UNIVERSITI TEKNIKAL MALAYSIA MELAKA

A STUDY AND ANALYSIS OF PRODUCT DESIGN AND DEVELOPMENT USING KANSEI ENGINEERING FEATURES FACTORS AFFECTED PRODUCT IDENTITY AND AFFECTIVE RESPONSE TO PRODUCT SHAPES

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Design) with Honors.

by

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This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) (Hons.). The members of the supervisory committee are as follow:

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DECLARATION

I hereby, declared this report entitled “A STUDY AND ANALYSIS OF PRODUCT DESIGN AND DEVELOPMENT USING KANSEI ENGINEERING FEATURES FACTORS AFFECTED PRODUCT IDENTITY AND AFFECTIVE RESPONSE TO PRODUCT SHAPES” is the results of my own research expect as cited in references.

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ABSTRACT

Creating a product that highly fulfils the demand of the customer satisfaction is often complicated and confusing. The customer satisfactions came from their feelings toward the product. Also, this feeling of satisfaction is different between each person. This is because each person has their own demand in order to feel satisfied. Currently those feeling of demand aren't possible to be recognizing through scientific approach. This paper is about designing and developing product that can fulfill customer demand by using Kansei Engineering approach. Kansei Engineering is a method that uses statistical approach to analyze the customer feeling satisfaction and to transfer the analyzed data to the design domain. Kansei Engineering has been developed by Mitsuo Nagamachi in Hiroshima in around 1970's by Jiao et al, (2006). This method allows customer's emotional responses to be linked to a product or service with their properties and characteristics. In consequence, products can be designed to bring forward the intended feeling. Since Kansei engineering used semantic differential to translate consumers feelings, Kano Models were used in order to determine the priority attribute needed by the customers. Kano models are quantitative methods that use pair wise to increase the effectiveness of the questionnaire. By combining these two methods, all feature of the product can be prioritizing their importance in fulfilling the customer demands.

ABSTRAK

Mencipta satu produk yang memenuhi permintaan kepuasan pelanggan selalunya merumitkan dan mengelirukan. Kepuasan pelanggan datang daripada perasaan mereka ke arah produk tersebut. Ia juga, rasa puas hati ini berbeza di antara setiap orang. Hal ini kerana setiap orang mempunyai permintaan mereka sendiri supaya berasa berpuas hati. Perasaan permintaan tidak mungkin mengiktiraf melalui pendekatan saintifik. Kertas ini adalah mencipta dan proses produk berkembang yang boleh memenuhi permintaan pelanggan dengan menggunakan pendekatan Kansei Engineering. Kansei Engineering ialah satu kaedah yang menggunakan pendekatan statistik analisis pelanggan secara rasa kepuasan dan memindahkan data yang dianalisis bagi domain rekabentuk. Kansei Engineering telah dimajukan oleh Mitsuo Nagamachi di Hiroshima dalam sekitar 1970's oleh Jiao et al, (2006).. Kaedah ini membenarkan reaksi-reaksi emosi pelanggan berkait dengan satu produk ataupun perkhidmatan dengan ciri-ciri kejuruteraan Kansei itu sendiri. Akibatnya, produk-produk boleh direkabentuk mengikut kehendak pelanggan. Sejak kejuruteraan Kansei menggunakan pembezaan semantik menterjemahkan perasaan pengguna-pengguna. Kano Models telah digunakan supaya menentukan sifat keutamaan yang diperlukan oleh pelanggan-pelanggan. Model-model Kano ialah satu kaedah-kaedah kuantitatif yang menggunakan sepasang bijak meningkatkan keberkesanan soal selidik. Dengan bergabung dua kaedah-kaedah ini, semua ciri produk boleh mengutamakan kepentingan mereka dalam memenuhi permintaan pelanggan

DEDICATION

This report is dedicated to my parents, Norizan Johari and Norziah Husin, my brothers, sisters and other family members who provide a loving, caring, encouraging, and supportive atmosphere. These are characteristic that contribute to the environment that is always needed to achieve the goals a heads.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

SD - Semantic Differential

VOC - Voice of Customer

SPSS - Statistical Package for Science

AHP - Analytical Hierarchy Process

PMM - Polytechnic Merlimau Melaka

MMU - Multimedia University

UTeM - Universiti Teknikal Malaysia Melaka

KE - Kansei Engineering

KW - Kansei Word

EEG - Electroencephalogram

EMG - Electromyography

PCA - Principal Component Analysis

FA - Factor Analysis

QT 1 - Quantification Theory type I

KES - Kansei Engineering System

SVR - Support Vector Regression

(GST) - The Grey System Theory

AGO - Accumulated Generating Operation

SRM - Structural risk minimization

ERM - Empirical risk minimization

SQC - Statistical quality control

ISQFD - International Symposium on Quality Function Deployment

CR - Customer requirements

PDPC - Process Decision Program Chart

CHAPTER 1
INTRODUCTION

1.1 Project Background

Customers worldwide nowadays are happy to use or comfortable to use of products that there is in market. Various products with same functions produced for customers used. Customer interesting to buy the product because impressed by product appearance like product form, color that produced and also additional features that produced to product that.

