

## A Study on the Effectiveness of Kansei Engineering in Cultural Design

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### Abstract

Today, people from different cultural and emotional background around the world use products that are the results of the globalization process and the integration of technology into the various aspects of their life. Lack of cultural considerations in design process is a matter of concern for many nations, including Iranians, due to a large gap between technological development and cultural identity. Therefore, it is necessary to take cultural factors into design considerations so as to retrieve the cultural identity in products and to create an emotional interaction between user and product. The present study thus aimed to find an effective method for integrating culture into the design process in order to provide new values in products and fill the mentioned gap. In this regard, Kansei engineering was proposed as a rule-based method to evaluate its effectiveness in identifying cultural needs and transforming them into design parameters. For this purpose, 5 rose water sprinklers were selected as Iranian cultural artefacts and used for identifying the design parameters of the rose water bottle using Kansei engineering. 60 industrial design students examined 5 photos of the sprinklers in an online questionnaire survey with 26 Kansei words using the SD method. Exploratory factor analysis and cluster analysis were adopted for analyzing the data collected through the questionnaires. And finally, the design parameters were extracted. The results indicated the effectiveness of Kansei engineering in integrating culture into the design process by guiding the designer to identify the cultural considerations in a distinct and organized manner.

**Keywords:** Culture, Interaction, Emotions, Kansei Engineering

## Introduction

Nations are no longer confined within national borders through globalization, which has led to product development. Nowadays, designers design products for the general public, and manufacturers seek to profit from local markets. Regardless of cultural roots, products are designed and come onto local consumer markets, which makes users unable to communicate with the products and thereby affecting social interactions. On the other hand, the main concern is to properly understand the needs of users with regard to linguistic, customary, and behavioral differences across the world with the development of technology in the future (Huang & Deng, 2008). Therefore, it is necessary to integrate culture into product design process. Hofstede (Hofstede, 1984) defined culture as "the collective programming of the mind which distinguishes the members of one group or category of people from another." Culture is a multifaceted phenomenon formed by common public thoughts, emotions, and lifestyle, and can be found in any aspect of society. In a society, different cultures can be distinguished by their individual and group characteristics, such as mental models, behavior patterns, emotional reactions, aesthetics, rules, norms, and values shared by its members.(Sato & Chen, 2008) For each society, there are cultural standards and culture is believed to affect people's behavior and thoughts (Vivek & Luciënne, 2007). The manifestation of some cultures appears to be more dominant than other culture in terms of the nature of activity and conditions. The interaction of different cultures creates a complex human behavior pattern that occurs in particular situations, which plays an important role in human-product interaction. As culture creates artifacts and environments, the artifacts can also create a new culture in a society. There is thus a two-way relationship between culture and design.(Sato & Chen, 2008)

Advances in technology have made many changes in human life, and there is difference between the past and the modern lives. On the other hand, modern design style is significantly different from traditional design. Qing (Qing, 2015) is believed that the traditional and modern design are inextricably linked with culture, despite the differences. He regards design as a valuable tool for converting local forms and values into global products. In Third World countries such as Iran,

there is a large gap between technological development and globalization and cultural values and identity. Accordingly, it is necessary to integrate culture into the design process in order to retrieve the cultural identity and the regional values of the products, as well as bringing emotions in user-product interactions. The present study, therefore, aimed to find an effective method for integrating culture into the design process so as to provide new values in products. In this regard, Kansei engineering was adopted to evaluate its effectiveness in identifying emotional culture-based reactions.

Achieving the study objective is of importance due the following:

- Reviving cultural values in global products
- Synchronizing cultural values with technological development
- Improving user-product emotional interaction

### **Human-Product Emotional Interaction**

Donald Norman (Norman, 2004), in his book "Emotional Design", introduced the three levels of product-user interaction, including visceral, behavioral, and reflective level. In addition to describing each level, he examined the depth of user-product emotional interaction at each level. The visceral level includes the most primitive and simplest reactions in user-product interaction, which occur through the five senses in relation to the form, material, appearance of products, and are showed with the emotions aroused immediately by looking, touching, hearing, smelling, and tasting. This level of cognition is common to all people around the world. At the behavioral level, use matters. With regard to behavioral design, Norman described four components: function, understandability, usability, and physical feel. According to him, the behavioral level is based on the positive and negative emotions that result from the user's assessment of a product. At the reflective level as the third level, cognition is associated with deep layers such as consciousness, understanding, and interpretation. At this level, the deepest emotions are aroused and experienced. The reflective level includes personal experiences, memories, differences, and

culture. Products become meaningful objects through people's cultural differences and beliefs, which arouse the user's deep, positive emotions.

