

Lokman, A.M., Noor, N.M., Nagamachi, M.(2009) EXPERTKANSEIWEB – A Tool To Design Kansei Website. Enterprise Information Systems. Series: Lecture Notes In Business Information Processing (LNBIP), Vol. 24. Filipe, Joaquim; Cordeiro, Jose (EDS.). 2009. ISBN: 978-3-642-01346-1, ISSN: 1865-1348.

## EXPERTKANSEIWEB – A Tool to Design Kansei Website

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**Abstract.** In this paper we describe our research work involved in the development of a design tool for developing Kansei website. The design tool to facilitate Kansei web design is named, ExpertKanseiWeb and was developed based on results obtained from the application of the Kansei Engineering method to extract website visitors' Kansei responses. From the Partial Least Square (PLS) analysis performed, a guideline composed from the website design elements and the implied Kansei was established. This guideline becomes the basis for the systems structure of the design tool. ExpertKanseiWeb system consists of a Client Interface (CI), system controller and Kansei Web Database System (KWDS). Client can benefit from the tools as it offers easy knowledge interpretation of the guideline and presents examples to the design of Kansei website.

**Keywords:** Design tool, Emotional design, HCI, Kansei website, Partial Least Square analysis, Web 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 artefacts 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 artefacts such as websites.

In this paper, we report the results of our research on affective website interface design. In our earlier work [1] [2] we put forward the conceptualisation of Kansei website to add up to the literature on design informatics by establishing a design methodology to embed website visitors' emotional impression in its interface design. Extending this work, we produced a guideline for Kansei website design which is derived from the Partial Least Square (PLS) analysis. This guideline is composed of detail design elements and visitors' Kansei and holds a tremendous amount of knowledge which may pose some difficulty when one has to read and interpret the knowledge. As a solution, we developed a design tool which we name the

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ExpertKanseiWeb, to convey the guideline to website designers in a systematic approach. This paper presents the development work on this design tool.

## **2 Emotional Design of e-Commerce Websites**

Over the past decades, the studies on user experience in website design were focused mainly on cognitive functionality and usability [3] [4] [5]. They include features such as active links, loading time, colour, typography, content organization, navigation and etc. covering features that may influence user experience with the website. In recent years, the concentration has shifted towards addressing emotional experience of website [6] [7] [3] [8]. This is due to the evolution of websites function from conveying information to the extent of providing persuasive engagement with visitors through the lively process of perception, judgment and action. Furthermore, emotional engagement has been found to influence decision making, perception, attention, performance, and cognition [9] [10] [11].

Aligned 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 [12] [7]. Norman [13], an advocator of emotional design discussed the notion of emotional design through elements of visceral, behavioural and reflective factors. His views, parallels the view of Engelsted (1989, as cited in [14]), who discussed three temporal categories of emotions - 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 Thüning [15] 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.

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 [16] due to the availability of established design methodology that addresses aspects of usefulness and usability. Design method that incorporates 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 [10]. Therefore, it is necessary to seek for a suitable design method to handle design requirements based on emotional signatures of websites. To seek for the method we turned to one established method of engineering product emotions, i.e. Kansei Engineering which will be briefly described in the next section.

### 3 Kansei Engineering

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 products that consumer will enjoy and be satisfied with. The focus of KE is to identify the Kansei value 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 [17]. 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.

### 4 Research Method

As seen in Fig 1 below, we divided the research into three phases. In the process of Kansei measurement, we adopted KE methodology to quantify website visitor's Kansei responses. Result from Phase I is then analysed statistically using Partial Least Square analysis to identify interrelations between design elements, influence of design elements to Kansei and link between Kansei and design elements. This lead to the establishment of guideline to the design of Kansei website, as anticipated in Phase II. Result of Phase II becomes the basis for the system structure of the design tool, the ExpertKanseiWeb. Details of research phases are described in Sections 5, 6 and 7.

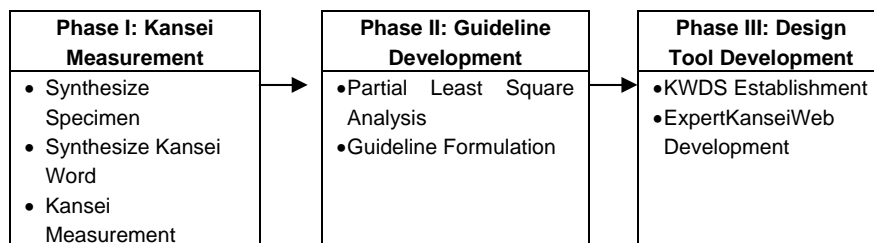


Fig. 1. Research method.

