

KANSEI ENGINEERING CONCEPT IN E-COMMERCE WEBSITE

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Abstract: In the early days of e-Commerce, web designers follow their intuition of how the website should look like. Further development of web design have seen for instance Nielsen's heuristic, which resulted designers to focus mainly on cognitive functionality and usability. However, as technology advances and e-Commerce matures, the affective quality has become important than ever. Affect has been proven to influence human cognitive judgments, and human first impression or primary affective responses to a website is seen to influence cognitive quality and higher order affect, such as Perceived Usefulness and Perceived Ease of Use. The study focuses at human Perceived Affective Quality, which looks at both valence and arousal dimension of affect, in the measurement of affective responses to an e-Commerce website. Kansei Engineering is a technique that is seen to enable the measurement and assimilation of the affective responses into perceptual design element. This paper presents the concept and framework of Kansei Engineering in e-Commerce websites. The framework provides systematic method of evaluating consumer's subjective emotional responses and ways to determine correlation of emotional responses with website design. Further research with empirical studies will enable to formulate guideline to design affective quality website. Result of such studies will help to increase understanding between web designers and users, and improve affective quality of a website. The design of affective quality website will result a paradigm shift from WYSIWYG to WYSIWYD.

Keywords: Affect, emotion, Kansei Engineering, Kansei e-Commerce website, Perceived Affective Quality

1. INTRODUCTION

According to recent research done by Forrester, online sales have reached nearly \$39 billion in 2005, and this has been 25% year-to-year increase. Thus, e-Commerce, which is the medium of online sales, has become more important than ever. In the early days of e-Commerce, web designers had followed their intuition of how their website should look like in every aspect that embodies the website. Later developments of web designs have seen, for instance the Nielsen heuristics [1], which resulted designers to focus mainly on cognitively convenient functions [2], [3], [4], [5].

However, as technology advances and e-Commerce rapidly matures, most e-Commerce websites are demonstrating equally good design features in terms of functionality and usability [6], [7]. With all other factors being equal, what may allow an e-Commerce to stand out is its ability to engender favorable customer experiences and affect [8]. Moreover, due to the luxury they get in cyberspace, today's e-Commerce websites users have now become sophisticated and skeptical. They are now looking for emotional connectivity in everything they see. Norman [7] and Desmet [9] have also supported that it has now become more and more important to include experiential and emotional quality in designs.

Most studies dedicated to e-Commerce website evaluation and use are based on the assumptions that a target customers spend at least a few minutes on a website, regardless whether they like it or not, and that good website features usually elicit positive cognitive evaluations and shopping experience [6]. The primary affective reaction or emotional responses towards the

website is missing [6]. According to psychology theories, this primary affective reaction occurs before one goes to cognitive process and higher-order affect [8], [10]. Affect has been found to influence decision making, perception, attention, performance, cognition and etc [6], [8]. Therefore, e-Commerce websites should induce desirable consumer experience and affect that influences its user's perception of the website. This in the end is seen to enhance the success and outreach potential of their online business.

2. AFFECT / EMOTION IN E-COMMERCE WEBSITE

This section discusses the concept of affect or emotion and its stands in the context of e-Commerce website evaluation.

Conceptual view of affect/emotion in e-Commerce website is shown in figure 1. There are two different sets of emotional dimensions developed in the emotions research domain [2], [11], [12]. The first set is called basic or primary emotions [12], which includes a small set of emotions that are generic to all human races and even to some animals, for instance the feeling of sad, fear and anger. The second set is called secondary emotions [11], which are multidimensional, domain specific emotions derived from the primary emotions, and elicited by external stimuli.

A concept that is closely related to the secondary emotion in the context of website evaluation is the affective responses. Consumer's evaluation of a website is based on its affective and cognitive quality [6]. Website evaluation has been focused on cognitive quality, but nowadays since consumers are flooded with

hundreds of thousands of e-stores, consumer's first impression might influence their cognitive judgment, and determine their success. Similarly, in the aspect of e-Commerce, the factor of visitor's primary affective responses have become more important than ever. According to psychology theories, the cognitive process and higher-order affect occur after or influence by the primary affective response [8], [10].

