



## Prioritization of aesthetic attributes of car profile



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### ABSTRACT

The viability and success of a product in the market depends on its aesthetic design. Quality function deployment (QFD) is a structured methodology for the design a new product with improved quality. The Kano model has been found to be a useful tool to establish the relationship between performance criteria. In order to make its use more objective, fuzzy Kano modeling may be more beneficially applied than the traditional Kano modeling. A fuzzy approach has been adopted for calculation of the relative importance of different aesthetic attributes. The proposed method has been illustrated using customer survey data. Four out of 12 aesthetic attributes (i.e., elegant, family-feeling, modern, and youthful) were found to be attractive (more significant).

**Relevance to industry:** This research paper presents an integrated approach that convert customer's emotions into usable design data. This enables industrial counselors, professional product designers and academicians to categorize requirements of users that can be subsequently incorporated into final product design.

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### 1. Introduction

Consumers' decision to purchase a particular product is motivated by not only its technical competence and fit for use, but also by the emotional response induced by its physical appearance. The physical appearance of a product plays a vital role in the consumers' preference and choice of the product (Chuang et al., 2001). The judgment of matching quality is mainly depended on match or mismatch between user's mental model and the product design, which is actually created based on designers' mental model (Goonetilleke et al., 2001). A successful product is one that has the highest quality, the lowest cost, and the shortest time-to-market. This has been widely advocated by most product manufacturers in their new product development (NPD) endeavors (Huang et al., 2012). Kansei Engineering (K.E.) is a product development tool used to identify users' perceptions and find quantitative relationships between their subjective responses and design features (Linares and Page, 2011). Researcher (Nagamachi, 1989, 1995) has stated that Kansei Engineering (K.E.) establishes a framework for quantifying the relationship between design characteristics and emotional responses. It is necessary to identify customer needs and transforming it into product design is very important to remain

competitive in market (Tontini, 2003). Hence, there is a need to study and develop procedures that can help a company or project team to gain knowledge of customer requirements and satisfaction, and then develop products with innovative features.

Quality function deployment (QFD) is a structured and useful approach for efficiently translating customer expectations and wants into design requirements in order to facilitate much higher levels of customer satisfaction (Chen and Ko, 2009). It provides valuable guidance to manufacturer to make trade-off between customer's wants and manufacturer's affordability (Matzler and Hinterhuber, 1998).

The fulfillment of customer's need depend on the existence and performance of certain product attributes. There are some requirements that bring more satisfaction to customer than others. By quoting an example of TV sets, Tontini (2007) states that TV sets have achieved higher degree of reliability in market until this time so improving this reliability above the current level will bring less satisfaction than improving other requirements, like image quality, sound or connectivity etc. Therefore, it is important to determine the requirements of a product attributes that bring more satisfaction than others.

Kano et al. (1984) developed a two-dimensional (linear and non-linear) quality model to address linear quality model shortcomings. This two-dimensional model divides quality criteria into must-be quality, one-dimensional quality and attractive quality. These terms describe the effect of a product's attributes on

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customer satisfaction. The traditional Kano model depends upon questionnaire and interview. It is found that data collected through questionnaires are sometimes very much ambiguous or vague and insufficient to interpret the significant results. Therefore, fuzzy Kano approach can be used to overcome this kind of deficiency for calculation of importance of different attributes.

Researchers (Matzler and Hinterhuber, 1998; Tan and Shen, 2000; Tontini, 2003, 2007; Chaudha et al., 2011) have integrated QFD and the Kano model effectively to identify customer needs more specifically and to yield better customer satisfaction. By using the Kano model and integrating it into the QFD, the designers can understand the requirements of customers. This study investigates the possible integration between quality function deployment (QFD) and fuzzy Kano model for achieving higher customer satisfaction with aesthetic feeling.

The authors have integrated QFD with fuzzy Kano model to explore the relative importance of different aesthetic attributes of a car profile and its impact on customer satisfaction. Besides this, the key factors that enhance the customer satisfaction have been identified using the fuzzy Kano model and results are compared with the traditional Kano model. The applicability and effectiveness of the proposed model has been illustrated by an example of survey data.