### 5 Phase I: Kansei Measurement

Phase I begins with selection of specific domain. It is important to control the domain and subjects as different domain will induce different Kansei. Specific target market group must be used as experiments subject, so that the intended Kansei could be measured accurately. Failing which will lead to confusion during Kansei measurement and yield invalid result. The context of web application chosen for this

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work is the design of e-Clothing websites where emotional appeal is assumed to be significant. Correspondingly, the selected subjects are consumer with online shopping experience. Then, the study proceeds with synthesizing specimen, synthesizing Kansei Words, and Kansei Measurement.

### **5.1 Research Instruments**

Initially, 163 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.

Kansei Words (KWs), which are used to represent emotional responses, were synthesized according to web design guidebook, experts and pertinent literatures. 40 KWs were selected according to their suitability to describe website. Among the synthesized words are 'adorable', 'professional' and 'impressive'. These KWs were used to developed checklist to rate websites, organized in a 5-point Semantic Differential (SD) scale.

### **5.2 Participants**

120 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 Electrical Engineering from the researchers' university participated in the Kansei evaluation. From each faculty, exactly 30 students consisting of 15 males and 15 females were recruited. All of them have prior experience as web users.

### **5.3 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 35 website specimens were shown one by one in a large white 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 within 3 minutes for each specimen. They were given a break after the 15<sup>th</sup> website specimen, to refresh their minds. The order of checklist was also change to avoid bias. Each Kansei evaluation session took approximately 2 hours to complete.

## **6 Phase II: Guideline Development**

Phase II begins with analysing results obtained from Phase I. There were three sets of data obtained from the study:

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1. The dependant (objective) variables, y, i.e. the 40 sets of Kansei responses by 120 subjects.
2. The sample, i.e. the 35 website specimens.
3. The independent (explanatory) variables, x, the design elements (categories).

We calculated the average Kansei evaluation value of each samples obtain from all subjects from the experimental procedure. On the other hand, the initial investigation of design elements resulted 77 design items which composed from 249 categories. All three sets of data are used in performing the Partial Least Squares analysis used in the study to obtain the intended output. The three sets of data are the contributing component in the development of the guideline.

### 6.1 Partial Least Square (PLS) Analysis

PLS analysis was performed to discover relations between y (Kansei) and x (design elements). It is also used to identify influence of design elements in each Kansei, best fit and most unfit value for each design elements, and which sample induces what kind of Kansei. In the study, PLS analysis has been identified to be most suitable to handle the huge amount of x variables, and tens of y variables.

**Table 1.** PLS scores.

Category	Kansei			
	Adorable	Appealing	Beautiful	Boring
BodyBgColor-White	-0.03655	-0.03699	-0.01674	0.024457
BodyBgColor-Black	0.006545	0.011992	-0.01374	-0.00265
BodyBgColor-DkBrown	0.060435	0.067045	0.018645	-0.03459
BodyBgColor-LtBrown	0.013248	0.011571	-0.00476	0.006006
BodyBgColor-Tone	0.013134	0.025984	0.028571	-0.03754
PageStyle-Frame	0.034036	0.025436	0.027154	-0.03955
PageStyle-Table	-0.04203	-0.03508	-0.02236	0.04195
DominantItem-Pict	0.046730	0.048044	0.030602	-0.04358
DominantItem-Adv.	-0.02968	-0.03225	-0.01741	0.019399
DominantItem-Text	-0.05612	-0.04549	-0.02663	0.050166
DominantItem-NotSpec	-0.01781	-0.02577	-0.02033	0.024059

We obtained coefficient values from PLS analysis. Table 1 shows a segment of the coefficient values. *Range* value is calculated to determine influence of each design category. *Range* is calculated using maximum and minimum value, where

$$Range = PLS_{Max} - |PLS_{Min}|$$

Mean of *Range* is calculated, where

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$$\overline{Range} = \frac{1}{n} \sum_{i=1}^n Range_i$$

Each Kansei has means of *Range*, and if the mean value of a ‘Category’ is larger than *Range*, the item is considered to have good influence in design. As a result, *Range* for every ‘Category’ having value bigger than  $\overline{Range}$  implies the best fit ‘Category’ which highly influence consumer’s Kansei in website design. To illustrate the result, shown in Table 2 is a segment of design influence for Kansei ‘Adorable’.