According to Siu (Siu, 2005), the spatial dimension of culture can be understood as three levels of structure: an outer level, an intermediate level, and an inner level (Fig. 1). The inner level is intangible and invisible and can be reflected through the intermediate and outer levels. The inner level affect the two other levels. In contrast, objects and systems influence and change the people's behavior and the way of thinking.

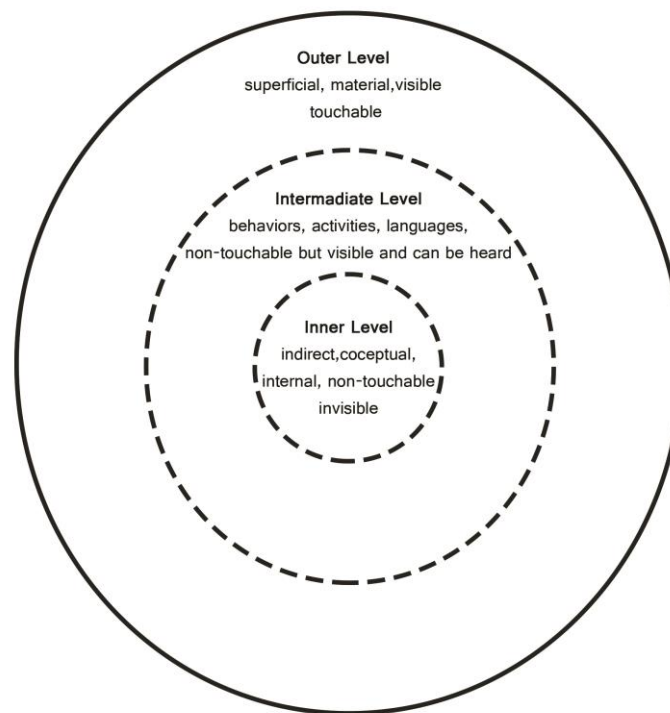


Figure1-Dimension of culture (Siu, 2005)

Lin (Lin, 2007) showed that the relationship between Norman's layers and Siu's cultural levels and layers in a model (Fig. 2). In this model, the reflective level is considered the same as the deepest cultural levels and layers.