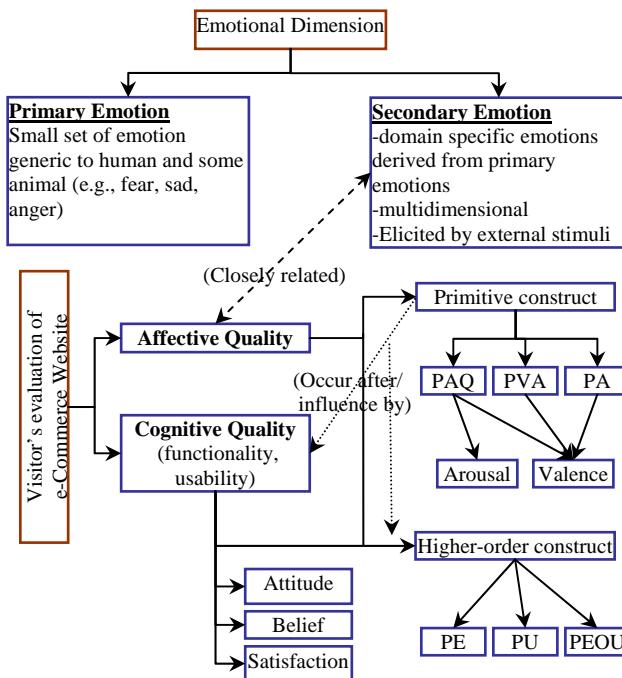


Figure 1 : Conceptual view of Affect / Emotion in e-Commerce Website

Previous studies have looked at Perceived Visual Attractiveness (PVA) and Perceived Aesthetics (PA), which focus on valence dimension of affect and its correlation with Perceived Usefulness (PU), and Perceived Ease of Use (PEOU) [6]. Valence value refers to the extent to which one is generally feeling good or bad [13]. However, arousal values such as interesting and captivating are also important. Li [6] in her paper of e-Commerce website evaluation and use has suggested Perceived Affective Quality (PAQ) to be such a primary construct that look at both valence and arousal affective values. PAQ is the primary affective reaction that user can obtain at first impression of a website.

As PAQ is now seen to be the important factor to influence users on a website, what matters next is how e-Commerce websites can deliver to users the desirable affective quality. Designing a stimulus that induces these values is the foundation in order to obtain user's positive judgment. In order to design such stimulus, critical thinking about how to quantify these user's PAQ is required.

3. KANSEI ENGINEERING

This section discusses the concept of Kansei Engineering, a method that is seen to enable the quantification of PAQ, using Kipling's 5W1H method to facilitate understanding in an orderly manner. The concept is presented in the order of 'What', 'Why', 'When', 'Where', 'Who' and 'How'.

3. 1. WHAT IS KANSEI ENGINEERING?

Kansei Engineering is a technology that combines Kansei and Engineering realms to assimilate human Kansei into product design targeting to engineer the production of goods that consumer will enjoy and satisfy with.

Kansei is a Japanese term which by definition from many dictionaries refers to sensitivity [14], sensibility and feeling. Psychologically, Kansei means the mental state where knowledge, feeling, and sentiment are harmonized, and people with rich Kansei is people who is full with rich feeling and sentiment, adaptive, warm and responsive [15]. The term Kansei has various interpretations by different literatures. Lee et al. [16] have classified the meaning of Kansei into five clusters.

