Lokman, A.M., Harun, A.F.H., Noor, N.M., Nagamachi, M. "Website Affective Evaluation: Analysis Of Differences In Evaluations Result By Gender And Educational Background". Proceedings of the 6th International Conference On Information Technology In Asia 2009. Malaysia.

Website Affective Evaluation: Analysis of Differences In Evaluations Result By Gender And Educational Background

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Abstract - *Studies involving consumer studies have suggested different mechanisms of subject selections. The paper elaborates results of subject's responses by the methodology adopted from Kansei Engineering. In the research, evaluations of subject's kansei towards website interface were performed, targeting to measure affective quality in website design. Principal Component Analysis was performed to show semantic structure of Kansei Words in respond to clothing websites. The analyses were based on the average of evaluation results obtained from subjects. Results of PC Loadings were analyzed to see differences of determinants by gender and educational background. The comparison results show how variations of gender and background of subjects affect determinants in the study of website affective evaluation. The study makes decent contribution in determining appropriate subject in designing research instruments for future studies involving website affective evaluations.*

Keywords: Consumer science, website affective evaluation, Kansei, Principal Component Analysis

1 Introduction

Websites are designed, built and used by people and the success of a website is determined by the community of people who uses it. Hence, it is only natural for social, cognitive, semantic and affective issues to be addressed in the designing and building of websites. In this paper, we aim to understand user behaviours base on social grouping. This is achieved by analyzing web experience base on genders and educational background. It is believed that by having an insight into user behaviour from a social standpoint, it can generate tremendous data to work with which in turn helps to understand how different social group interpret web experience.

The context of web application chosen for this work is the design of online clothing e-commerce websites where affective quality is assumed to be significant. Based on the result, we discuss the differences in kansei space, concluded to determinants, as output from both gender and educational background.

2 Subject Selection

Choosing participants for a social study can have a profound impact on the types of results obtained. However, one costly element of a research is the participant costs. Hence, it is desirable to carefully select participant demographics without sacrificing the quality of the experiment. In this study, random sampling method was chosen in selecting participants as it contains no bias and can be relatively representative of the targeted population [1]. It allows researchers to make generalizations and justification about the majority of the population by a certain level of certainty [2].

In proceeding with subject selection, we have opted to implement convenience selection, where the researcher randomly chooses participants whom can be easily found. As random sampling can create a false sense of security, [3] has suggested clustering to be used as a mechanism for selecting ideal participants. Process applied can be seen in Figure 1.

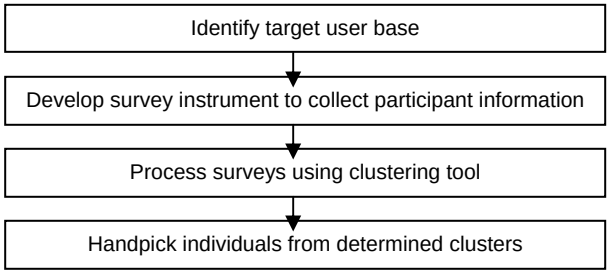

Figure 1: Participant Selection through Convenience Sampling and Clustering Method

A study by [4] allows us to conclude that gender base data are important empirical information. This is because such data allows one to infer gender information and how it influences behaviour and preference. This information can then be used to build map information of user web experience interpretation and the use of sound statistical methods to reason the effect of such classification on web design and preference. This approach is also applicable to other type of subject groupings such as subject's educational background.

It should be noted that by considering the elements of gender and education background in representing a population allows a research to be justified [5] and controlled. Furthermore, these elements allow for a research to be carried out in an equitable manner.

3 Affective Website Interface Design

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 [6] 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. These assumptions have ignored the primary affective reaction or primary emotional responses towards the website. Echoing this concern, [6] 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 also been discussed in literatures as a factor found to influence decision-making, perception, attention, performance, cognition and etc [7] [8]

Aligned with these claims, we argue that e-Commerce websites should induce desirable consumer experience and emotion that influences users' perception of the websites, to enhance visitor's stickiness that promotes consumer conversions and retentions.