**Table 2.** Design influence in Kansei Adorable.

$\overline{Range} = 0.05$

KANSEI	ADORABLE		
	Range	Good Design	Bad Design
Page Color	0.114884	Brown	White
Product Display Style	0.106444	Filmstrip	Catalog
Header Menu Bg Color	0.106119	Grey	Blue
Left Menu Font Color	0.103703	White	Mix
Header Bg Color	0.102178	Grey	Blue
Face Expression	0.100237	Mix	None
Body Bg Color	0.100152	Dk Brown	White
Dominant Item	0.099800	Picture	Text
Header Font Size	0.096507	Not Text	Medium
Main Text Existence	0.088132	Not Exist	Exist
Main Bg Color	0.085869	Brown	Lt Blue
Main Font Style	0.085822	Italic	Normal
Main Font Size	0.083240	Medium	Large
Right Menu Link Style	0.078679	Picture	Text

The column ‘Category’ lists design category result that has influence in ‘Adorable’ design. The column ‘Range’ shows values higher than  $\overline{Range}$ , sorted in descending order, to show influence of design category from highest to lowest. Column ‘Good Design’ lists highest PLS score within a category, which implies best fit value to ‘Adorable’ website. Column ‘Bad Design’ lists lowest score within a category, which implies most unfit value to ‘Adorable’ website. PLS scores has also enabled the identification of Kansei in relation to each sample website.

Table 3, which shows Kansei sample score segment, represents largest value as the best fit Kansei and vice versa to describe a website. This result has lead to the discovery of sample’s Kansei and enable the visualization of which sample highly implied what Kansei.

Results of all the analysis enable the paper to devise guideline to the design of Kansei website interface. The guideline is a composition of Kansei and value of each category that has influence to the design of Kansei website.

**Table 3.** Website Kansei.

Sample ID	Adorable	Appealing	Beautiful	Boring	Calm	Charming
1	3.23352	3.04163	3.14276	2.39434	2.77595	2.93343
2	2.72056	2.75152	2.94337	2.84746	2.70364	2.81997
3	3.68517	3.70649	3.30493	2.66730	3.52251	3.55746
4	2.52333	2.47425	2.92539	3.32273	2.83322	2.56347
5	3.06786	3.01651	2.98098	2.83406	2.67317	2.66387
6	2.34030	2.41328	2.58091	3.56973	2.66560	2.25456
7	3.16084	3.13096	3.25413	2.58095	2.77491	2.90715
8	3.49967	3.45554	3.35909	2.30261	3.32644	3.33457
9	2.65392	2.56151	2.84483	3.31682	2.74922	2.23772
10	3.31305	3.32962	3.00556	2.72732	3.49567	3.19025
11	2.96722	2.85847	2.96223	3.08820	2.88259	2.68545
12	3.26369	3.35897	3.43048	2.40299	3.16667	3.22916
13	2.87722	2.75896	2.95498	3.19583	2.87777	2.57862
14	2.12599	2.18171	2.69230	<b>3.72111</b>	2.68575	1.95756
15	3.32669	3.24533	3.54718	2.44541	3.02450	3.12673
16	<b>4.00896</b>	<b>4.02631</b>	<b>3.66163</b>	1.97005	3.56817	3.69670
17	3.88432	3.87891	3.43218	2.31150	<b>3.66133</b>	3.69804
18	3.57208	3.75637	3.21562	2.83233	3.49431	3.50153



: Best fit



: Most unfit

## 7 Phase III: Design Tool Development

Phase III is the process of developing the design tool, which uses findings from phase II as basis in its structure. The tool called ExpertKanseiWeb targets to facilitate clients in the process of developing Kansei website. ExpertKanseiWeb offers several options which client can choose from. The following sub-sections describe the tool development.

### 7.1 Kansei Web Database System (KWDS)

Firstly, results from PLS analysis are used to construct Kansei Web Database System (KWDS), shown in Fig 2, targeting to streamline the Kansei website interface design guideline. KWDS consists of Kansei Word Database (KWDB), Design Element Database (DEDB), LOGIC and Kansei Design Database (KDDB). KWDB stores all Kansei words, DEDB stores all identified design elements, and LOGIC handles

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interrelation of Kansei and design elements, influence of design element to Kansei, and the implied Kansei of particular web design.

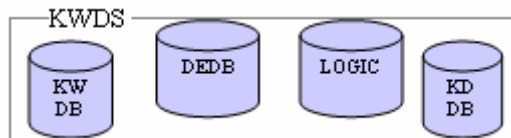


Fig. 2. KWDS.

KWDS deploys the expert system for Kansei website design. The system, ExpertKanseiWeb, allows client to input KW via selection from a list of existing Kansei words into the Client Interface (CI). The KW will be processed to identify the semantic taxonomy in reference to the KWDB. Inference Engine will then handle the associated design with the KW, extract the design elements with the detail attributes from DE DB and LOGIC, and send a design example to be displayed on CI.