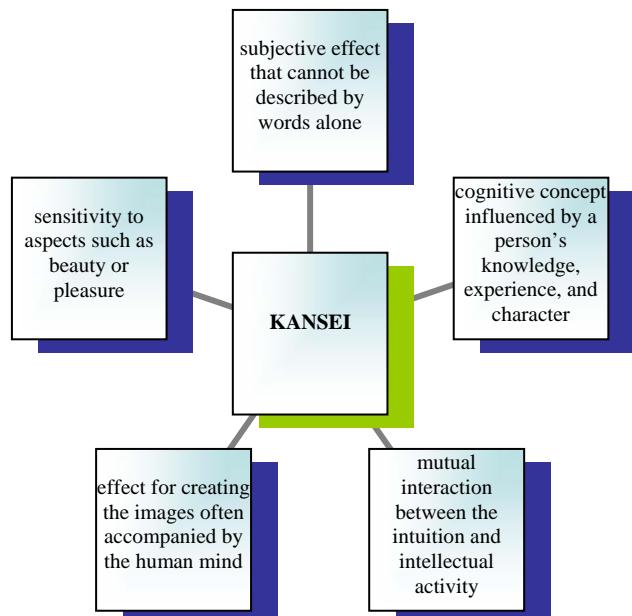


Figure 2 : Cluster of Kansei as adopted from Lee et al. [16].

Discerning the fact that the term 'Kansei' is originated in Japanese, therefore it must have indigenous meanings. This supports the claim that there is no direct translation that can perfectly describe Kansei in English [14], [15]. Despite sensitivity, sense, sensibility, feeling, aesthetic, emotion, affection and intuition as described by Lee et al [16], according to Nagamachi [15] the closest interpretation of Kansei is "psychological feeling" people have with a product. Nonetheless, since the more people try to describe Kansei in different way

the harder they can attain the true meaning, today the word 'Kansei' is being used as it is [15].

The concept of Kansei is also domain specific, subjective, and evoked by external stimuli. Schütte [17] in his paper described the concept of Kansei as closely connected to affective, emotional values of human beings.

The idea of Kansei Engineering nurtured in the 1970s as a result from the evolution of consumer's role in the market. In the earlier days when there were less types of products filling the market, producers followed their intuition and introduce new products. Consumers were naïve and bought the new inventions with no question asked. Nevertheless, later at the time the massive volume of products flooded the market and consumers started to look for quality when selecting a product.

Recognizing that consumers are now at the center of their business, producers battled to improve their product quality. Most of them concentrate on consumer's satisfaction in the design of new product. It was then, the producers realized that good quality product resulted longer lifetime and the buying activity would reduce. The need to look for another dimension of product value had again aroused targeting to motivate people to buy. This also means to improve the product development method to enable them to come out with new type of product. Businesses had then realized the importance to produce goods that is desired by consumer. Product design had then entered a new horizon, the consumer oriented design.

Professor Mitsuo Nagamachi of Hiroshima University was inspired at the time that most products' development methods just did not reveal enough understanding about consumers' feelings that enables their emotional needs to be satisfied. He pioneered a new method to design and develop product that can fulfill consumer's feelings and desire. According to him [15], businesses will not sustain if they do not make products that are sensitive to the diverse consumer feelings. Inspired by this, the idea of Kansei Engineering was then born.

Kansei Engineering targets to improve human well-being by looking into physiological and psychological aspects. Products that were developed by using Kansei Engineering is called 'Kansei product'. It is a product that assimilates human feelings and desire into its design element such as shape, color or feature.

Figure 3 presents product evolution from new product to quality product to desired product to Kansei product, illustrated over consumer maturity and time.

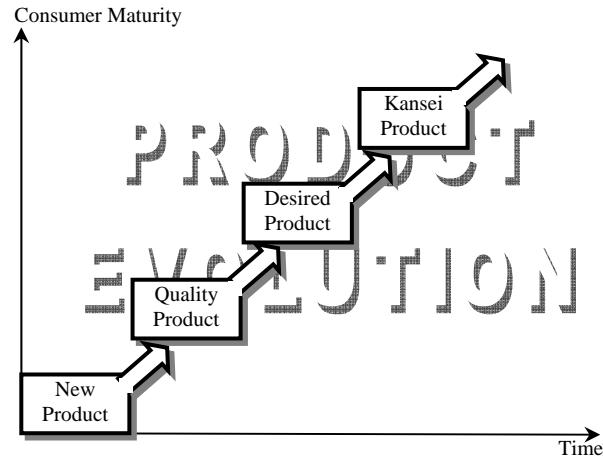


Figure 3 : Product evolution over consumer maturity and time.

