CHAPTER 2

LITERATURE REVIEW

2.1 Overview

The research on product emotion has widely discussed how emotional design works better than useful and usable design (Desmet, 2002; Hekkert et al., 2003; Norman, 2004; Tractinsky, 1997). Similarly, recent research on the emotional aspect of website is gaining attention (Dillon, 2001; Egger, 2001; Kim et al., 2003; Lee et al., 2001; Li & Zhang, 2005; Okada & Tejima, 2003; Overbekee et al., 2004; Schenkman & Jönsson, 2001; Siu & Ho, 2005; Thielsch, 2005; Wong, 2004; Yoon & Lee, 2003; Zhang et al., 2000). This especially makes sense in the context of online business, where capturing visitors attention to stay on their website become crucial when there are vast competitors readily available over the Internet (Li & Zhang, 2005). However, although the interest of emotional aspect of website design is increasing, knowledge that supports the development of website that engage emotional connectivity is lacking. While design requirements that support the development of useful and usable website system is currently available (Backlund 2001; Garret, 2003; Ivory & Hearst, 2001; Krug, 2000; Lederer et al., 1998; Lam, 2001; Lee et al., 2003; Marcus & Gould, 2001; Nielsen, 2000; Powell, 2002; van Welie et al., 1999; Zhang et al., 1999; Veen, 2001), design requirements to develop website that embeds target emotion is absent.

Before this research endeavours to fill in the gap, it must grasp a reasonable understanding of the theory of psychology and emotion and how it relates to human well being. The chapter accordingly investigates the theory of emotion, the arguments that took place, and the definition and classification if exist. This research then argues the emotional dimension that fits to its intended investigation. The

science of design is also discussed as to justify the need of a scientific study to the emotional design of website.

The chapter continues with providing backgrounds in web design positioning the investigations of issues in web design, website evaluations and emotional aspect of user experience in web design. Over the past decade, a variety of contributions have been published discussing emotional user experience with interactive systems and to provide theoretical understanding of emotional user experience (Dillon, 2001; Egger, 2001; Kim et al., 2003; Lee et al., 2001; Li & Zhang, 2005; Okada & Tejima, 2003; Overbekee et al., 2004; Norman, 2004; Schenkman & Jönsson, 2001; Siu & Ho, 2005; Thielsch, 2005; Wong, 2004; Yoon & Lee, 2003; Zhang et al., 2000). However, these literature either lack of empirical evidence or focus on functional aspects, and therefore insufficient to address the emotional aspect of user experience comprehensively. Thus, this research addresses a more comprehensive study providing empirical evidence in the aspect of emotional user experience.

Finally, the chapter reviews existing method in evaluating user experience as to explore their suitability to this research approach. The chapter concludes with the attention to Kansei Engineering as a suitable methodology to be used in this research. A detail description of Kansei Engineering is provided in Chapter 3.

2.2 The Design Science

Definition of design goes around human experience, skill and knowledge which concerned with man's ability to conceive, plan, and realize products that serve human beings in the accomplishment of any individual or collective purpose (Archer, 1973; Buchanan, 2000). In the discipline, there are design principles that generally apply to any piece of work one may create. The creativity in applying those principles determines how effective a design is in conveying the desired message and how attractive it appears. The principles are various and used in all visual design fields, including graphic design, industrial design, architecture and fine art. They

differ both between the schools of thought that influence design, and between individual practicing designers. Among the principles, there are balance, unity, harmony, contrast, and emphasis (Howard, 1997; McClurg-Genevese, 2005; Porter, 2007).

The concern to 'scientise' design emerged when people see a desire to produce works of art and design based on objectivity and rationality (Cross, 2001). His work described that this aspiration has marked the launch of design methodology as a subject or field of enquiry. In the article, he laid down the chronological order of 'design science revolution', based on science, technology and rationalism, to overcome the human and environmental problems that are believed could not be solved by politics and economics. Hubka and Eder (1987 as in Cross (2001)) defined design science as the following:

'Design science comprises a collection (a system) of logically connected knowledge in the area of design, and contains concepts of technical information and of design methodology... Design science addresses the problem of determining and categorizing all regular phenomena of the systems to be designed, and of the design process. Design science is also concerned with deriving from the applied knowledge of the natural sciences appropriate information in a form suitable for the designer's use...'

The definition suggests that in designing any artefacts we must pursue systematic knowledge of the design process and methodology as well as the scientific and technological underpinnings of the artefacts.

Parallel with these connotations, this research argues that, in order to design website that embeds target emotion, we need to find a design method that is founded to scientific knowledge that underpin the structure of the targeted emotion in the artefact.

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2.3   Psychology and Emotion

Research in psychology seeks to understand and explain thought, emotion, and behaviour. Psychology is the study of the soul or mind which involves the scientific study of human or animal mental functions and behaviours. Theories about the soul stretch back as far as the Ancient Greek as Plato and Aristotle. Plato distinct structure of the soul into three components: cognition, emotion/affect/passion, conation/motivation (Scherer, 1994). Inspired by Plato, Aristotle defines, explicates, compares and contrasts various emotions, and characterizes emotions (Leighton, 1982). He observed 'Emotion' as; the things on account of which the ones altered differ with respect to their judgments, and are accompanied by pleasure and pain: such are anger, pity, fear, and all similar emotions and their contraries (Aristotle, 350 B.C.E.; Aristotle, 1378a20-23, as in Leighton (1982)).

Thereafter, theorists have incorporated multiple perspectives of emotion in their work. Some influential theorists include Barrett (1997), a social psychologist specializing in affective science and human emotion, Damásio (1980), behavioral neurologist and neuroscientist, Ekman (1972), psychologist specializing in study of emotions and their relation to facial expressions, Frijda (1986), psychologist who specializes in human emotions, especially facial expressions, Scherer (1994), psychologist specializes in the psychology of emotion, de Sousa (1980), philosopher who specializes in the philosophy of emotions, philosophy of mind and philosophy of biology.