The system structure of Expert Design Tool for Kansei Website is as illustrated in Fig 3.

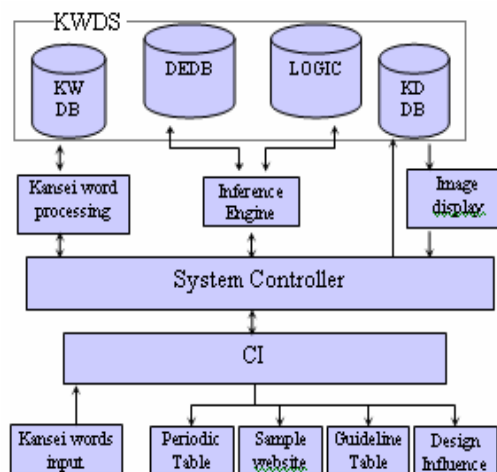


Fig. 3. System structure of ExpertKanseiWeb.

## 7.2 The Client Interface (CI)

The presented CI as seen in Fig 4 is the main client interface to ExpertKanseiWeb. The interface offers selection of Kansei Word to client. Client can then select the type of display interface they desire. The first option offered is the information visualization in the form of periodic table (shown Fig 5), which is used to display the value of design elements, as a guide in designing certain Kansei website.

The periodic table is an arrangement of e-Commerce web design elements ordered by web page structure from top to bottom, left to right. Demonstrating the devised guideline in the form of periodic table is seen to be a solution to visualize the large



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amount of information as obtained from the study. The design elements could be represented in periodic form where the value is a repetition of patterns in terms of design elements. The value is shown when the intended Kansei Word is selected. Kansei Words can be selected from a drop down button on the CI, and the respective values will be displayed. In addition value for each design elements will be displayed when client hover a mouse over the elements.

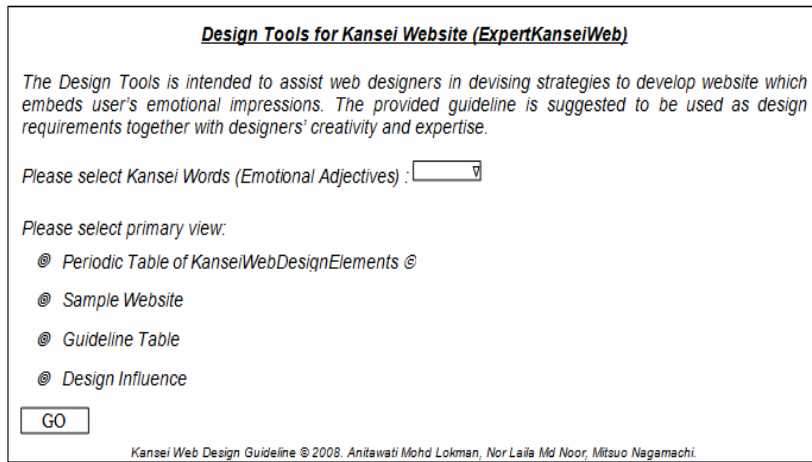


Fig. 4. Snapshot of the Main CI.

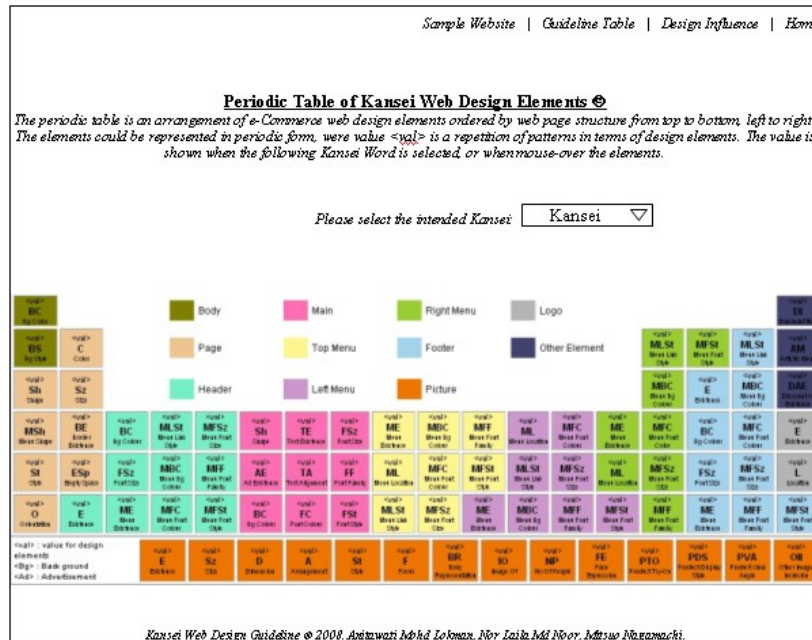


Fig. 5. Snapshot of Periodic Table of Kansei Web Design Elements.

