

Studying Emotional Design in LCD Monitors

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Abstract: Concerning users' experience has a significant role in product design. Creating an emotional connection between user and product can make a product successful in market. The aim of this study was to develop a systematic method for obtaining form specifications of products according to the emotional needs of customers. In this paper Kansei Engineering and Quality Function Development (QFD) was integrated to design an emotional LCD monitor. QFD is one of the techniques that can be applied for process and design improvement. Using this technique, the voice of customer is translated to the engineering and design characteristics. Kansei engineering was applied to extract product properties from unknown emotional needs of users. For this purpose, sample of LCD monitors was collected then four LCD monitors having more differences in the form feature were selected. A Kansei words were collected from experts, pertinent literature, customers and etc. A Kansei Word is a word describing the product domain. The number of Kansei words collected was reduced to 10 pair adjectives. 68 people aged 20 to 30 were selected randomly and were asked to evaluate each LCD monitor on each of 10 pairs Kansei word with a five-point Scale, and weigh the four LCD monitors. All data from questionnaire and interview were analyzed. The data showed that there are relationship between the users' feeling and design features and form of monitors. According to findings, two new LCD monitors were designed based on the result of the study. The factors which were concerned in design, compared with the last four samples that obtained the highest score in the study. Therefore, it was concluded that the emotional needs of the users were translated to form feature characteristics.

Key words: *Emotional Design, QFD, Kansei Engineering, LCD Monitors*

1. Introduction

Nowadays in many cases form and appearance in product design have a significant role. It is difficult or even impossible to predict all users' reflections. But their interests can be defined and designers should concentrate on users' interests. Creating an emotional connection between user and product can make a product successful in market. Emotional design is related to users' emotions and effects of the products on the users. Today designers try to make balance in objective and subjective matters in product design and they also are more concern about the users' experience rather than to focus on the appearance of the product. The emotions appear unconsciously

to the users and it is related to users' experiences, that's why discovering the emotions is not easy. The aim of this study was to develop an organized method for obtaining form specifications of products according to the emotional needs of customers. For this aim QFD and Kansei Engineering were applied as the methodologies of the study.

1.1 QFD

Quality Function Deployment (QFD), which is a method for translating the voice of the customer to Engineering specifications, provides a systematic model to design an object according to customer requirements.

The concept of QFD was introduced in Japan by Yoji Akao in 1966, and was first applied at the Kobe Shipyard of Mitsubishi Heavy Industries Ltd. Since that time, QFD has become the accepted methodology for development of products and services in Japan [1]. In the early 1980s, QFD was introduced at Xerox, According to [2], QFD is a method for developing a design quality aimed at satisfying the consumer and then translating the consumer's demand into design targets and major quality assurance points to be used throughout the production phase [3].

There are several approaches to QFD in which a number of matrices are used to organize and relate pieces of data to each other, in the four-phase model [4] which is more customary in western countries, the QFD, the House of Quality (I) is run first, translating customer demands into engineering characteristics and ranking them in order of their importance. These data are the starting point for the second phase, where the critical parts of a new product are identified and ranked according to the importance. In the following step the key production processes are reviewed (III) and improved if necessary. Phase four focuses on the role of the production personnel and the impact on product quality (Figure 1).

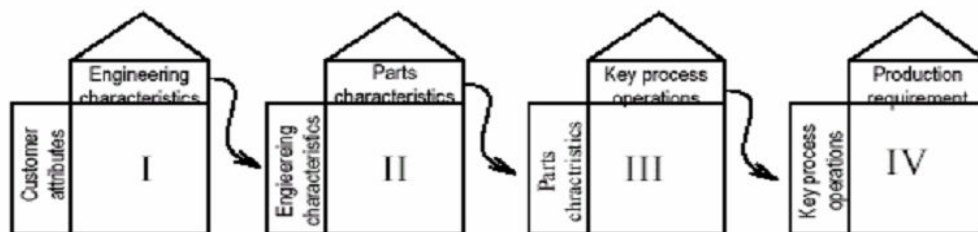


Figure.1 four phases of QFD [3]

In recent years, QFD has been widely applied for different purposes and in different environments. Although a considerable number of publications reviewed have been on product design, they mostly focused on technical rather than aesthetical aspects of products. These four were application of QFD for the design of Ceramics tea pot [5], worsted fabrics [6], hand-made carpet [7] and knife [8].