Since Plato, there have been many arguments on how emotion should be classified (Aristotle, 350 B.C.E., Leighton, 1982; Scherer, 1994). Scholars in the emotional research domain (Griffiths, 2002; Ekman, 1999; Russell, 1980; Russell, 2003; Tractinsky, 2004) have developed two different sets of emotional dimensions:

i.   Basic or primary emotions, 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.

ii.   Secondary emotions, which are multidimensional, domain specific emotions derived from the primary emotions, and elicited by external stimuli.

Russell (2003) developed circumplex model that classify the dimension of emotion into a bi-polar dimension of valence (pleasure-displeasure) and arousal (sleepy-activated). Ekman (1999) divided emotions into basic and complex categories, where some basic emotions are modified in some way to form complex emotions. Plutchik (1980) proposed a three-dimensional "circumplex model" which describes the relations among emotions presenting dimension of intensity, and degrees of similarity among the emotions. Scherer (2005) placed emotions within a more general category of 'affective states' where affective states can also include emotion-related phenomena such as pleasure and pain, motivational states (e.g. hunger or curiosity), moods, dispositions and traits.

Emotion is one of the strongest differentiators in user experience namely because it triggers unconscious responses to a product (Spillers, 2004). While being unconscious as it is natured, the dimension of product emotion is complex. Hekkert et. al. (2003) found that every product characteristic affects user experience, which can be complex and multi-faceted. Desmet & Hekkert (2007) discussed three components or levels of product experience: aesthetic pleasure, attribution of meaning, and emotional response. They defined product experience as,

'…the entire set of affects that is elicited by the interaction between a user and a product, including the degree to which all our senses are gratified (aesthetic experience), the meanings we attach to the product (experience of meaning) and the feelings and emotions that are elicited (emotional experience)…"

Emotion is also subjective experiences from an individual point of view. The idea of emotional experience is parallel with Norman (2004) that asserted emotion as having a crucial role in the human ability to understand the world, and how they learn new

things. According to him, user's affinities for an object that appeal to them are due to the formation of an emotional connection with the object (Norman, 2004).

From dispositions of the above literature, it is reasonable to conclude that the design of a product affects human emotion, and good product design is the design that elicits positive appeal to users. Parallel with Norman (2004), users get attracted to certain product if the product arouses emotional connectivity with them. Among the emotional theories explicated by the above mentioned scholars, Russell's circumplex model of affect is adopted to describe emotional dimension investigated in the study. Russel (1980) defined affective structure using a two-dimension space, i.e. valence (pleasure-displeasure) and arousal (sleep-arousal). Each dimension is a continuum ranging from one intense to its opposite.
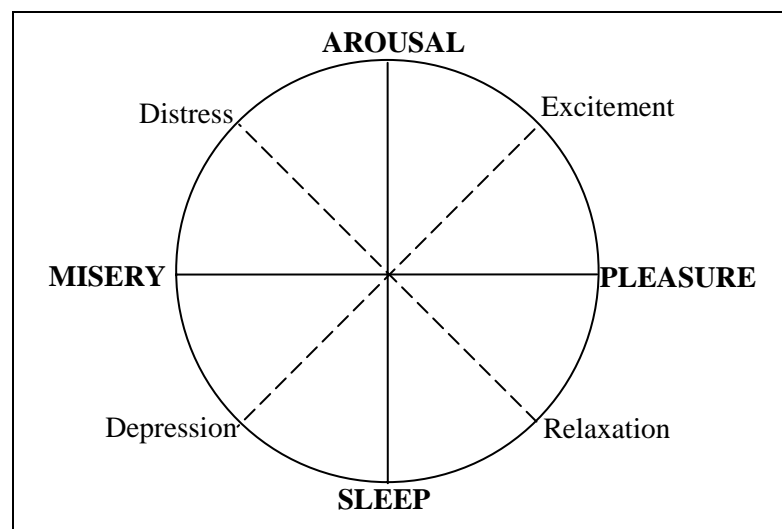

Figure 2.1: Russel Circumplex Model of Affect (1980).

The comprehensiveness of the description of the structure of emotion in the model is seen as most suitable in the study. Li & Zhang (2005) in the study of the influence of website characteristic to user's Perceive Affective Quality, asserted that most affective feelings could be represented in this space. They posited that both dimensions have been found to be fundamental components of affective constructs in e-commerce website evaluation studies, e.g. "exciting" is a blend of pleasure and arousal; and "gloomy" is somewhere between displeasure and sleep. Thus, the study attempts to investigate emotion within the dimension of both valence and arousal in

the study of user's emotional responses to e-Commerce website, to offer a balance consequence in the intended outcome.

2.4   Users and Design

People often take for granted that everything around them are designed and that design decisions impact nearly every part of their lives, be it the TV screen that they see, the chair they sit on, the car they drive in, or the stairs they climb on. Only when those things do not work as they expected, they start to realize the importance of good design. Donald Norman (1988) has brought a strong case of needlessness of badly designed everyday objects.

While his view counterparts Nielsen's in their reasoning of user experience in terms of product functionality and usability (Nielsen, 2000; Norman, 2002), he shifted to emotional aspect of a product after he realized that attractive things really do work better (Norman, 2004). Although he used to be known as a critic of unusable things but he has transformed himself into an advocate for pleasurable and enjoyable products. He asserted that successful products should be a pleasure to use, and convey a positive sense of self, of accomplishment, and pride of ownership (Norman, 2004). He draws theory that human emotional reaction to design exists on three levels: visceral (appearance), behavioural (performance) and reflective (memories).