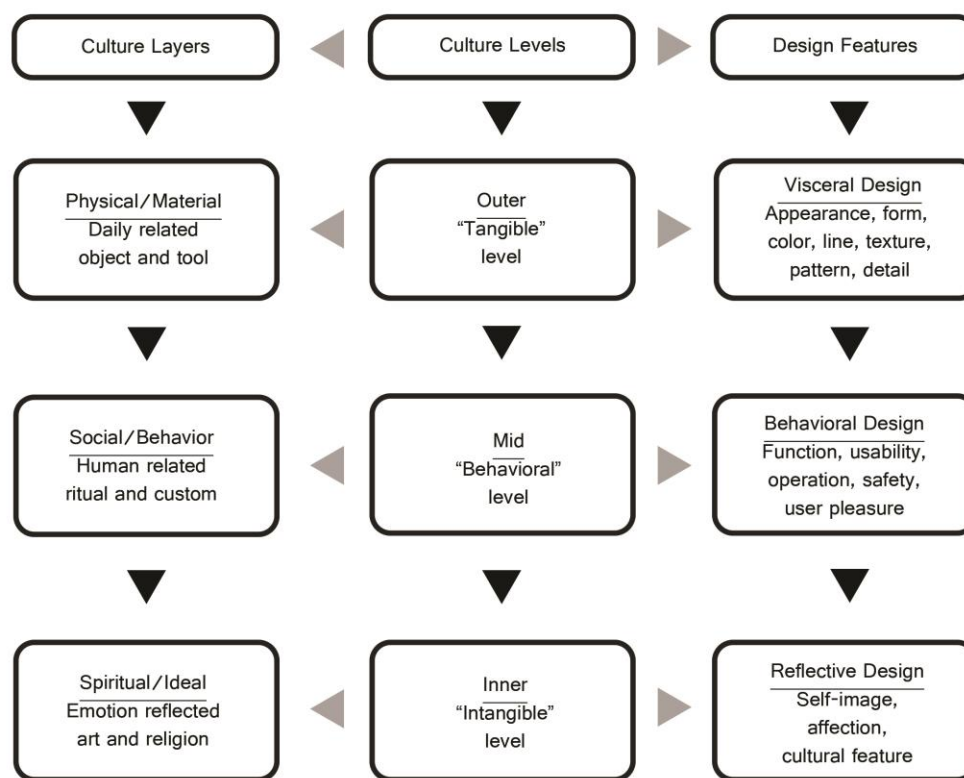


Figure 2- Three layers and levels of cultural objects and design features (Lin, 2007)

Therefore, if the designers achieve the deep cultural layers in the design process, they can effectively use them in their design process, the most important achievement of which is to synchronize culture with technological development. As a result, the final product will be more successful in terms of emotional and semantic interaction with user. Now, the question is how to identify users' emotions and emotional culture-based reactions in the process of user-product interaction? In order to provide a solution, Kansei engineering method was proposed and evaluated in the present study.

### Kansei engineering:

It was founded by Mitsuo Nagamachi, Professor of Hiroshima University in the early 1970s (Nagamachi, 1995). The term Kansei was first used by Yamamoto in his speech at the University of Michigan (Schütte, 2005). It is a Japanese word meaning the psychological sense of the consumer and the visualization of a new product. Kansei engineering aims at the development of products and services based on the customer's feelings and needs. In fact, Kansei is a technology for translating the customer's feelings into the domain of product design (Nagamachi, 1995). This method evaluates the customer's psychological feelings and needs in relation to a specific object, and converts them into specific parameters in the product design process. From a philosophical point of view, Kansei is the basis of a complex combination of interactions between perception and emotion (Schütte, 2005). Kansei is, indeed, a combination of keywords like sensitivity, sense, sensibility, feeling, aesthetics, emotion, affection, and intuition (Lee, Harada, & Stappers, 2002). In this method, the customer's feelings is processed and analyzed as input data to eventually be converted into design parameters. Sensory input related to one or more of the five senses, including vision, hearing, smell, taste and touch, can create Kansei. Simultaneously, Chisei generates human knowledge based on similar inputs through learning (Schütte, 2005). Since Kansei is the state of consumer's internal sensation, it is necessary to use a standard set of methods in the measurement process. According to Nagamachi, the most commonly used methods are (Schütte, 2005):

1. Human behavior and activities
2. Words
3. Body language and face
4. The body's physiological reactions (such as heart rate, EEG, electrical behavior of muscle)

Nagasawa (Nagasawa, 2002) classified the measurement of Kansei into two main groups:

Physiological measurements: Behavior and reactions of the human body generated by external stimulation are measured using special equipment.

Psychological Measurement: Mainly evaluated by semantic differential (SD) scale.

## Rose Water Sprinkler – the Study Sample

### Background

Rose water is a flavored water used in ceremonies and rituals, and is somehow tied to Iranian culture. The scent of this aromatic fluid, which is an important element in Iranian funerals, conjures up heaven in the mind of mourners due to its tranquilizing properties. Given the fact that water is a symbol of purity in the Iranian culture and has always been considered as a sacred element, to sprinkle a few drops of rose water in the hands of mourners, as part of the mourning ceremonies with the aim of giving them peace of mind, symbolically represents the flow of healing water. The common use of rose water led to the emergence of a beautiful type of artefacts called rose water sprinkler, with smooth flowing forms and decorative motifs. However, such sprinklers have undergone fundamental changes in the age of technology. Those traditional, beautiful water rose sprinklers were replaced by glass and plastic bottles that are psychologically ineffective in user-product interaction and reviving cultural roots.

