyday Things. New York: Basic Books.
- Sigala, M., Mich, L. and Murphy, J. 2007. Exploring the Use of Emotional Features at Romantic Destination Websites. *Proceedings of the International*

Conference in Information and Communication Technologies in Tourism 2007, Ljubljana, Slovenia, 2007 Springer Vienna.

Tractinsky, N, Katz, A.S. and Ikar, D. 2000. What is Beautiful is Usable. *Interacting with Computers*, 13: 127-145

Spillers, F. 2004. Emotion as a Cognitive Artifact and the Design Implications for Products that are Perceived as Pleasurable, *Experience Dynamics*.

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

Part of 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					
...