Despite the gained recognition, the subject of emotional appeal of websites is often neglected as designers tend to pay more attention to issues of usefulness and usability [9] 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 [8]. 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 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 [10], [11], [12]. Since it was first introduced by one of the author, Nagamachi, in the seventies, KE has been successfully used to incorporate the emotional appeal in the product design ranging from physical consumer products to IT artefacts. 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 Method

We divided the research into three phases; Phase I: Kansei Measurement, Phase II: Gender Based analysis, Phase III: Background Based Analysis. This is reflected in Figure 2. In the process of Kansei measurement, we adopted Kansei Engineering methodology to quantify website visitor's Kansei responses. Result from Phase I is then analysed statistically using Principal Component Analysis to scrutinize the kansei space. The result enables the conclusion of differences in kansei space based on gender and educational background. Details to the phases are described in the following sections (6, 7 and 8).

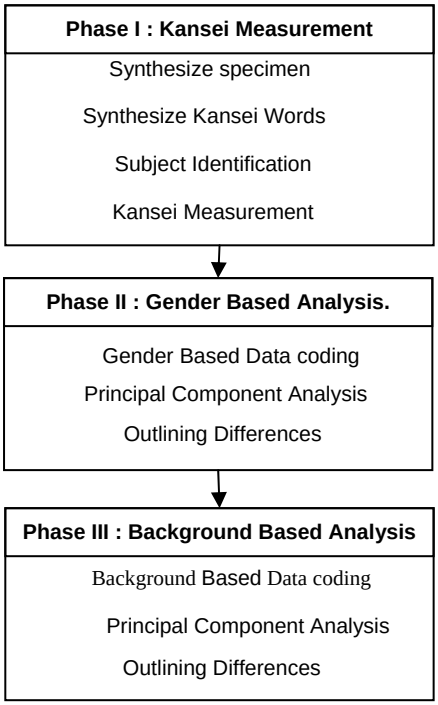

Figure 2: Research Method.

6 Kansei Measurement

We adopted Kansei Engineering methodology in the measurement of visitor's emotional responses in website design. Phase I begins with selection of specific domain. In the study, it is important to control the domain and subjects because 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 results. The context of web application chosen for this 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, Subjects Identification, and Kansei Measurement.

6.1 Synthesize Specimen

Initially, 163 online clothing websites were selected based on their visible differences in design such as colours, layouts, page orientations and typography. An investigation was conducted to identify detailed design elements in all websites in the context of what consumer's see in its interface feature. As a result, the study has identified 77 categories in design element, and 249 items as specified values in each design category identifiable from all websites.

All websites were then analyzed following a set of predefined rules in the study. From the analysis, 35 website specimens were finally used. The specimens are coded numerically from one to thirty-five where snapshot of the specimen can be seen in Table 1.

Table 1: Specimen and Code

ID	Specimen	ID	Specimen	ID	Specimen	ID	Specimen	ID	Specimen
1		8		15		22		29	
2		9		16		23		30	
3		10		17		24		31	
4		11		18		25		32	
5		12		19		26		33	
6		13		20		27		34	
7		14		21		28		35	

6.2 Synthesizing Kansei Words

Since Kansei is the state of consumer's internal sensation, the measurement process can be very challenging. In the measurement of visitor's Kansei in e-Commerce website, measurements are psychological as it deals with human emotional state. Hence, the most suitable measurement method is by self-reporting system. This is done by using words that describe the emotional expression associated to e-Commerce website. In Kansei Engineering, this expression is called Kansei Word (KW) [11].

In the study, KWs are used to represent emotional responses and were synthesized according to web design guidebook, interpretation by experts and pertinent literatures. Forty (*40)* Kansei Words were then selected according to their suitability to the described website. Among the synthesized words are *'adorable', 'professional'* and, *'impressive'* among others. These KWs are then used to develop checklist for website rating. The kansei checklist developed was organized in a 5-point Semantic Differential (SD) scale.