Users are the people who will use the final product or artefact to accomplish a task or goal (Abras, Maloney-Krichmar & Preece, 2004). Good design begins with the needs of the user, and no design, no matter how beautiful and ingenious, is any good if it does not fulfil a user need (Norman, 2004). He pointed that finding out what the customer wants is the first stage of what designers do. The designer then develop product based on the results with a mixture of creativity and commercial insight. Although gut instinct is part of the designer's arsenal, there are more scientific ways of making sure the design achieves the target. Different designers use different

methods, combining techniques of market research, user testing, and prototyping and trend analysis.

Donald Norman's research laboratory at the University of California San Diego (UCSD) originated the term 'user-centred design' (UCD) in the 1980s, which addresses user's perspective in design processes and allow end-users to influence how a design takes shape. The term became popular after the publication of a co-authored book entitled: User-Centered System Design: New Perspectives on Human-Computer Interaction (Norman & Draper, 1986). Since then, many literature involving user as important part in design processed have emerged, and users became a central part of the development process (Abras et al., 2004; Nielsen, 1993; Norman, 2004; Preece, Rogers & Sharp, 2002).

Table 2.1 shows the technique used in involving users in the design cycle. The table illustrates the kinds of techniques, the purpose and the potential occurrence point in the design life cycle.

Table 2.1: Users and Design. (As in Preece et al., 2002)

Technique	Purpose	Design Cycle
Background Interviews and questionnaires	Collecting data related to the needs and expectations of users; evaluation of design alternatives, prototypes and the final artefact	At the beginning of the design project
Sequence of work interviews and questionnaires	Collecting data related to the sequence of work to be performed with the artefact	Early in the design cycle
Focus groups	Include a wide range of stakeholders to discuss issues and requirements	Early in the design cycle
On-site observation	Collecting information concerning the environment in which the artefact will be used	Early in the design cycle
Role Playing, walkthroughs, and simulations	Evaluation of alternative designs and gaining additional information about user needs and expectations; prototype	Early and mid-point in the design cycle
Usability testing	Collecting quantities data related to measurable usability criteria	Final stage of the design cycle
Interviews and questionnaires	Collecting qualitative data related to user satisfaction with the artefact	Final stage of the design cycle

Since the work of Nielsen and his associates (1990s), a variety of techniques have been developed to support UCD including usability testing, usability engineering, design principles and participatory design. It is evident form the above literature that involving users in design has become unavoidable to lead the development of more satisfying designs (Abras et al., 2004).

Similarly in the scope of this research where Website Emotion is the centre of attention, to successfully design a website that engage emotional connectivity, involving users in determining emotional design requirement is essential. Assumptions cannot be made and scientific investigation with users involvement must be performed.

2.5   Web Design

The Web, or World Wide Web, is often mistakenly used as a synonym to the Internet. While they compliment each other, the history of Internet started decades before the Web. Left aside the Internet technology jargons such as ARPANET, TCP/IP, HTTP, the context of this chapter focus to the design of a web page. The definition of "Web Design" can vary depending on situations, but basic answer is that web design is the design of a web page or website, including the information and UID. Web design is a multidisciplinary pursuit pertaining to the planning and production of websites, including, but not limited to, technical development, information structure, visual design, and networked delivery (Powell, 2002). While design is the art and process of combining individual elements of design into a pleasing arrangement, web design is the art and process of creating a single web page or entire web sites and may involve both the aesthetics and the mechanics of a website operation although primarily it focuses on the look and feel (Garret, 2003; Krug, 2000; Nielsen, 2000; Powell, 2002; Veen, 2001).

The building blocks of web design is called the design elements. There are many literature that explicate classification of design elements. Among others, the elements

of web design are classified to content, layout, delivery, objective and technology (Garret, 2003; Powel, 2002; Veen 2001). Figure 2.2 illustrates the classification of the elements of web design.
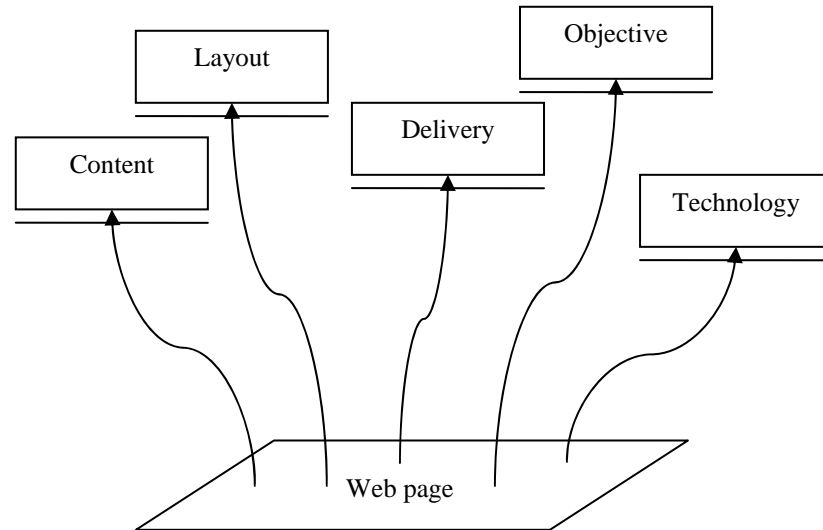
Figure 2.2: Classification of Web Design Elements.

In the classification, 'Content' deals with everything you see on the surface of a web page, such as text, images, illustrations, and other visible elements on a web page. 'Layout' deals with the placement of text, images, buttons, and other relevant elements on a web page. 'Delivery' deals with the speed and reliability of a site's delivery over the Internet or an Intranet related to the server hardware/software used and the kind of network architecture employed. 'Objective' deals with the reason the site exists. 'Technology' deals with the use of various core web technologies such as HTML or CSS ranging from client-side scripting languages like JavaScript to server-side applications such as Java servlets.