3.2. WHY KANSEI ENGINEERING?

Let us talk in brief about hand phone invention. In the early era of hand phone, they were not many in the market. It was bulky in size and high in price. Those days, people buy because of their interest to new inventions, or they want to become one of the leading hand phone owners. Then different businesses battle with different kind of hand phone designs, and they flooded the market. This time people look for better quality hand phone to choose for, and consequently equivalently good quality hand phones flooded the market. Nokia, Panasonic, Vodaphone, you name it, all of them offers similar features; colorful, high resolution, polyphonic and the list keep mounting. So, which one will a consumer grab for?

Now, imagine this scenario; you want to buy a hand phone and you go to a hand phone store. You see various options of hand phones and take the trouble to surf from one store to another to look for the one that you want and make a choice. Think about it! What you have chosen is actually a kind of hand phone that you have already imagined, most of the time, unconsciously before even stepping into the stores. Therefore, the hand phone that meets your imagination wins your heart.

The scenario shows that actually consumer makes decision based on feelings and or emotions. Today, people's need for emotional satisfaction is growing and being acknowledged by producers [18], [19]. Unfortunately, when designing a product, designers tend to follow their intuition of what the product should be, in every aspect that embodies the product. Consequently, consumers are not satisfied with this kind of product since it somehow does not fulfill their feelings or image of the product, even though they are functionally reliable and meet to a certain standard.

Kansei Engineering is designed to capture these subjective consumer insights, synthesize them with the actual product design element, that is to map what

Kansei is associated to which element, so that the new product design embeds the consumer insights. As a result, when the product can predict that consumer will feel connected to them, you can imagine consumer will grab the product without even giving any thoughts. How brilliant!

3.3. WHEN TO USE KANSEI ENGINEERING?

Kansei Engineering can be performed at any point in the product development cycle where sensible flexibility exists in making decisions concerning any design aspects of the product. There is a technique in Kansei Engineering where producers can start from nothing, and begin to design a new product based on the targeted concept. Another technique enables designers/producers to reengineer an established product, and also recurring techniques in the product development cycle.

3.4. WHERE TO USE KANSEI ENGINEERING?

Even though most of product development by Kansei Engineering is Japan based company, the movement to another part of the world has also emerged. Other country's based businesses, academic researchers and practitioners have shown interest in the technique [18], [20], [21], [22], [23].

Additionally, implementation of Kansei Engineering until today has been seen in various field such as electronic home appliances, computer systems, automobile industries, cosmetic products, apparel product, community design and so forth [20]. It is not too much to say that Kansei Engineering can be adopted in every part of the world with possible issues such as culture and indigenous characteristic to be addressed.

3.5. WHO SHOULD USE KANSEI ENGINEERING?

Kansei Engineering has attracted not only industrial designers, but also academic practitioners and researchers in diverse field from psychology to robotic to neural science [20], and people from industrial design to marketing to engineering [21]. These suggest that everybody involves in any process and practice could utilize Kansei Engineering.

3.6. HOW TO PERFORM KANSEI ENGINEERING?

In principal, the process of performing Kansei Engineering can be represented as follows:

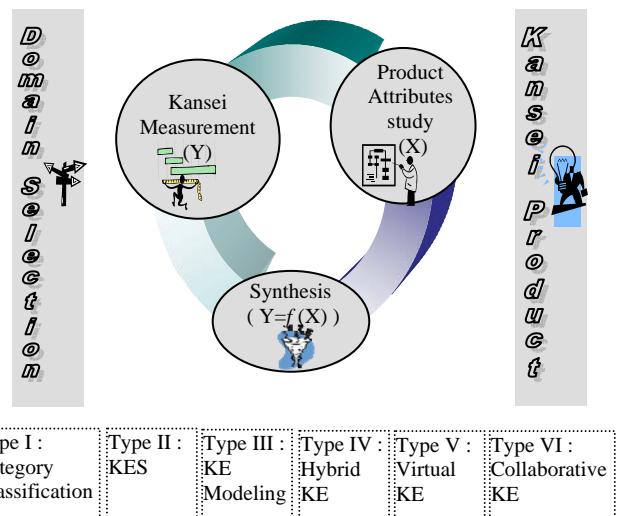


Figure 4 : Principle of Kansei Engineering.