6.3 Subjects Identification

Before the evaluation, subjects were carefully selected in order to obtain accurate input in the Kansei measurement process. KE suggests that the most appropriate subjects are consumer from a target market group. Thus, the most appropriate subject group for e-Commerce website evaluation is web users. As previously mentioned, we have selected users that represent the population of web users categorized into gender and educational background group. This is in line with Kansei Engineering principle to investigate and induce specific end-user's Kansei into product design.

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 have 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.

6.4 Kansei Measurement

Selected 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 projected one by one in a large white screen to all participants in a systematic and controlled manner. Participants were then requested to rate their feelings towards the projected websites into the checklist according to the given scale within a timeframe of three minutes for each specimen. A short break was given at the fifteenth website specimen in order to avoid mental exhaustion. In proceeding with the sixteenth website specimen onwards, the order of checklist was changed to avoid bias. Each kansei evaluation session took approximately 2 hours to complete.

7 Gender Based Analysis

We analyzed the semantic space for our websites by principal component analysis using the averaged evaluation value for the evaluation session. In Phase II, we coded the averaged data according to gender differences, male and female. This is to organize information from the original data set into set of orders where kansei semantic space can be observed by gender. The result of PC loadings show the degree if kansei evaluation affecting variables which is then used to obtain KWs structure. The following analyses show results of differences in Kansei structure by gender.

7.1 Principal Component Analysis by Female Gender

Calculation of contribution ratio shows that the first two principal components represent 79.1% of the total variability. Thus, most of the data structure can be captured in the two underlying dimensions. This indicates that the structure of Kansei Words is highly influenced by the first two principle components. The remaining principal components account for a very small proportion of the variability and can be ignored.

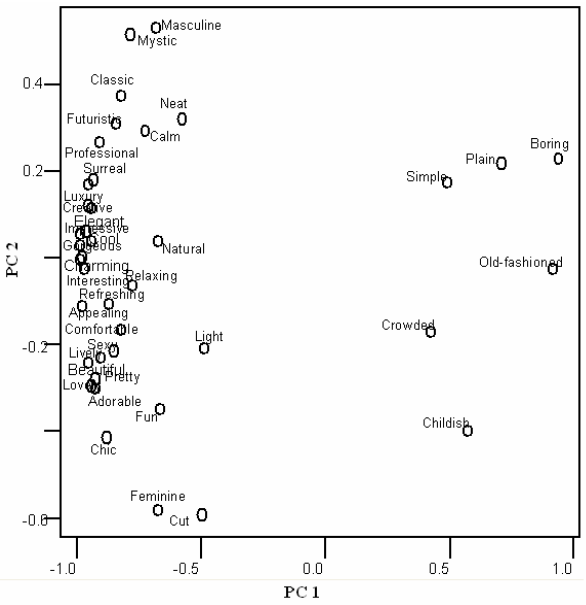

Figure 3: PC Loadings for Female Group

Figure 3 shows PC loadings for evaluation results from female group. We can observe a good distribution of variables to both axes, which proves that the measurement was successful. It is evident from the plot that the KWs that produced large negative first PC loadings (x-axis) are '*Charming'*, *'Impressive'*, '*Gorgeous'*, and so on. The dense area on the left hand side of the chart is corresponding to such KWs. On the other hand, KWs that produced large positive PC loadings are '*Boring'* and *'Old-fashioned'*. Thus, we label this PC as the axis of '*Attractiveness'*. We can expect that websites with lower scores on this component are likely to have higher sense of attraction and conversely.

Evident from the second PC loadings (y-axis), KWs that have positive large loadings are '*Masculine*' and '*Mystic*, and KWs that have negative PC loadings are *'Cute'*, *'Feminine'*, and *'Chic'*. Thus, we label 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. Result from female group suggests that Kansei structure on website design has two components, which are attractiveness and masculine-feminine. In addition, blending and balancing these two components are determinants of affective website design.