In this research where it attempts to investigate user experience at first sight when visiting a website, it concentrates on content and layout aspect of design elements. This research calls both elements as visual design since it is the most visible aspect of web design from the user's view point.

2.6   Issues in Web Design

Since the birth of the Web in 1980's, discussion on the aspect of web design has grown rapidly. Much has been written in technological and graphical aspect of web design, e.g. what makes a good design (Buchanan, 2000; Howard, 1997; Porter, 2007; Prasad, 2008), and usability of a web site (Backlund, 2001; Bevan et al., 199; Lam, 2001; Nielsen, 1994; Nielsen, 2000).

Pioneered by the work of Nielsen and his associate since 1990s, previous literature have indicated that common argument of Web design is the focus on users (Garret, 2003; Marcus & Gould, 2001; Li et al., 2001; Nielsen, 1994, Song & Zahedi, 2001). A common mistake made in Web development is that, far too often, sites are built more for designers and their needs than for the site's actual users (Powell, 2002). Designers fail to realize that what they understand is not always what a user will understand. As a designer, they have extensive knowledge to the technicality of a web site, e.g. where to put certain information, what is the state-of-the-art technology, and how to render pictures. No matter how carefully a designer builds a website with their imagination and skill levels, visitors of the website may not simply be attracted to it. Given the importance of the user's interests and desires, it might seem appropriate to simply ask the users to design the site the way they want.

However, one cannot simply be a Web designer. Powel (2002) writes and analogy as the following:

> *"Just as it would seem foolish to let moviegoers attempt to direct a major motion picture on the basis of their having viewed numerous movies, we should not expect users to be able to design websites just because they have browsed a multitude of sites. Users often have unrealistic requirements and expectations for sites. Users will not think carefully about the individual components of a Web site."*

Obviously, users do not have the sophisticated understanding of the Web that a designer would have. On the other hand, designers do not have the idea of what users see and perceived from the design of a website. Collectively, as evident form the above literature, it is deemed important to research what users see and what designers can do about it in the production of a website. This research argues that it is highly due to establish a method that offers solution to achieve such understanding between designers and users. This method must have capability to translate user's input into design requirements that is understandable by designer advocates. Hence, utilizing the discovered knowledge, such website that geared to user's desire can successfully be developed.

2.7 Website Emotion

HCI issues related to e-Commerce website pointed out that the evaluation of Website UID has lacking in the dimension of primary affective reaction or emotional responses towards the website (Kim et al., 2003; Li & Zhang, 2005). Previous literature have suggested that affective reaction is a factor that promotes online shopping (Bhattarcherjee, 2001; Constantinides, 2004; Griffith, 2002; Kim et al., 2003; Li et al., 2001). This is because e-commerce websites have gone beyond the function of conveying information to the extent of providing persuasive engagement with website visitors through the lively process of perception, judgment and action.

Affect has been found to influence aspects such as decision making, perception, attention, performance, and cognition (Norman, 2002; Pettinelli, 2009; Tractinsky, et al 2000). Consequently, this research argues that e-Commerce websites should induce desirable consumer experience and emotion that influences user's 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 user's experience driven by emotional factors (Dillon, 2001; Spillers, 2004). Donald Norman, an advocator of emotional design discussed the notion of emotional design through elements of visceral, behavioural and reflective factors (Norman, 2004). He illustrated that 'Visceral' design concerns itself with appearances, 'Behavioral' design has to do with the pleasure and effectiveness of use, and 'Reflective' design considers the rationalization and intellectualisation of a product. His views, parallels the view of Englelsted (1989, as in Aboulafia & Bannon, 2004) who discussed three temporal categories of emotions, namely affect, emotion, and sentiment. Affect is a brief emotional state often in response to environmental stimuli; emotion is less situational than affect, and tends to be based more on memory and causality; sentiment is the longest lasting emotional state, and tends to include such feelings as love and hate. This research argues that in terms of e-Commerce website emotional design for desirability, visceral factors or affect that is the emotional state that results from a response to the external stimuli is more pertinent.

Mahlke and Thüring (2007) studied affect and emotion as important parts of the user's 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 user's emotion from emotional evaluation procedures. In addition, they developed the Component of User Experience (CUE) model as illustrated in Figure 2.3 that clearly illustrates subjective feelings as a component of emotional user reaction.
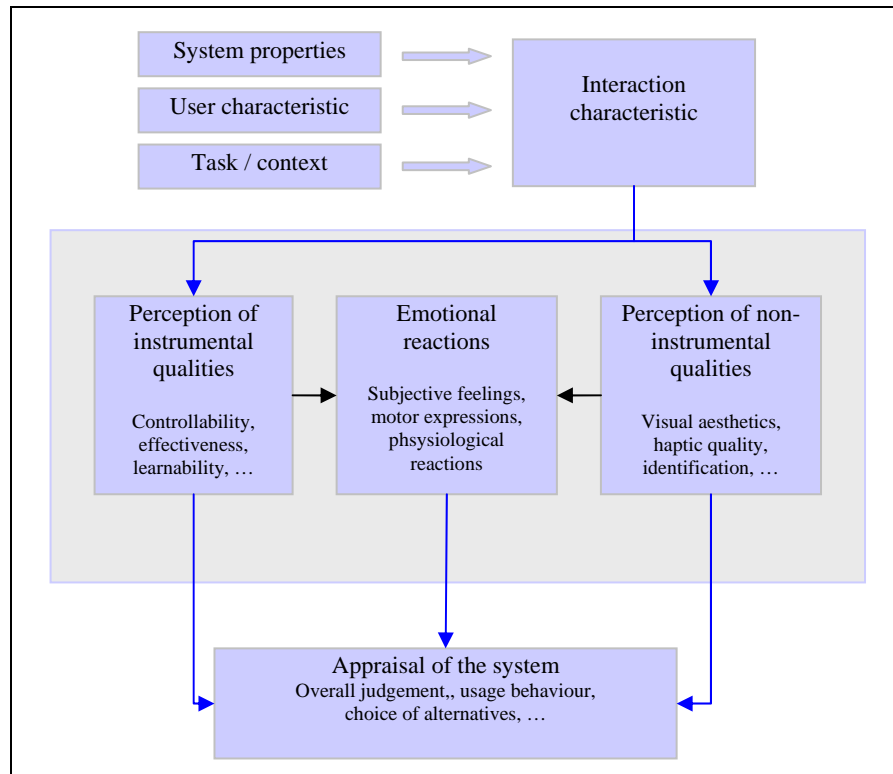
Figure 2.3: Components of User Experience Model. (Mahlke & Thüring, 2007).

