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# Review and Classification of Kansei Engineering and Its Applications

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**Abstract.** Using customer requirements and needs in the product development process has become a major subject in quality engineering. Many scholars have tried to develop systems that enable product developers and designers to consider customer requirements during the design process. Among them, Kansei Engineering (KE) is the first to consider customer feelings as input to the design process. KE is a Japanese word which doesn't have an exact synonym in English but can be interpreted as sensibility, feeling, or aesthetics. KE was originated in Japan around 1970. Although applications of KE began from automotive industries, nowadays many other industries such as electric home appliance industry, office equipment industry and so on, have made extensive use of KE.

There are six techniques for the implementation of KE concept: Category Classification, KE computer System, KE Modeling, Hybrid KE System, Virtual KE, and Collaborative KE. These techniques differ from each other in their approaches to apply KE in different development process situations in terms of information availability, complexity, and required performance.

This paper presents a detailed critical review of the KE concept and a new classification based on computational and non computational approaches. It will also provide a review of the application of KE in different areas.

## 1. Introduction

Customers have the right to choose their favorite goods and services from among many kinds. Companies who are capable of taking into account customers' feelings about a product during design will stay the head of the competition. One of the customer-oriented techniques that has been developed recently is Kansei engineering (KE). KE was originated in Hiroshima University, Japan; around 1970. Several Japanese companies used this tool as well as some other Total Quality Management (TQM) techniques to enhance their product quality. Some of the similar techniques like QFD (Quality Function Deployment) [1] used functional customer requirements as input. KE is the first technique that uses customer's feelings as input and tries to find the relationship between the customer's feeling and the product features.

Kansei is a Japanese word which doesn't have an exact synonym in English. Kansei is made up of two words, Kan and Sei. The combination of these two words can be interpreted as sensitivity, sensibility, feeling, or aesthetics [2]. However, Nagamachi [3] defines Kansei as a Japanese word that means customer's feeling and includes the customer's feeling about the product design, size, color, mechanical function, feasibility of operation, and price as well. Also, Matsubara & Nagamachi [4] define KE as an efficient method for rendering the customer feeling into the product design elements.

KE for the first time was applied in the Japanese automotive maker, Mazda, to develop a new sports type car called "Miata" [5]. Since then it has been applied in other industries such as automotive [6], construction machine [7], textile [8], office machine, house construction, costume and cosmetic industries [9]. Six types of KE techniques have been developed which include Category Classification, KE computer System, KE Modeling, Hybrid KE System, Virtual KE, and Collaborative KE. While the initial KE technique (type one) used some qualitative techniques, later techniques began to use more sophisticated quantitative and computer based methods.

In this paper a new method for the classification of KE will be presented and different types of KE based on this new classification method will be reviewed.

## **2. Discussion**

### **3.**

The main aim of KE is to help designers make decisions and focus on the design elements which make the product better fit human feelings. The main point of this method like other customer oriented product development methods is to clarify the relationship between the customer's feelings (Kansei) and the product features. Each of the mentioned six types derives this relationship by their own approach. The current classification of KE methods is based on information availability, complexity, and required performance. However, these methods could be classified according to other criteria such as the method that they use to derive the relationship. Generally, there are two methods that can be used to find the relationships: mathematical (quantitative or computational) and non mathematical (qualitative or non-computational). KE types two, three and four could be considered as computational KE and the others can be classified as non-computational KE. Now, these two categories of KE will be explained.

#### *3.1. Computational KE*

In this category of KE methods, feelings (Kansei) words are considered as dependent variables and product features as independent variables. The purpose is to find the most contributory product characteristics to stimulate or satisfy customer's feelings. In KE computer system (type two) and KE modeling, product features are identified from Kansei words (Forward method); however, in hybrid KE designers have additional features so that it can evaluate their designs with respect to Kansei words (Backward method). The most common methods that are used to find the relationships between Kansei and product features sets are multiple linear regression analysis, neural networks, genetic algorithm, and rough set analysis.

#### *3.2. Non Computational KE*

Category classification (type one), Virtual KE (type two), and collaborative KE are grouped in this class. In this kind of KE, no specific mathematical or computational methods are used to define the relationships between variable sets. For example, in category classification, developing team uses qualitative approaches such as Delphi method while in virtual reality and collaborative methods computer and network capabilities are used more.

## **3. Conclusions**

Kansei engineering is a customer oriented product development approach in which customer's feelings are mapped to products exclusively. Although the application of KE began from the automotive industries, its application has been extended to many other areas in recent years. This paper presented a new method for the classification of KE methods. The KE methods are classified based on the approach used to define the relationship between Kansei set and product attribute set which could be mathematical and non mathematical.

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