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The second option offers samples of websites that implies selected Kansei. A snapshot example of ‘Feminine’ Kansei website can be found in Fig 6. The left section of the page displays samples of website. The right section of the page displays several highest influences of design elements and its value, with option to see more influential elements. With this information, clients can have better clue in devising strategies to design a particular Kansei website. Selection of the intended Kansei also can be made from dropdown button provided at the top section of the CI, and display will change accordingly.

The screenshot shows the interface of the EXPERTKANSEIWEB tool. At the top, there are navigation links: "Periodic Table", "Guideline Table", "Design Influence", and "Home". Below these, there is a dropdown menu labeled "Sample of" with "Feminine" selected, followed by the word "Website".

On the left side, there is a preview of a website for "loralie". The website features a pink sidebar menu with options like "Home", "About", "Products", "Contact", "Privacy", "Terms", "FAQ", and "Blog". The main content area shows a woman in a red dress with the text "FROM 2006".

On the right side, there is a table titled "Influential Design Elements". The table has three columns: "Degree of Influence", "Element", and "Value".

Degree of Influence	Element	Value
1	Body Representation	Model
2	Main Font Size	Medium
3	Product view angle	Rear
4	Page Color	Pink
5	Footer Menu Font Color	Pink
6	Left Menu Font Color	Grey
7	Top Menu Bg Color	Lt Pink
8	Picture Existence	Exist
9	Main Font Style	Bold
10	Left Menu Link Style	Button
11	Main Bg Color	Grey
12	Page Orientation	Footer
13	Top Menu Font Color	White
14	Left Menu Bg Color	Pink
15	Picture Focus	Breast

Below the table, there is a link labeled "more" and a note: "Scale : 1 is highest". At the bottom of the interface, there is a copyright notice: "Kansei Web Design Guideline © 2008. Aniswari Mohd Lokman, Nor Laila Md Noor, Mitsu Nagamachi."

Fig. 6. Snapshot example of ‘Feminine’ Kansei website.

The third option provided in the Main CI (Fig 4), is to have a display of guideline in a table form. The table content will change when Kansei is selected from the drop down button. The table provides a full list of influential design elements and its value as a guide to design a particular Kansei website.

Finally, the Main CI provides a fourth option, which is an interface display of design influence. The interface lays out influence of good design elements sorted in descending order to streamline elements from highest to lowest influence to the selected Kansei. The information is beneficial to client to figure out which element has high influence to certain Kansei website design. Options for Kansei are provided in drop-down button. A link to see a list of bad design influence is also offered, which is useful as an idea of what design value should be avoided when designing a particular Kansei website.

## 8 Conclusion

From our study, we have shown that it is possible to discover the emotional signature in website interface design. The PLS analysis has (1) revealed interrelations of design

elements that contribute the influence towards the design of Kansei website and (2) linked between Kansei and design elements and website Kansei. Here, lies the biggest challenge of the study, i.e., in the process of translating Kansei responses to the underlying design elements. The heavy interaction between Kansei and design elements demanded careful attention. These results are used to formulate guideline which is a composition of design elements and the implied Kansei responses. The guideline holds a huge volume of information but one has to read and interpret the knowledge for it to be used. As a solution, the paper presented ExpertKanseiWeb, which lays down the interpretation offering easy access to the knowledge presenting idea to the design of Kansei website.

ExpertKanseiWeb help comprehend the large amount of data quick, consistent and accessible at any time. It offers an environment where the knowledge and the power of computers can be incorporated to overcome many of the limitations in human capabilities. Additionally, the presented periodic table resolves the issue of visualizing large amount of data into one view.

ExpertKanseiWeb, streamline the guideline and delivers the knowledge of how design elements elicits Kansei. It facilitates client in devising strategies to improve website affective qualities, whereas positive affective qualities are proven to influence visitor's affective and eventually cognitive judgment [9] [14] [10] [15] [1]. Ultimately, the design of Kansei website will result in a paradigm shift from WYSIWYG (What You See Is What You Get) to WYSIWYD (What You See Is What You Desire).

Nonetheless, the study was performed focusing on e-Clothing and young consumers as target market group. Thus, the result may not produce globally applicable features. Additionally, although ExpertKanseiWeb is seen to provide solution to designing Kansei website, the effectiveness of the tool has not been tested. We will address these issues in our future work.

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