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

Also, conclusively from all the above explicated literature, this research suggests that Website Emotion can be defined as emotions elicited by website appearance, i.e. the visual design of a website interface.

2.8   E-Commerce Website Evaluation

Internet shopping has become popular fashion for consumer to buy products or services they desire. Online sales have reached nearly $39 billion in 2005, and this has been approximately 25% year-to-year increase (Forrester Research Inc., 2005). In line with this encouraging fact, businesses have been putting strength and effort in convincing customer to buy their product. In the physical world, retail merchants convince customer by store design, concept, layout, and product presentation. Accordingly, internet retailers have also been putting efforts on their web presence. Nonetheless, the approach is different between physical and virtual world. In the absence of physical interaction, focus is to attract website visitor to stay even longer on the website and convert them to potential customer.

Today, website has become an essential tool for e-Businesses to attract consumers, display products, provide services and complete transactions. 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. Previous literature have indicated that visitor's evaluation on websites significantly affects their browsing behaviours and purchase decisions (Bhattacherjee, 2001; Constantinides, 2004). However, the literature involving website evaluations were grounded to the assumption that visitor will stay on the website to find aspect of attractions and positive cognitive experience is evoked by enjoyable features on the website (Li & Zhang, 2005).

In real life, visitors will jump from one website to another if they do not get attracted to stay longer on one website. Especially in present scenario where all kind of businesses put their presence on the Internet, and potential consumers have vast choices of electronic store to make purchase. This indicates that if an e-store cannot capture visitor's interest at first sight, it can even be out of business no matter how attractive the technology featuring the website or how good quality of the product offered (Li & Zhang, 2005). The critical part is to first and foremost persuade

visitors to stay on their website, before they can think about further process of judgement.

The aspect of cognitive and affective quality has been discussed in many literature in the context of website evaluation and use (Bhattarcherjee, 2001; Griffiths, 2001; Kim et al., 2002; Li & Zhang, 2005). Li & Zhang (2005) apply Russell's theory of affective quality (Russell, 2003) to better understand the role of emotions in e-Commerce website evaluation. Kim et al. (2003) focused on specific design dimensions to improve aesthetic quality. They conducted empirical studies with professional web designers and users to identify critical factors for the visual aesthetics of websites. They found that users rated the quality on a specific aesthetic dimension higher if the designer had focused on the critical factors when designing websites.

Backlund (2001) employed Nielsen usability heuristic in developing prototypes and conducted usability testing to study the usability and utility of the interface in job offering websites. Marcus and Gould (2001) highlighted the cultural dimension implementing the use of renowned Hofstede (1997) theory in the design of website interface. Thielsch (2005) addressed aesthetic perception of websites and its relationship with usability. Lee & Benbasat (2003) reported the effects of web interface features on user responses such as attention and memory. The study has empirically shown that interface features, fidelity, motion, and the interaction between fidelity and motion, play important roles in influencing user's attention reactions in e-commerce settings, while size influences people's recall of pictorial aspects of the products displayed.

Sutcliffe (2002) addressed evaluation of attractiveness and usability criteria during the stages of interaction with e-commerce websites. Siu & Ho (2005) investigated psychological feelings and web interface features for the design of a web page. They performed empirical study to investigate he design of the web pages' visual appearance based on "font type", "font colour", and "image size". The result indicated that the design of visual appearance based on "font type", "font colour",

and "image size", as suggested by design guidebooks, is unable to provide positive sentiments.

As evident from previous literature, early studies on website evaluation have focused on cognitive quality (Kim et al., 2002; Li & Zhang, 2005; Nielsen, 2000). Obviously, the above theoretical and empirical evidence suggest that IT artefact such as website does contain certain affective quality, and that the affective quality impacts its user's perception. Therefore, this research argues that e-commerce websites, as one of IT artefacts, should embed certain affective quality that influences its user's perception.

Theorist is emotional research domain suggested the role of primary emotional responses as preceding and influencing higher order cognitive process and affect (Pettinelli, 2009; Russell 2003; Tractinsky 2004). Thus, it is most duly important to investigate website's visitor's primary emotional responses in the study as it attempts to find ways to influence visitor's cognitive judgement. In present scenario where hundreds of thousands of e-stores flooded the Internet, attracting visitors at first sight may determine their success.