7.2 Principal Component Analysis by Male Gender

Calculation of contribution ratio shows that the first two principal components represent 75.3% of the total variability. Thus, most of the data structure can be captured in the two underlying dimensions. This indicates that the structure of Kansei Words is highly influenced by the first two principle components. The remaining principal

components account for a very small proportion of the variability and can be ignored.

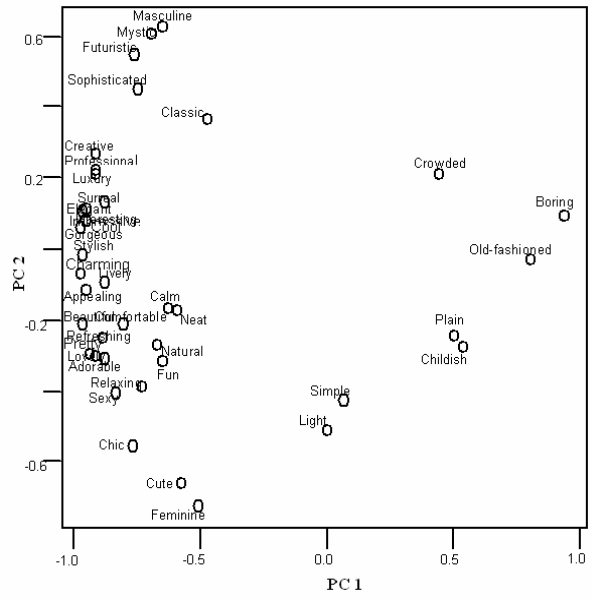

Figure 4: PC Loadings for Male Group

Figure 4 shows PC loadings for evaluation results from male group. Result from the PCA analysis shows that all Kansei are well distributed to both axes. It is evident from the plot that the KWs that produced large negative first PC loadings (x-axis) are '*Gorgeous'*, '*Charming'*, '*Beautiful'*, and so on. The dense area on the left hand side of the chart is corresponding to such KWs. On the other hand, KWs that produced large positive PC loadings are '*Boring'* and '*Old-fashioned*'. Thus, we label this PC as the axis of '*Attractiveness'*. We can expect that websites with a lower score on this component is likely to have higher sense of attraction and conversely.

In the second PC loadings (y-axis), KWs that have positive large loadings are '*Masculine*' and '*Mystic*', and KWs that have negative PC loadings are '*Cute*', '*Feminine*', and '*Chic'*. Thus, we label this PC as the axis of '*Masculine-Feminine'*. We can expect that websites with high scores on this component will tend to have high characteristic of masculinity and conversely.

Result from male group suggests that Kansei structure on website design has two components, which are attractiveness and masculine-feminine. In addition, blending and balancing these two components are determinants of affective website design.

7.3 Outlining Differences

The following table summarizes the difference in determinants from PC Loadings results for each gender background.

Table 2: Determinants by Gender.

Group		**1st axis**	**2nd axis**
Gender	Female	Attractiveness	Masculine-Feminine
	Male	Attractiveness	Masculine-Feminine

As can be observed from the comparison table, both genders suggest same determinants in designing affective website. This shows that Kansei structure for both genders, male and female, are similar.

8 Background Based Analysis

We analyzed the semantic space of the website specimens by principal component analysis using the averaged evaluation value for the evaluation session. In Phase III, we coded the averaged data according to their educational background. This is to organize information from the original data set into set of orders where kansei semantic space can be observed by educational background. The results of PC loadings show the degree of kansei evaluation affecting variables. The result could be used to obtain structure of KWs. The following analyses show results of differences in Kansei structure by educational background.

8.1 Faculty of Architecture, Building, Planning and Survey

Calculation of contribution ratio shows that the first two principal components represent 78.8% of the total variability. Thus, most of the data structure can be captured in the two underlying dimensions. This means, the structure of Kansei Words are highly influenced by the first two principle components. The remaining principal components account for a very small proportion of the variability and can be ignored.

