DETERMINATION AND PRIORITIZATION OF PRODUCT DESIGN SPECIFICATIONS WITH KANSEI ENGINEERING APPROACH; (CASE STUDY: PACKING DESIGNATION OF NEW HEALTH PRODUCT OF FIROUZ HEALTH GROUP)

MohammadAli Zeynali[1], Dr. Gholamreza Hashemzadeh[2], Dr. Hessam Zandhessami[3]
[1]*Department of Technology Management, Faculty of Management and Accounting, Tehran-South Branch, Islamic Azad University, Tehra, Iran*
[2]*Assistant Professor, Department of Management, Faculty of Management and Accounting, Tehran-South Branch, Islamic Azad University, Tehran, Iran*
[3]*Assistant Professor, Department of Industrial Management, Faculty of Management and Accounting, Qazvin Branch, Islamic Azad University, Qazvin, Iran*

Abstract
Today, manufacturers need to pay attention to the emotions of real users in order to design and manufacture of desired products so that buyers are able to differentiate a product from other products and show their satisfaction through their purchasing .In this study, through Kansei engineering approach, we will evaluate the real emotions and feelings of users and modify them through appropriate design specifications for using in packing design of new health product of Firouz Health Group (L.L.C). In this regards, based on Kansei engineering methodologies in first and second steps with the help of expert designers, desired domain and kansei words will be identified and also screened. Then, Certified vendors, due to the perception of the demands of the users, are requested to determine the technical characteristics of the users and finally the collected data using Pareto diagram is analyzed and featured properties are selected and using these properties, we adopt the selected products. In next step, for synthesizing kansei words and product properties through questioning with presence of certified developers and vendors, we continue to analyze and identify properties that cover Kansei words with appropriate and exact mode. They can be used in presenting desired model in the next step. In the fifth and final step using Topsis model, we will select the best option as the best product between designed model and selected products that are identified in third step.

Keywords: Kansei engineering, Packing, Design, Product develop, Emotion and Sentiments

1. Introduction

Today, designing and role of packaging in order to create a link between product and customer is of very important concerns that majour manufacturers in the world are faced with them. To achieve intended communication objectives that provide sufficient information on the psychology of users of product through manufacturers, understanding

the reactions of users over product packaging should be considered. Products'packing is a kind of science, art and technology to protect products against pollution and risks of proper transportion and reservation of those products. In the new era, large and popular enterprises are looking for a movement toward improvement and development of technology in order to apply it to influence on human activities in societies. Along with this development, extending and development of communication tools also contribute to accelerate the exchange of information in wide level. In this way, one of effective communication tools between users and product is undoubtedly product's packaging. Customers increasingly select their product based on soft values, emotions, feelings and meanings can be transferred from the product only based on logical argument, while making decision to purchase product and finally the great attention to be paid to integration of emotional meaning. Today, strong and superior trends such as fun, spirituality and individuality to create distance through traditional methods can be considered as key indicators during the design of products (Jordan, 2002). Integrating factors in product development means that for the first time focused changes on the functional requirements shall apply to the emotional needs of customers. For example, products such as automobiles, furniture, jewelry, etc have not only practical value for customers but also the emotional characteristics such as self-confidence can be transferred. According to Kano, Seraku, and Takahashi (1984), indicators of functional properties provided proper accessories. But they can not be used through properly understood characteristics of products as features that create appeal for customers (Schütte, 2007).
Hence, Kansei engineering has been used in Japan since 1970, which aims to design and develop products and services that correspond with feelings and emotional eand psychological needs of customers. In this article, we intend to introduce background of Kansei engineering, method for designing, and manufacturing new products through deep kindness and offering a new frame in a form of structural model which can be systematically used to understand potential structures and deep intrest used tomake new, innovative and attractive products, (Dahlgaard, 2008). In the article, in the first section, we will study the research background in the field of Kansei engineering and in the second section, type of research method consistent with Kansei engineering methodology will be provided. The third section, we will analyz the data consistent with data obtained from a case study on the new health product packaging of Firooz Group. However, in this section, using questionnaires and open interviews among experts in two fields of design and sell, we collect the data. Finally, the results obtained of the study are discussed in forth section.

2. Research Background (Kansei Engineering)

In the competitive world of current trade containing various types of products and different selling methods, success of each product in selling needs that packing and appreance of product can make effective relationship with potential buyer. Of course, design skill plays an effective role in creating such relationship. As we know, the act of product purchase is not the end of the buying process as well as buyer and seller relationship; rather it is the initiate customer relationship with a manufacturer. Thus, packaging appearance shall recognize good memorie associated with consumption of goods and led to purchase repeatation.Basicllay, stimulating customers' feelings and emotions is caused by external sensitive stimulies existed in environjment and the reason

of forming its different levels is due to difference in senses importance by customers. Often the sense of sight is regarded as the most important human senses and other senses of hearing, smell, taste and touch is often considered as a complement to the sense of sight. In this regard, there are general models for ranking are regulating the senses complying with existed frequencies and importance of their application (Schifferstein, 2006).