### Methodology

After describing Kansei engineering, rose water sprinkler as an Iranian cultural product was selected as the study sample and was examined using Kansei engineering to provide parameters for designing rose water bottle.

In the first step, a set of Kansei words were collected from different sources, such as websites, articles, and ads based on the product range. A total of 170 words were collected, out of which 26 words were obtained after examining and removing the similar words (Table 1).



Table 1. Kansei words

Delicate	Aromatic	Calm	Pure	Feminine	Spiritual	Kind	Intimate	Formal
Eternal	Magnificent	Salubrious	Dignified	Noble	Healing	Harmonious	Safe	Traditional
Luxurious	Simple	Fresh	Flowing	Charming	Sacred	Good grip	Usable	

Then, a set of photos of sprinklers that were designed and produced in Iran were found through search on the Internet. After removing the similar items, 5 sprinklers were examined and categorized based on different characteristics like shape, components, and proportions. The main components included container, neck, spout, lid, handle, and base. The high quality photos of the sprinkler were provided with the most possible similar dimensions.



Figure 3. 5 sprinkler samples used in the Kansei experiment

A 7 point semantic differential scale was used for measuring the Kansei keywords. And, an online questionnaire survey was conducted through the participation of 60 industrial design





The mean scores of the Kansei words in all the sprinklers as an ideal product are presented in Diagram 2. This diagram shows the importance of each word for the respondents participated in the questionnaire survey.

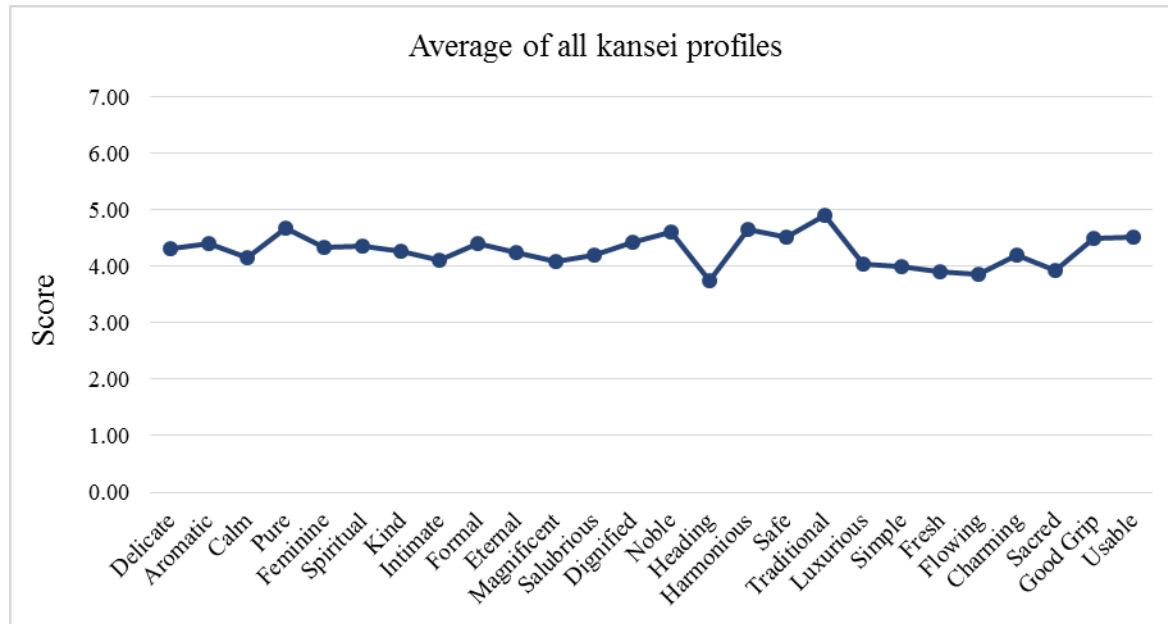


Diagram 2. The linear diagram of the mean scores for all the sprinklers

In the next step, the exploratory factor analysis method was adopted to simplify the data and discover the relationships between the variables. In the analysis, all the Kansei words were divided into three groups. The first group included kind, salubrious, intimate, feminine, aromatic, fresh, flowing, pure, calm, healing, spiritual, and eternal. The words represent the emotions shown by the user at the reflective level of cognition. The second group included safe, dignified, sacred, formal, usable, good grip, harmonious, delicate, charming, magnificent, and noble. The words represent the emotions aroused by evaluating the use of the sprinklers at behavioral level. The third group only included simple, traditional, and luxurious that describe the appearance of the sprinklers at visceral level.