3.6.1. DOMAIN SELECTION

This is the process of identifying specific domain to be investigated using Kansei Engineering technique. Kansei Engineering highlighted the importance of limiting a study to a specific domain since Kansei response is unique with different product [15].

Today, there are six types of Kansei Engineering technique as categorized by Nagamachi [24];

Kansei Engineering Type I: Category Classification

Category classification is a break down technique from a targeted concept for a new product to the associated subjective Kansei to the objective design elements.

Kansei Engineering Type II: Kansei Engineering System

This is Computer Aided Kansei Engineering System (KES). The KES comprises databases and inference engine to support a computerized system that handles process of interpreting consumer's feeling and emotion to perceptual design element.

Kansei Engineering Type III: Kansei Engineering Modeling

This type of Kansei Engineering utilizes mathematical modeling as logic in a computerized system. This is mainly used to handle fuzzy logic to form machine intelligence.

Kansei Engineering Type IV: Hybrid Kansei Engineering

This is a type of Kansei Engineering System (KES) by Forward KES and Backward KES to form Hybrid KES. This type of Kansei Engineering enables iterative process from design element to consumer's emotion.

Kansei Engineering Type V: Virtual Kansei Engineering

Virtual Kansei Engineering incorporates Kansei Engineering techniques into Virtual Reality, and enable consumer to examine Kansei product in a virtual world.

Kansei Engineering Type VI: Collaborative Kansei Engineering

Designers / consumers in different places utilize a mutual Kansei database and collaborate through a network to develop a new product design in this collaborative Kansei Design System.

Depending on the type of Kansei Engineering to employ, the process of Kansei measurement, identifying product attribute and synthesizing process differs accordingly.

3.6.2. KANSEI MEASUREMENT

Kansei measurement is the process of capturing consumer's internal sensation. Ishihara [25] classified Kansei measurement into physiological measures and psychological measures. Physiological measure targets to capture consumer behaviors, response and body expression by means of analysis of brain waves by electroencephalogram (EEG), muscular loads measurement by electromyography (EMG), eye movement and so on.

On the other hand, psychological measures deals with human mental state such as consumer behavior, expression, action, and impression by means of self reporting system such as Different Emotional Scale (DES), Semantic Differential (SD) scale or free labeling system. Sources of data can be from target consumers, experts, pertinent literatures, business magazine and the like.

3.6.3. PRODUCT ATTRIBUTE STUDY

Product attribute study is the process of identifying specific design features such as color, size, shape, functionality and so forth.

3.6.4. SYNTHESIS

The key ingredient to design and develop a successful Kansei product is to integrate consumer's physiological or psychological responses to product design characteristic. In this synthesis process, the main purpose is to derive which consumer's Kansei is highly associated to which product attribute so that the design element of each Kansei can be determined. Here, the data internal organization from Kansei measurement process and the relationship with the identified product design elements will be analyzed and translated into new design element.

3.6.5. KANSEI PRODUCT

Kansei product is a product resulted from the Kansei Engineering implementation. It is a product that assimilates human Kansei responses into its design element.

4. KANSEI ENGINEERING IMPLEMENTATION IN E-COMMERCE

This section discusses the implementation of Kansei Engineering in the field of e-Commerce and presents the concept and framework of Kansei Engineering implementation in e-Commerce website. The framework is targeted to enable the measurement of user's PAQ, so that which design element elicit what PAQ can be determined.

4.1. KANSEI ENGINEERING IN E-COMMERCE WEBSITE

Many studies have proven that Kansei Engineering works well with physical product [17], [21], [26], [27]. The question now is whether Kansei Engineering workable in e-Commerce websites. The answer is not certain, but it is worthwhile to find out. Current e-Commerce websites have relied heavily on functionality and usability. Targeting to win consumer they even invest for cutting-edge and trendy technology. Little work has been paid into the affective responses of the website visitors or potential customers. Furthermore, the excess of conventional marketing strategies or highlights to draw their attention, such as blinking text or multimedia for promo ad has resulted limited thought to the affectively inspired elements.