2.9   Existing Method of User's Evaluation

Users are always affective in one sense. From the old days, human beings get passionate to their belongings, admiring the environment and entity, and often emotionally aroused when watching movie shows. These kind of affective values play an important role when making decision. Therefore, integrating these insights into the value of a product has become important as well. Currently, several method in evaluating the affective aspect of product component on the users mind exist, and have been implemented in many studies acquiring the knowledge about affective values in the effort to improve product quality. Such methodologies are:

1. Self Reporting Techniques

   The oldest and most familiar form of gathering data about feelings for products is to ask people to report their feelings in adjectival words. This requires some technique to choose the adjectival words and then asking people to express their feelings using those words. There are two types of self-reporting techniques identified:

   i.   Semantic Differential Methods (Osgood et al., 1957)

         Adjectives such as active, sporty and beautiful are organized into 5-point or 7-point semantic scale. A test group of people is asked to rate a number of specimens into the report. The scores become the raw data for the intended analysis. This type of self-reporting method has shortcomings in terms of ambiguity in the meaning of words (Childs, 2003).

   ii.   Text Completion

         This self-reporting method is more sophisticated than completing semantic scale questionnaires. Data from text completion methods is used to establish what is important to a customer and what aspects of a product are perceived to deliver what affect. The use of this techniques helps to clarify meanings of words, improving the issue of word ambiguity in the first technique (Childs et al., 2003).

   iii. Free Flowing Speech

         This technique allows recording of free-flowing speech by experts and end-users. The gathered information is used to understand the meaning of everyday words used by test groups such as 'sweet' in a professional context. This technique is used as a means of determining what factors that highly interests customers in a product, what are the impressions of products, and to differentiate between groups of end-users.

2. Conjoint Analysis (Green & Srinivasan, 1978)

Conjoint analysis is a statistical technique used in market research to determine how people value different features that make up an individual product or service. It is a method for weighting different product concepts against each other in order to identify which product attributes are preferred by a certain customer group and the price they are willing to pay for it. For example, the combination of the different attributes like price, size, colour, brand etc. has a joint influence on the consumer decision whether to purchase the product or not (Green & Srinivasan, 1978; Gustafsson, 1996). One assumption is, if brand is seen as one of product attribute, then a consumer would spend more money on a Mercedes than on a Fiat with the same specifications (Schutte, 2005). Conjoint analysis is based on the consumers' ability to rank concepts with different content in order to make a clear decision on how desirable the concept is. There are three different approaches in performing conjoint analysis study (Gustafsson, 1996). They are:

i. The paired comparisons approach. In the paired comparisons approach the test users compare two simultaneously presented products and indicate which one is the better. Paired comparisons are suitable for complex products when it is hard or time consuming to rate each product separately.

ii. The trade-off approach. In the trade-off approach, test users rank their preference for two product attributes at a time, holding all other attributes constant.

iii. The full-profile approach. In this approach, test users rate complete product concepts on 10 step scales from e.g. 'Would never consider buying this product' to 'Would definitively consider buying this product'.

3. Physiological and Sub-conscious Method

Physiological method is the measures of physiological responses, behaviours, and body expressions generated by 'external stimulation'. Some of the techniques to gather data are:

    i.   Video-recording. This technique is used to observe facial expressions and body language.

    ii.   Eye-tracking cameras to record eye movement and pause time, to gauge which objects and elements of objects are of most interest to users.

    iii.   Muscular loads measured by Electro-Myo-Graphy (EMG) and hand-grasping stresses by sensor-instrumented gloves for evaluating ease of use of products and evaluating touch and texture phenomena.

    iv.   Electro-Encephalo-Gram (EEG), measuring brain waves to determine the kind of respond when user interacts with product.

    v.   Electro-Cardio-Gram (ECG), measuring heart rate to determine the kind of respond when user interacts with product.

4. Semantic Description of Environments (SMB) (Küller, 1975)

Semantic Description of Environments (SMB) is a Swedish invented tool designed as a method for evaluating architectural structures according their aesthetic appearance. The word SMB is a short form from Swedish terms representing the English terms, the Semantic Description of Environments. This method originally addressed artistic non-commercial interests.

SMB is based on Osgood Semantic Differential theory and is specially adapted to architectural environment. In SMB, images, models or films of the chosen environment to test subjects, the emotional impression of the different environments can be measured. The results can be used as planning support for new architectural objects (Küller, 1975 as in Schütte, 2005).

5. Quality Function Deployment (QFD) (Akao, 1990)

   QFD is an engineering tool developed by Japanese Quality technology experts, growing out of Deming's work from the 1950s on statistical quality control (Childs, 2003; Akao, 1990). Since it was introduced as possible method to identify relations between customers' (functional) needs and engineering characteristics, it has spread around the world, in various forms. It has become a well established product development method all around the world.

   The procedure of QFD is illustrated in principle through the well-known House of Quality visualization. Figure 2.4 shows the House of QFD. It consists of a relationship matrix in the middle and displays the customer's wants along the left and the technical options at the bottom. A group of experienced product designers link the customer's needs to the technical parameters. After combining with priority ranking, a ranking of the needs, it delivers a technical response on the top as an outcome. The roof of the house shows a half square matrix, which means the technical elements might interact. The elements of the roof identify regions of interaction and provide clues for decision making on compromises in developing the product design. A similar structure can be created to plan the deployment of processes.
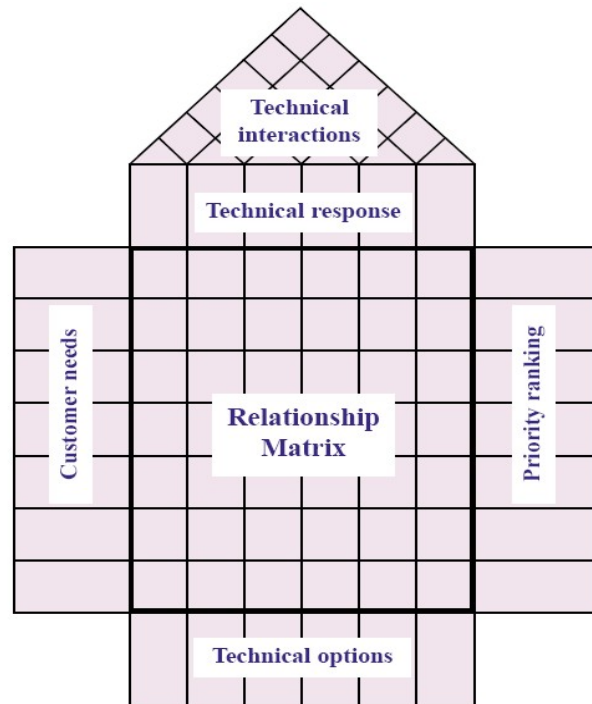
Figure 2.4: The House of QFD (Akao, 1990).