1.2 Kansei

Kansei engineering is considered as an appropriate methodology for linking users' emotions to product properties. Kansei Engineering translates users' impressions, feeling and intrests to design solutions. According to Nagamachi there are there points in this methodology:

- Understanding users' Kansei (emotions and intrests)

- Reflecting and Translating Kansei into product design
- Creating a system for design based Kansei [9]

The design process in Kansei Engineering consists of different steps including choice of domain, spanning the semantic space (collection of words, Kansei structure, and statistical methods), spanning the space of properties and synthesis.

In choice domain, the domain of the product is defined. Choice of domain is based on target group, market, new product specifications and product samples. In spanning the semantic space the kansei words are collected then structured usually by statistical methods. Kansei words define the domain of a product. These words can be collected from any source. Usually these words are collected from books, magazines, Medias and users' ideas and suggestions. The number of collected Kansei words is usually between 50 to 600 words.

After spanning the semantic space, physical properties are defined for semantic space. The last procedure is synthesis. In this procedure users' emotions and interests will be linked to physical properties [10].

2. Methodology

In this study QFD and Kansei Engineering were used to translate users' emotional needs to design specifications. "LCD monitors" as a product with aesthetics feature was selected as the case for this study.

Five procedures were considered to design:

- Collecting samples and choosing the best samples
- Finding Kansei words to understand users' emotional needs
- Evaluating the Samples by the customers
- Recognizing the effective parameters in customer's choice
- Designing two new LCD moitors according to the emotional needs of customers

A random sample of 68 students between 20 to 30 years old was selected. The sample size of 68 was calculated from the following formula for attribute data (with $\alpha=90\%$, $e=10\%$, $p=0.5$):

$$n = \frac{z_{\alpha}^2 \cdot p \cdot q}{e^2}$$

A random sample's evaluation of product provides the data for analysis.

3. Results

3.1 Collecting and classifying the sample

It was found that the customers were normally unable to clearly describe the design features which have in their mind. Therefore, there was a need to make an image by showing him/her the existing products. For this aim, different LCD Monitors were searched in the market. Due to the similarity of the designs, 4 monitors with more differences in the characteristics were selected by experts (Figure 2).

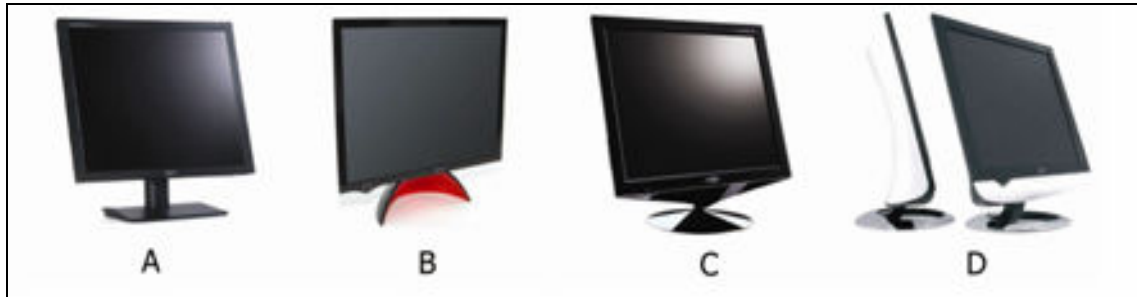


Figure.2 Four models of LCD monitors

3.2 Finding Kansei words to understanding users' emotional needs

To investigate users' emotional needs 108 Kansei words were gathered. The Kansei words were gathered based on product domain and physical properties. The words which had the most impression were recognized. The 9 pairs Kansei words were: luxe– simple, modern -traditional, simple- complex, interesting- monotonous, mild-strong, mysterious- apparent, dexterous- stable, unique- ordinary, casual- formal

3.3 Evaluating the Samples by the customers

The customers (68 samples) were asked to evaluate the LCD monitors by considering Kansei words (Table 1).

Table 1. Importance of Kasei words in the samples by the customers

Kansei words Models	luxe- Simple	modern -traditional	complex -simple	interesting- monotonous	mild- strong	mysterious- apparent	dexterous- stable	unique- ordinary	casual -formal
	Model A	4.22	4.01	4.42	1.89	2.10	1.56	4.08	4.42
Model B	2.60	1.90	2.82	3.60	3.42	3.53	2.39	2.26	2.47
Model C	2.86	2.50	3.38	2.69	2.54	2.46	3.39	3.35	3.76
Model D	1.86	1.72	2.31	3.86	3.67	3.75	2.69	2.14	2.58

3.4 Recognizing the effective parameters in customer's choice

By matrixes in QFD methodology, the connection among physical properties and Kansei words were recognized. For each Kansei word a matrix with column based on physical properties and row based on Kansei words was created. Taking the House of Quality methodology the relation between each Kansei words and physical property was studied. The weights of the characteristics of LCD were specified in terms of the relation between the characteristics and Kansei words. Each characteristic was defined in terms of zero or one, based on the presence or absence of factor as explained before. The score of each characteristic in any word was calculated by multiplying the weights by the relationship number (Table 2).