Today, the webspace has become crowded with equivalently good e-Commerce website features. They are many players: the big brands, new inventors, network marketing, giant to home businesses. They all provide features in every aspect that simulate physical activity and make easier for consumer to buy, from shopping basket to credit cards to home delivery! It is not too much to say that, today's users are showered with analogous e-Commerce website and they are more demanding and no longer naïve. The need for an e-Commerce website to stand out and offer immediate impact to an increasingly sophisticated and skeptical consumer is now greater than ever. Imagine if your website can read visitor's mind, enchant them to linger on and before they know it your product is in their shopping basket and they finally become your regular consumer! Fantastic, isn't it?

The key to converting a prospect to a customer is to provide desirable experiences across all interactions between the visitor and the website. Since today's consumer satisfaction is mainly based on emotional performance of products [7], [18], inducing appropriate emotion into homepages is becoming more important in practice [2]. This is because emotions were found to influence both users' memories of products and their decision processes when they purchased products [28].

However, little studies have focused on the affective quality aspects of websites, and a systematic guideline on how to produce websites that embeds the affective quality is in almost no existence. Nielsen's usability heuristics have touch on aesthetic design [1], but its focus was only to minimizing negative emotion related to usability such as anger, confusion, and frustration. Major focus have been given to usability test [29], [30], [31], [32], looking at only functionality aspects addressing for instance accuracy, speed and portability [33], [34], and has been ignoring the intangible aspect of user experience, especially affective quality. The study on positive emotion have been proving that things work better when user feels happy [7], and positive user experience over webspace can be enhanced by inducing rich human emotion into web design.

4.2. CONCEPT OF KANSEI ENGINEERING IN E-COMMERCE

This section presents the concept of Kansei Engineering in e-Commerce website.

Figure 5 illustrates the concept. The concept is derived from Kansei Engineering technique to quantify subjective emotion and classification of e-Commerce website design elements. Through the implementation of Kansei Engineering, user's subjective PAQ to an e-Commerce website can be quantified and by reflecting them to the website design elements, user's PAQ can be embedded into an affective e-Commerce website design.

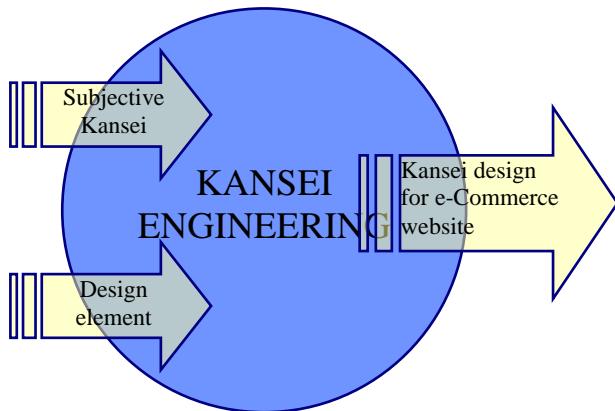


Figure 5 : Kansei Engineering concept for e-Commerce website.

The need to digest what elements or characteristics in a website design that have an impact on user's PAQ is foreseen to be possible by Kansei Engineering implementation. This is necessary to communicate user's PAQ about particular e-Commerce website and provide understanding between website designers and users.

4.3 FRAMEWORK OF KANSEI ENGINEERING IN E-COMMERCE WEBSITE

Figure 6 presents the framework of Kansei Engineering implementation in e-Commerce website.