## 2. Research framework

### 2.1. Quality function deployment (QFD)

By employing the QFD (Quality Function Deployment) method the human needs are systematically matched with the product characteristics, that can help to improve the product quality (Bergquist and Abeysekera, 1996). In the beginning of the QFD design process, the design team needs to capture the Voice of the Customer (VoC). Usually, it is determined through personal interviews and/or focus groups. Requirements are identified on the basis of customer needs. After identification of requirements, a quantitative marketing research is conducted to evaluate the competitive position of the product in the market in terms of customer satisfaction and the importance given by customers to each requirement. Based on the competitive analysis, a target for customer satisfaction is set for each requirement. Thereafter, an improvement ratio (target/current satisfaction) is calculated. This improvement ratio is then multiplied by the importance that the customer gives to each requirement. The final relative weight of the requirements is then calculated (Govers, 1996; Tontini, 2007) (Fig. 1).

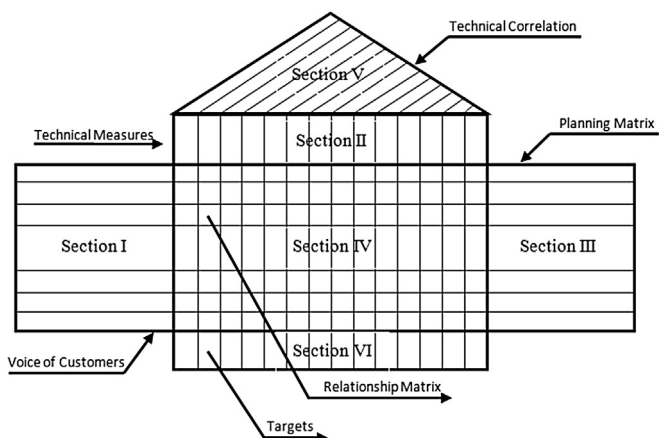


Fig. 1. The house of quality matrix.

In the process, a set of product attributes that could fulfill the customer requirements is determined. Further, customer requirements and product attributes are correlated in a matrix called House of Quality (HoQ), transforming the voice of the customer into product specifications. The specifications for the design attributes are determined after performing a competitive analysis between the product being improved (or developed) and its competitors for similar products. After determining product's specifications and their relative importance, other matrices are developed for determination of process, quality control, and material requirements.

### 2.2. Problem identification

In the traditional importance adjustment approach, the relationship between customer satisfaction improvement ratio and importance increment ratio is treated as linear. It is assumed that increase in product or service performance will enhance customer satisfaction in a constant proportion; however, this may not be true for every product's attribute (Tan and Shen, 2000). It means that some attribute needs more attention than others. Customer satisfaction can be improved greatly with a little increase in importance value of product attributes and vice versa. For example, customers may take 'sharp cutting edge' as granted when they buy a new shaving razor. Customer satisfaction does not increase much if this attribute is present or improved very much but it will definitely make customer dissatisfied if not present or performance decreases. The problem existing in traditional importance rating is that customers usually give more weight to 'must be' requirements if asked directly. This leads to decrease overall customer satisfaction because of negligence of innovative and attractive attributes. A way that can help to identify different categories of requirements is the theory of 'attractive' quality and 'must be' quality (Kano's model). This model presents a framework for determination of importance value of customer requirements in such a way that it will lead to development of a product with innovative requirements with overall customer satisfaction (Govers, 1996).

### 2.3. Kano model of customer satisfaction

Customer evaluates the quality of a product using several factors and dimensions. Kano et al. (1984) was the first person who thoroughly addressed and developed the two dimensional nonlinear relationship between qualities attributes performance and overall satisfaction of the customer. They have suggested that quality attributes can be classified into five categories as shown in Fig. 2.

Each quality attribute affects customer in a different way. The five different quality attributes are:

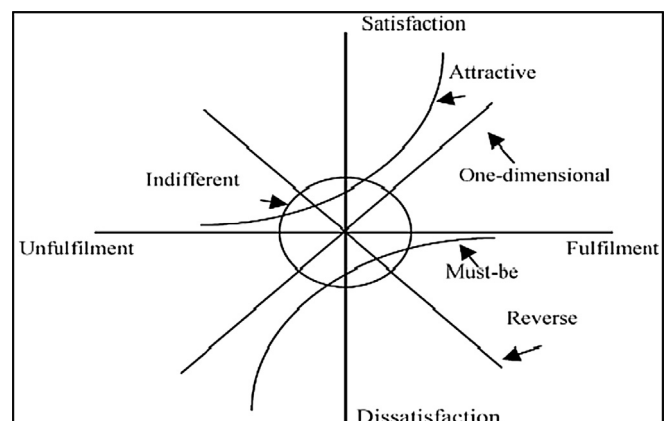


Fig. 2. Kano model of customer satisfaction.

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