QFD provides a method of prioritising where design effort should be deployed to add customer value or quality to a product (quality deployment); and where organisational effort should be deployed to support the processes that in turn ensure the product quality (quality function deployment).

6. PrEmo (Desmet, 2003)

Desmet devised a clever, non-verbal emotion measurement tool called PrEmo (for Product Emotion). The tool remarkably study the emotions elicited by different products on different people across languages and cultures. PrEmo uses 14 animations, cartoon diagrams of emotional expression combining face, hands and body, with inclusion of short sound and movies. Each animation conveyed one dimension to be measured. Using the tool participant evaluates the product by systematically clicking on all 14 animations, and after viewing each product, they assign values on a three-point rating scale: 'I do feel the emotion expressed by this animation'; 'To some extent I feel the emotion expressed by this emotion'; or 'I do not feel the emotion expressed

by this animation'. PrEmo measures the dimension of Pleasant (Desire, Pleasant surprise, Inspiration, Amusement, Admiration, Satisfaction, Fascination) – Unpleasant (Indignation, Contempt, Disgust, Unpleasant surprise, Dissatisfaction, Disappointment, Boredom).
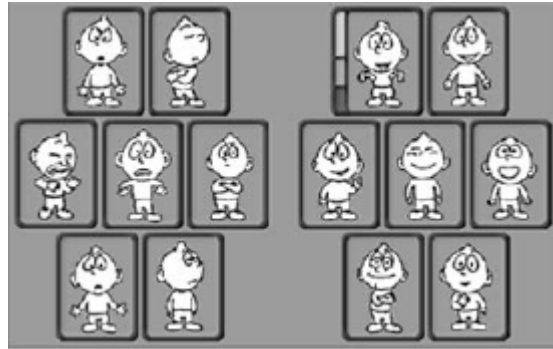
Figure 2.5: Product Emotion Evaluation Tool (PrEmo) (Destmet, 2003).

While asserting the importance of understanding user's emotional responses towards product, Desmet (2003) highlighted that the knowledge of how product design elicits emotion needs to be investigated.

7. Kansei Engineering (K.E.) (Nagamachi, 1989)

The term "Kansei" used in K.E. refers to an organized state of mind which has emotions and images held in the mind towards physical objects such as products or environment. For example, "luxury", "elegant", "flashy", "young" and alike as in the "that dress looks luxury and elegant", or "that car looks flashy and for youth" are all Kansei Words describing feelings or emotion to certain product, situation or surrounding. Although in most cases Kansei is used in the form of adjective, nouns as well as short sentences can also be employed (Nagamachi, 2003).

K.E. is a technology that unites Kansei into engineering realms. It is the field where the development of product that pleases and satisfies human is carried out technologically. This is done by analysing human's Kansei and incorporating them into product design. It collects the user's emotional

reponses and establishes mathematic prediction models of how the emotional responses are connected to selected product properties. K.E. targets to improve human well-being by looking into physiological and psychological aspects. Products that were developed by using K.E. is called 'Kansei product', and describe as a product that assimilates human feelings and desire into its physical traits such as shape and colour.

In K.E., human Kansei is measured using physiological method, e.g. video recording or eye-tracking, or psychological method, e.g. semantic differential scale or speech recording, whichever suite the intended domain measurement. Statistical analysis, e.g. multivariate analysis, is employed to understand the connection between Kansei and product parameters.

In particular the last methodology mentioned, K.E. is of special interest, since it is the only method specifically designed for quantifying consumer's emotion and incorporate them into product design.

K.E. share the same basis with SMB accepts SMB only focus to architectural artefact. K.E. is also seen to be more powerful than SMB by its capability to discover relationship between emotion and product characteristic. On the other hand, Kansei is seen possible to be integrated into conjoint analysis method, where conjoint analysis has looked only at different product alternatives of available product in the market. The lacking in terms of analysing design elements against user experience makes conjoint analysis methods less powerful. In terms of QFD, it addresses voice of customer by interviews, observations, customer's complaints or internal error statistics (Griffin & Hauser, 1991). QFD and Kansei are looking at the same point, which is the voice of customer. However QFD focuses on use value such as functionality, usability and usefulness. On the other hand, K.E. targets specifically on the aspect of emotion.

Although Desmet (2005) provides a sound method to overcome cultural issues in the measurement of emotion, it is not geared to HCI artefacts such as Website UID. It

also offers tool to evaluate emotion per se, and does not connect the findings with product design elements. While the evaluation tool is remarkably interesting, the relationship between emotional responses to product design is not covered. This makes it difficult to understand how certain design elements elicit emotion.

Overall, most of the methods are still confined in the paradigm of consumers being treated as the evaluation source rather than requirement generator. K.E. instead is based upon methods and techniques to include consumer in the process of generating design requirement. K.E. which based on methods and techniques from other discipline such as mathematics, statistics, psychology, marketing and engineering, enables the measurement and association of emotion to product design (Nagamachi, 1999). K.E. has probably come furthest in the pursuit of engineering the implicit consumer's emotion, and translates them into the product design requirement. It also has the ability to synthesize and prioritise emotion and design influence, and distinct consumer group enabling the projection of target market group accordingly.