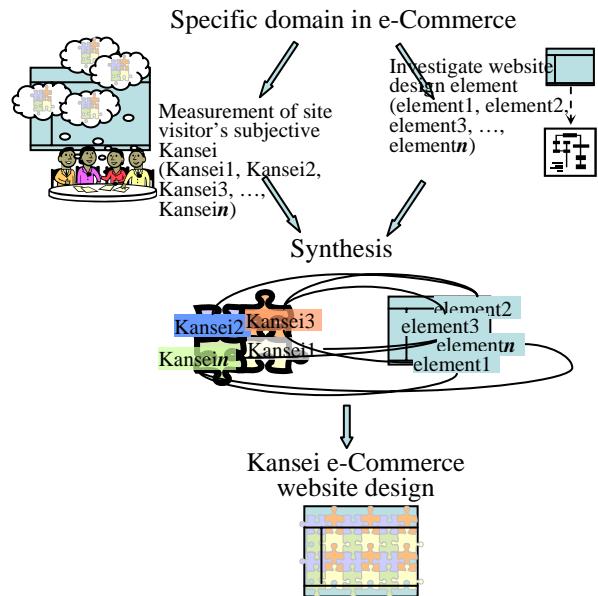


Figure 6 : Framework of Kansei Engineering in e-Commerce website.

In the context of e-Commerce, the domain which acts as stimulus for the measurement of PAQ, is the e-Commerce website itself. The Y process is the process of measuring Kansei, which represent user's PAQ of the e-Commerce website. The Kansei values are to be measured by self-reporting method against the website.

In X process, the e-Commerce website design element is to be investigated, and each element is to be investigated to further identify each value of the elements. Data from both X and Y processes will be synthesized to link between Kansei responses to design element. Method for the analysis can be quantitative or qualitative depending on the research method.

Finally, as the synthesis process will derive the link between Kansei and the website design, this result will form a guideline to the design of affective e-Commerce website.

5. CONTRIBUTIONS

This section presents contributions made by this study to the study of e-Commerce website evaluation and potential contribution made with empirical studies.

Table 1: Contributions made by the study.

| | |
|-----------------------------|---|
| Methodological Contribution | <ul style="list-style-type: none"> - Method to evaluate affective quality on e-Commerce website - Method to determine |
|-----------------------------|---|

| | | |
|------------------------|-------------------------------|---|
| | | correlation of affective responses with product design |
| Potential Contribution | Empirical Contribution : | - Empirical evidence of the state of affective quality in e-Commerce website. |
| | Methodological Contribution : | - Guideline to the design of affective website |
| | Theoretical Contribution : | - A paradigm shift from WYSIWYG to WYSIWYD |

Shown in table 1 are the contributions made by this study. The framework illustrates a systematic method of evaluating user's PAQ of a website and ways to determine correlation of affective responses with the website design.

Further research with empirical studies will enable to determine the state of affective quality in e-Commerce website.

Result of such empirical studies will help web designers, researchers, e-retailers and other stakeholders to understand which design element elicits what kind of affective responses from the website users. Thus enable them to devise strategies to improve website affective qualities, whereby positive affective qualities are proven to influence visitor's affective and eventually cognitive judgment.

The result will also enable to form guideline to the design of affective e-Commerce website. Ultimately, the design of affective website will result a paradigm shift from "What You See Is What You Get" to "What You See Is What You Desired".

6. CONCLUSION

Many studies have proven that Kansei Engineering works very well in the engineering field. In the webspace, Kansei Engineering implementation is still in its infancy with a few suggestions done in the field of emotion. There is a need to explore the implementation of Kansei Engineering in e-Commerce and the most important step now is to start the work to find the answers.

The concept and framework presented in this paper is based on previous studies involving Kansei Engineering and emotion/affect. Kansei Engineering is an important solution to induce human affective responses into a new product design. The design of websites used to concentrate on usability and functionality. However, the increasing consumer demand has lead to the need for designers to introduce website that induce human emotion. By analyzing the emotional responses to business websites, web designers can devise strategies to enrich user experience and ensure that the

target consumers' feelings and emotions are addressed. Moreover, as emotions influence decisions and usability facilitates easy interactions, e-Commerce website can benefit significantly from increased consumer conversions and retentions, enhance user experience, encourage purchases and ultimately increase profit.

Of course, there is always considerable risk in adopting Kansei Engineering. Other than culture that is known to be different even in the same region, indigenous characteristic will also need to be taken into count.

In this paper, the extension of Kansei Engineering to e-Commerce website is conceptualized and a framework is presented. Currently, research is in progress targeting to employ Kansei Engineering to induce human affective responses into the design of e-Commerce website based on the developed concept and framework.

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