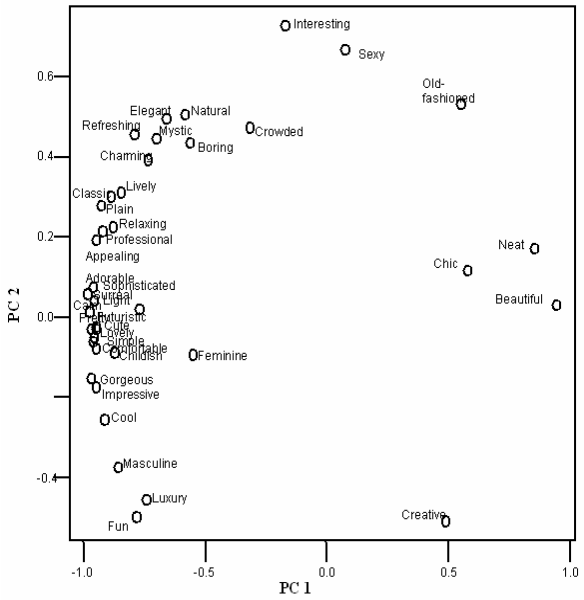

Figure 5: PC Loadings for Architecture, Building, Planning and Survey Faculty Group.

Figure 5 shows PC loadings for evaluation results from Architecture, Building, Planning and Survey faculty group. We can observe a good distribution of variables to both axes, which proves that the measurement was successful. It is evident from the plot that the KWs that produced large negative first PC loadings (x-axis) are '*Sophisticated*', '*Futuristic*', and so on. The dense area of the left hand side of the chart is corresponding to such KWs. On the other hand, KW that produced large positive PC loadings is '*Beautiful*' and '*Neat*'. We can represent this PC as the axis of '*Complexity*'. We can expect that websites with a lower score on this component is likely to appear more complex than in the contrary.

In the second PC loadings (y-axis), KW that have large positive loadings are '*Interesting*' and '*Sexy*', and KWs that have large negative PC loadings are '*Creative*' and '*Fun*'. We can represent this PC as the axis of '*Artistic*'. We can expect that websites with a low score on this component will tend to have high characteristic of artistic background and conversely.

Result from the Faculty of Architecture, Building, Planning and Survey group suggests that Kansei structure on website design has two components, which are '*complexity*' and '*artistic*'. In addition, blending and balancing these two components are determinants of affective website design.

8.2 Faculty of Business

Calculation of contribution ratio shows that the first two principal components represent 77.9% of the total variability. Thus, most of the data structure can be captured in the two underlying dimensions. This means, the structure of Kansei Words are highly influenced by the first two principle components. The remaining principal components account for a very small proportion of the variability and can be ignored.

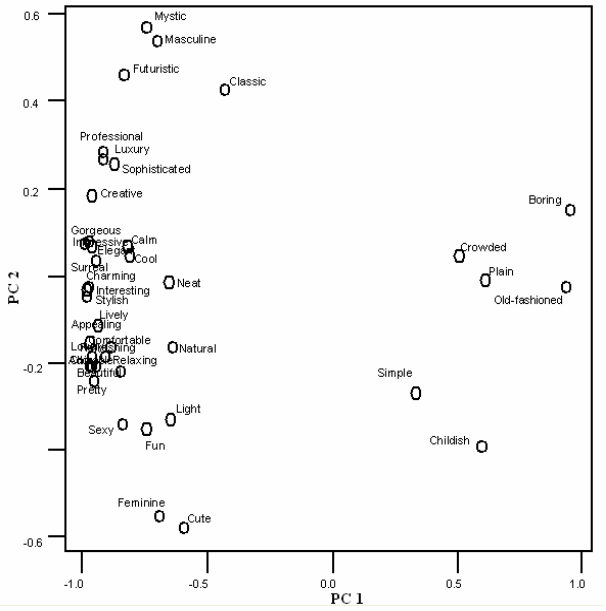

Figure 6: PC Loadings for Business Faculty Group.