2.10 Summary

The emotional power of products has never been doubted (Norman, 2004), and emotion has played a major role in marketing and advertising (Nagamachi, 2004). Skilled designers understand the powerful appeal of emotions and have used their intuitions and artistic skills to exploit this emotional appeal. But despite the strong intuitive appeal, emotions have played little formal role in the design profession (Desmet, 2002; Hekkert et al., 2003; Norman, 2004; Tractinsky, 1997, Zhang et al., 1999). Moreover, within engineering and the disciplines of Human-Computer Interaction and Cognitive Ergonomics, emotions are seldom mentioned (Desmet, 2002; Norman, 2004). Considerable progress has been made in recent years, and we are beginning to converge upon some generally accepted standards, such as the facial coding scheme of Ekman, Frijda's classifications, and the widely used Ortony, Clore & Collins (OCC) model for the cognitive analysis of emotions (Ekman & Rosenberg, 1997; Frijda, 1986; Lewis & Haviland-Jones, 2000; Ortony, Clore, & Collins, 1988).

Emotional user experience research offers a new perspective on the user-oriented view of interactive product quality. The field emerged from traditional approaches regarding the consideration of user's subjective evaluation of an interaction that focused on the concept of user satisfaction. A variety of previously established user experience measurement methods have been discussed in this chapter. They differ with respect to their foundation and comprehensiveness in the target measurement and its underlying knowledge interpretation.

It is evident that in web design literature, the common argument has been addressing the focus of user-experience per se (Garret, 2003; Li et al., 2001; Marcus & Gould, 2001; Nielsen, 1994), and that most designers fail to understand the needs of the site's actual users (Powell, 2002). In pursuing better user centric approach, website evaluation has gone from the measurement of constructs such as perceived usefulness (PU) and perceived ease of use (PEOU), to trust, perceived security and so on (Bhattacherjee 2001; Li & Zhang, 2005). Li & Zhang (2005) highlighted that previous methods in evaluating user's perception has been confined to assumptions that website visitor would spend at least a few minutes on a website, and that good website features elicit positive cognitive evaluation and shopping experience. They suggested the measurement of perceived affective quality (PAQ) as a primitive affective construct enabling the evaluation of primary emotional responses to website evaluation. This is based on the fact that visitors will soon go to another website if they do not get attracted to the website at first sight (Li & Zhang, 2005).

Online shopping has become popular fashion for consumer to buy products or services they desire, and this is supported by the report of online sales that have an approximate 25% year-to-year increase (Forrester Research Inc., 2005). In line with this encouraging fact, online businesses need to put more strength and effort in convincing customer to buy their product. This research argues that, in the internet world where users have vast choices of e-stores to purchase product, an e-Commerce website need to capture visitor's attention at first sight and persuade them to stay longer on the website. This will enhance stickiness to the website, which will

promote consumer conversion and eventually retention (Zhang et al., 1999; Griffith, 2002; Kim et al., 2003). To build such successful website, we require a method that ingeniously discovers the implicit knowledge of what user's feel towards website design and how it relates to the contributing design elements. Subsequently, we must deliver the knowledge in a form that designer advocates could access and understand easily and effectively in facilitating the design process.

Mahlke & Thüring (2007) asserted that affect or emotion is important part of user's experience with interactive systems, aiming to consider emotional aspects in the interactive system design process. While admitting that emotion cannot be designed, they asserted the importance of deriving a method for recognizing user's emotion from emotional evaluation procedures. Desmet (2003) posited that emotions influence both our well-being and our purchase decisions, and it is evident that both knowledge of how product design elicits emotion and tools to evaluate the emotional aspect of a product design can be of use for the design practice. However, little is known about how people respond emotionally to products and what aspects of a design trigger an emotional reaction (Aumer-Ryan, 2005; Desmet, 2003; Kim et al., 2003; Mandryk et al., 2006; Norman, 2004; Zhang et al., 1999).

It is evident that despite the gained recognition, very little attention has been given to deriving design method that enables the incorporation of emotion into website design. 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), and the study of emotional appeal have widely discussed on the emotional dimension per se, and how to enable the measurement of this emotion (Aumer-Ryan, 2005; Bhattacherjee, 2001; Desmet, 2003; Mahlke & Thüring, 2007; Norman, 2004; Overberkee et al., 2004; Schenkman & Johnson, 2000; Scherer, 2005; Siu et al., 2005; Spillers, 2004; Thielsch, 2005; Tractinseky et al., 2000; Zhang et al., 1999). Therefore, it is deem important to scientifically research a suitable tool to evaluate emotion in Website UID, translates the emotion into design requirements, and devise a method that enable the incorporation of target emotion into Website UID.

Among the presented method to evaluate user's experience, this research pays interest to K.E. methodology since it enables the quantification of emotional user experience, and association of emotion with product design elements. As a result, a new product that incorporates a target emotion could be designed. K.E. has been successfully implemented into a wide range of industrial product design and electronic home appliances, such as in the design of sports car and digital camera, in every part of the world. For the very first time, this research attempts to bring the method of K.E. into the design of e-Commerce Website UID. The details of K.E. methodology and its possible implementation in website evaluation are discussed in Chapter 3.

Also, aligning with the concept of Kansei, Russell's two-dimension space of emotion, i.e. valence (pleasure-displeasure) and arousal (sleep-arousal), is considered as best suited to describe emotional dimension investigated in the study. Li & Zhang (2005) asserted that as most affective feelings in e-Commerce website could be represented in this space. Thus, the comprehensiveness of the description of the structure of emotion is seen as most suitable in this research. Therefore, this research attempts to investigate the dimension of both valence and arousal in the investigation of user's emotional responses to e-Commerce Website UID, to offer a balance consequence in the intended outcome. The notion of emotion that is seen as suitable for this research is the visceral design factor that is concern with appearance as described by Norman (2004), and affect (Englelsted, 1989 as in Aboulafia & Bannon, 2004) that is the emotional state that results from a response to the external stimuli.