Table 2. Matrix for obtaining form characteristics

Physical Properties \ Kansei words		Kansei words												
		A	B	C	D	luxe- Simple	modern -traditional	complex -simple	monotonous -interesting	strong -mild	mysterious- apparent	stable -dexterous	ordinary -unique	casual -formal
The composition of basis and body	with geometrical irregular curve object	0	0	0	1	1.86	1.72	2.31	3.86	3.67	3.75	2.69	2.14	2.58
	with geometrical regular curve object	1	0	0	0	4.22	4.01	4.42	1.89	2.1	1.56	4.08	4.42	4.44
	without object	0	1	1	0	5.46	4.4	6.2	6.29	5.96	5.99	5.78	5.61	6.23
body	crooked lines	0	0	1	0	2.86	2.5	3.38	2.69	2.54	2.46	3.39	3.35	3.76
	horizontal and vertical lines	1	0	0	0	4.22	4.01	4.42	1.89	2.1	1.56	4.08	4.42	4.44
	geometrical regular curve	0	1	0	0	2.6	1.9	2.82	3.6	3.42	3.53	2.39	2.26	2.47
	geometrical irregular curve	0	0	0	1	1.86	1.72	2.31	3.86	3.67	3.75	2.69	2.14	2.58
basis	horizontal and vertical lines	1	0	0	0	4.22	4.01	4.42	1.89	2.1	1.56	4.08	4.42	4.44
	geometrical regular curve	0	1	1	0	5.46	4.4	6.2	6.29	5.96	5.99	5.78	5.61	6.23
	geometrical irregular curve	0	0	0	1	1.86	1.72	2.31	3.86	3.67	3.75	2.69	2.14	2.58
	invisible	1	0	0	0	4.22	4.01	4.42	1.89	2.1	1.56	4.08	4.42	4.44
power key	visible with geometrical shape	0	1	0	0	2.6	1.9	2.82	3.6	3.42	3.53	2.39	2.26	2.47
	visible with non geometrical shape	0	0	1	0	2.86	2.5	3.38	2.69	2.54	2.46	3.39	3.35	3.76
	visible with regular curve	0	0	0	1	1.86	1.72	2.31	3.86	3.67	3.75	2.69	2.14	2.58
Total						46.2	40.5	51.7	48.2	46.9	45.2	50.2	48.7	53

4. Discussion and Conclusion

The connection between users' emotions and the specifications of the product form was investigated through the study. Kansei words (users' emotional specifications) in columns and physical properties in the rows of the

quality houses show the connection between the factors which were investigated in the study (Table 2). The houses of the matrix which have the most or less score show the grade of the users' emotions and interests in product. The connection between each Kansei word and specific physical property was studied. Kansei words express the emotions and messages which influenced the users.

As it was shown in table 3, the word mild expresses a specific emotion through the defined physical properties, such as vertical and horizontal lines in product design. In another Kansei word interesting a different emotion is expressed through geometric irregular curves or a word strong has a direct connection with vertical and horizontal lines.

Based on the analyzed data (Table 2), two monitors were designed. In the design process visual elements and specifications were applied, so two different monitors with different characteristics were designed. One of the monitors was designed as a formal characteristic. The word formal was linked to specific physical properties which were concluded from the study (Figure 3).



Figure.3 Formal Monitor

Another monitor was designed as casual monitor (Figure 4).



Figure.4 Casual Monitor

In this study Quality Function Development was applied to translate users' emotions to product properties. Kansei Engineering was also used to figure out users' emotional specifications. As the emotions are commonly unconscious, the users' emotional specification contains the factors which are not easy to hear from the users.

The aim of this study was to investigate the connection between users' emotions and product properties. The study showed that there is a direct connection between these factors. For example vertical and horizontal lines were connected to word such as simple, traditional, common and formal. Geometrical curves were connected to words such as mild, modern and interesting. In other words the same direct connections were observed. So it is concluded that there was a direct connection between users' emotion and product properties. Understanding and applying this connection will help the designers to provide users' needs much better.

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