Figure 6 shows PC loadings for evaluation results from Business faculty group. Result from the PCA analysis shows that all Kansei are well distributed to both axes. It is evident from the plot that the KW that produced large negative first PC loadings (x-axis) are *'Impressive', 'Interesting', 'Stylish'*, and so on. The dense area of the left hand side of the chart is corresponding to such KWs. On the other hand, KW that produced large positive PC loadings is *'Boring'* and '*Old-Fashioned*'. Thus, we label this PC as the axis of *'Attractiveness'*. We can expect that websites with lower scores on this component are likely to have higher sense of attraction and conversely.

In the second PC loadings (y-axis), KW that have large negative loadings are *'Cute'* and *'Feminine'*, and KW that have positive PC loadings are *'Masculine'* and *'Mystic'*. Thus, we label this PC as the axis of '*Masculine-Feminine'*. We can expect that websites with high scores on this component will tend to have high characteristic of masculinity and conversely.

Result from Business Faculty group suggests that Kansei structure on website design has two components, which are attractiveness and masculine-feminine. In addition, blending and balancing these two components are determinants of affective website design.

8.3 Faculty of Engineering

Calculation of contribution ratio shows that the first two principal components represent 71.1% of the total variability. Thus, most of the data structure can be captured

in the two underlying dimensions. This means, the structure of Kansei Words are highly influenced by the first two principle components. The remaining principal components account for a very small proportion of the variability and can be ignored.

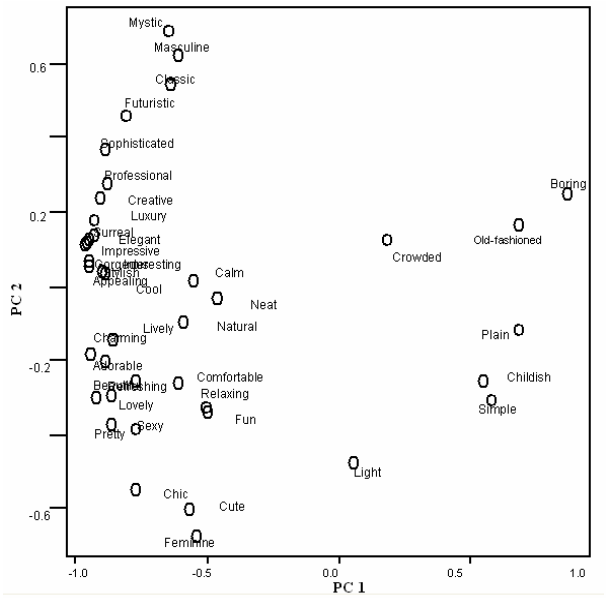

Figure 7: PC Loadings for Engineering Faculty Group.

Figure 7 shows PC loadings for evaluation results from Engineering Faculty group. We can observe a good distribution of variables to both axes, which proves that the measurement was successful. It is evident from the plot that the KW that produced large negative first PC loadings (x-axis) are '*Gorgeous'*, *'Impressive'*, *'Interesting'*, and so on. The dense area of the left hand side of the chart is corresponding to such KW. On the other hand, KW that produced large positive PC loadings is '*Plain'*, *'Boring'* and *'Old-Fashioned'*. Thus, we label this PC as the axis of "Attractiveness". We can expect that websites with lower scores on this component are likely to have higher sense of attraction and conversely.

In the second PC loadings (y-axis), KW that has large positive loadings is '*Cute'* and '*Feminine'*, and '*Chic*'. KW that has large negative PC loadings is '*Masculine'* and '*Mystic'*. Thus, we label this PC as the axis of '*Masculine-Feminine'*. We can expect that websites with low scores on this component will tend to have high characteristic of masculinity and conversely.

Result from Engineering Faculty group suggests that Kansei structure on website design has two components, which are attractiveness and masculine-feminine. In addition, blending and balancing these two components are determinants of affective website design.