Then, the cluster analysis method was used to find the relationship between the Kansei words and sprinkler characteristics. Accordingly, the Kansei words were classified as follows.

Table 2. Clusters of the Kansei words

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster5	Cluster 6	Cluster 7	Cluster 8	Cluster 9
Magnificent Luxurious Simple	Traditional	Calm Intimate Charming	Pure Noble Harmonious	Healing	Delicate Aromatic Feminine Spiritual Formal Dignified	Kind Eternal Salubrious	Safe Good grip Usable	Fresh Flowing Sacred

There was a significant relationship between words in one cluster. For example, a “luxurious” sprinkler is also considered “magnificent” in the mind of user, in contrast to the word “simple”. Or, a “Good grip” sprinkler is also considered to be usable and safe. The clusters of the Kansei words and the significant relationship between them are listed in Table 2. After classifying and sorting the words, the best sprinklers of the words in each cluster with score higher than 4.5 were identified. Table 3 illustrates how the sprinklers are selected in a cluster.

Table 3. The selection of the best sprinkler in each cluster (for example, Cluster 6)

Cluster 6					
Delicate	Aromatic	feminine	spiritual	formal	Dignified
C,D,E	B,C,E	B,E	B,C,D	A,C,D	C,D

The results of this table were adapted to the characteristics previously identified. For example, the form of the sprinkler body is like a drop for the word “delicate” in each of the 3 photos, or the sprinkler consists of a handle and the rose water is dripped through a curved tube placed on the main body in both selected photos for the word “feminine”. Finally, the design parameters of

the rose water bottle were extracted by integrating the similar items consisting of features like the form of drop, short legs, tube, long neck, handle, and colors like golden, turquoise, and white.

## Discussion

The results of the exploratory factor analysis clearly showed that the words of each group was related to which level of the cognition process. The first group included the words related to the reflective level. Considering that rose water sprinkler is an artefact influenced by Iranians cultural and religious roots, the respondent's reflective level was a reflection of their cultural and religious experience and feelings and, in fact, related to the inner level of their culture. The second group included the words that evaluate the use of the sprinkler at behavioral level. As a sprinkler is used to perform a specific action like other artefacts, its use needs to be evaluated technically, culturally, and religiously. This level of recognition is considered to be the same as the intermediate level of culture. For example, the word “formal” measures the product use in proportion to custom, culture, and the conditions of use. This behavioral level of cognition is aligned with the behavior level of culture and the social behavior layers. At the visceral level, the third group words specifically measure the factors related to the appearance of sprinklers, such as color, texture, motif, component diversity, etc, in relation to the outer level and the material layers of culture.

The above indicates the effectiveness of Kansei engineering in identifying the emotions related different levels of cognition and the cultural levels and layers through words. And, the analysis results confirmed the model proposed by Lin (Lin, 2007). In the next step, the design parameters were determined according to the linear diagram of the ideal sprinkler, final scores of the words, cluster analysis results, and characteristics of each sprinkler. The fact that each word was related to specific levels and layers of cultural cognition indicated that Kansei engineering is an effective and rule-based method to guide the designer's mind to identify cultural factors in the design process.

## Conclusion

The present study aimed to find an effective method for integrating culture into the design process. The results indicated the effectiveness of Kansei engineering in this regard. Such method is thus can be used for integrating cultural aspects. In the study samples, the external features were adapted to the results obtained through the analysis of the Kansei words, and the design parameters were extracted for designing an ideal rose water bottle. In general, it can be claimed that Kansei engineering is an effective method for the identification of the cultural considerations in the design process with respect to the present study objectives. The user culture-based behavior exhibited in the use process, can be considered as the product features in Kansei engineering for future research.

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