Nowadays consumers are strict in choosing products in terms of their demands and preferences Jiao, J *et al (2006)*. Obviously, the key factor that influences the success of a new product is how to capture the "voice of the customer" by Griffin, A. and Hauser, J.R. (1993) .In order to help designers develop a suitable product form for a given product image, some models, such as design support models Chung *et al*, (2001) and consumer-oriented technologies Hsu, C.H *et al* (1999), have been proposed to capture the relationship between the product form and the product image perceived by consumers.

It notices difficult, otherwise impossible, find some relationship between design features and emotion reactions. The relationship straight fight this may not exist due to emotion in most cases not elicited by product but usage impact that derived from product. The trend of product innovation is now concerned with the customer satisfaction, affordability, production rate, technical ability, value chain and competition Browning *et al*. (2006). Especially, the level of importance on customer satisfaction is becoming higher. For successfully launching and sustaining the product in the market, the voice of customer on their requirements must be responded. Customer requirements are subject to a variety of factors like technology, and their age, income, profession, education and preference Lee *et al.* (2012). Customers' affective needs must be considered, Jordan (2000). Affect is said to be a customer's psychological response to the perceptual design details styling of the product, Demirbilek & Sener (2003).

Affect is a basis for the formation of human values and human judgment. For this reason it might be argued that models of product design that do not consider affect are essentially weakened Helander & Tham, (2003). Until recently, the affective aspects of designing and design cognition have been substantially absent from formal theories of design Helander *et al.* (2001). Affective design is the inclusion or representation of affect emotions, subjective impressions, visual perceptions and so on in design processes Khalid (2004). Many research issues are implied, including, for example, how to measure and analyze human reactions to affective design; and how to assess the corresponding affective design features. In the end, it is necessary to develop theories and predictive models for affective design Jiao et al. (2006).

A designer could not be just depend on own creation result because there was nothing guarantee that they similar to what desired by consumers by Khalid, H. M. (2004). Therefore, so that resemble what desired by consumer, create emotional designer adaptation by discussing emotion reactions with consumers because they difficult to give birth what they feel and why they want it. Language use that suitable to be used between both designer and consumers do not make a mistake. Research

could be preparing designer with insights of specific user product context for which he is designing. Product design with emotional fit requires an integrated approach in which the research does note lead but was part of design activity. If designers strive to create form products that satisfy her emotional need should know to what desired by consumers that focused specially by Helander, M. G., & Tham, M. P. (2003). Therefore inventor and customer should communicate. It also can be done by doing research towards most case which occurred around. When a designer start to create form a new product, he has to integrate lot of demand and desire consumers product that may have prospective and not only claims technical already important objective but also aesthetic, emotional and different experience factors, and partly difficult to be stated objectively by Ebru Ayas,Jorgen Eklund, Shigekazu Ishihara. (2008), in design practice, inventor have to consider between objective and subjective features between function technology and emotional between information and inspiration.

Kansei Engineering is a systematic method through the usage principles on a product and translated this perceptions into design parameter Nagamichi (1995), Schutte & Eklund (2003), it have been used in development of cars, construction machinery, home appliance, office machine, and cosmetic Jindo & Hirasago (1997), Nakada(1997), Nagamachi (2002), Mondragon *et al.* (2005), Demirtas *et al.* (2009). Kansei word is feeling immediately from emotion. It also undergone when interacts with product already have in market. Most important in Kansei word was to observe customers identify priority and their will or Kansei is product development process. Category classification was a method where category Kansei word is a product loosed in tree structure to get detailed information in design Huang *et al*. (2011). In our level realize on what we want, we decide use information sense. Conscious mind then solve a “logic” story justify decision. Feeling on the certain products variables and uncertain sometimes whether it correct or wrong on product. Kansei occur naturally in all things such as product and service. It raises all kinds of feeling whether those feelings strong, weak, good or unpleasant. Kansei Engineering is a method to ensure products or services can raise an emotion reaction that is good by Ichitsubo *et al* (1998). Process allows going to feeling models simultaneously and customer emotions and then translated into design parameters. Kansei Engineering was a method to translate feelings from customers and deep impact product