8.4 Faculty of Information Technology

Calculation of contribution ratio shows that the first two principal components represent 73.0% of the total variability. Thus, most of the data structure can be captured in the two underlying dimensions. This means, the structure of Kansei Words are highly influenced by the first two principle components. The remaining principal components account for a very small proportion of the variability and can be ignored.

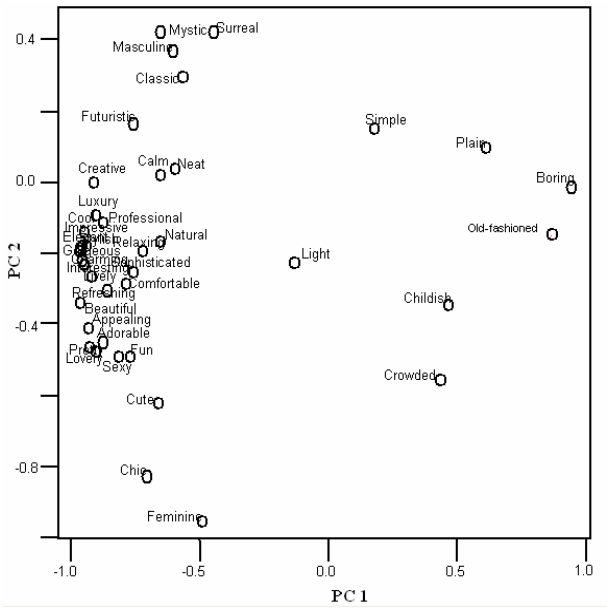

Figure 8: PC Loadings for IT Faculty Group.

Figure 7 shows PC loadings for evaluation results from IT Faculty group. Result from the PCA analysis shows that all Kansei are well distributed to both axes. It is evident from the plot that the KW that produced large negative first PC loadings (x-axis) are '*Beautiful'*, *'Gorgeous'*, *'Stylish'*, and so on. The dense area of the left hand side of the chart is corresponding to such KW. On the other hand, KW that produced large positive PC loadings is '*Boring'* and '*Old-Fashioned'* and '*Plain'*. Thus, we label this PC as the axis of '*Attractiveness'*. We can expect that websites with lower scores on this component are likely to have higher sense of attraction and conversely.

In the second PC loadings (y-axis), KW that has large negative loadings is '*Feminine'*, *'Chic'*, and *'Cute'*. KWs that have large positive PC loadings are '*Masculine* and *'Mystic'*. Thus, we label this PC as the axis of '*Masculine-Feminine*'. We can expect that websites with high scores on this component will tend to have high characteristic of masculinity and conversely.

Result from IT Faculty group suggests that Kansei structure on website design has two components, which are attractiveness and masculine-feminine. In addition, blending and balancing these two components are determinants of affective website design.

8.5 Outlining Differences

The following table summarizes the difference in determinants from PC Loadings results for each educational background.

Table 3: Determinants by Educational Background.

Group		1st axis	2nd axis
Educational background	Architecture, Building, Planning and Survey	Complexity	Artistic
	Business	Attractiveness	Masculine-Feminine
	Engineering	Attractiveness	Masculine-Feminine
	IT	Attractiveness	Masculine-Feminine

As can be observed from the comparison table, three groups suggest same determinants in designing affective website. Although Architecture, Building, Planning and Survey group appears to suggest different determinants, majority of the groups suggest similar result for affective web design. It is evident that at least one educational background shows different Kansei structure.

9 Conclusion

The study was performed to identify differences in Kansei structure by gender and educational background. The result shows that Kansei structure from both gender backgrounds is similar, and majority of educational background produces similar Kansei structure. With the result, we could conclude that gender differences and educational background of subjects used in the research instruments does not affect the result of determinants in affective web design.

Nonetheless, we acknowledge the slight difference of data distribution for each social group. Though minimal, it may call for further research to understand if there are additional design requirements necessary should a web site is designed for a particular social group.

Acknowledgement

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

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