Harada, Stappers and Lee (2002) presented a developed model to articulate the concept of Kansei and Chaysy that introduced as uniquefor Kansei concept, which can be equivalent to “reason" term. In their point of view, the concept of Kansei is related to human emotional and feelings values and Chaysy represents knowledge and understanding that is used for linguistic descriptions of logical facts. In fact, the sensory input in both concepts is common and orginate from human mapping perspective. As you can see in Figure 1, the concept of Kansei is constructive of human love, feelings and emotions, which in turn leads to creativity and Chaysy or logical reason creates understanding and recognizing that will eventually turn into knowledge (Schütte, 2007).

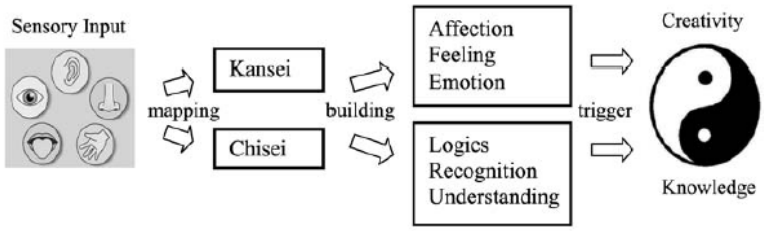

Figure1. Developed Kansei Engineering Model (Source: Schütte, 2005)

Similar emotional reactions can also lead to a particular state of mind which can be described as nature (Picard, 1997). The calculating and measuring based on Kansei engineering methods are not a simple task because it is always formed based on mental structures and the method is used for measuring regarding to human reactions. However, Japanese researchers using Nagamachi method, which is regarded as a pioneer in this field since 1970, were able to understand Kansei engineering, translate and apply it in order to provide proper and accurate solutions for designing product to meet customers’ demands and their satisfaction. At first, the method is called Emotional Engineering and Mazda Motor Corporation, as the first company, has benefited of this new methodology in product development from early 1980, although the use of the method by Mazda Motor Corporation is formally presented by the speech of Mazda Motor president in 1986 during a ceremony to hand over Detroit as the new output and introduced as a way to design and develop the product to the world. In the Kansei engineering concept, a static perspective is not included the importance of usuful sensory systems. Rather, it has considerable importance of sensory systems, the dependence of the questions raised in the fields of products, concepts and individual preferences. In most studies in product development utilizing emotional engineering methods, all required senses are used (Nagamachi, 1989). Kansei engineering method is as an inner feeling that is close to the external senses (Nagasawa, 2002). External senses are considered as appropriate inputs to provide detailed

implementation of Kansei engineering methodology. This principle in Kansei engineering method, in which emotions and feelings can be used to sense external stimuli, is measured (Lee et al , 2002).

3. Research Method (Kansei Engineering Methodology)

Schütte's model in 2005 examined all Kansei engineering methods and with the development of this model, all contents of Kansei engineering will be covered. This model is presented in Figure 2.

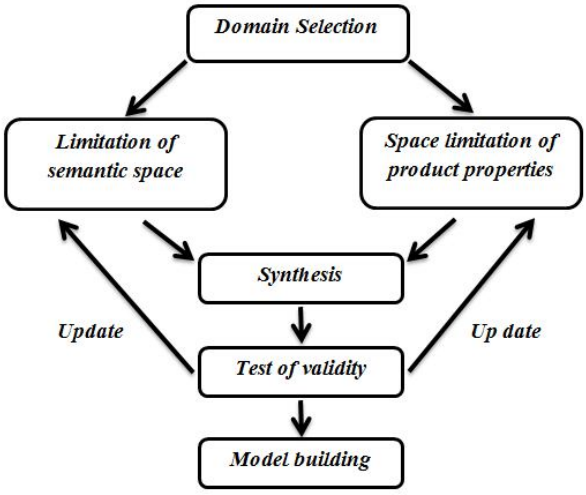

Figure2. Kansei Engineering Process (Source: Schütte, 2005)

3.1. Domain Selection

The domain represents a description of the general idea of the background of the product. The target group will be considered in selecting the domain and type of user, market and product group are also included. The selection and determination of domain using existed products as well as new concepts and undersigned solutions are performed and by use of this data, description of formulated domain as basic for further evaluation will be carried out.

3.2. Limitation of semantic space

Semantic space for the first time was presented by Osgood et al. In 1957, it was proposed that each artifact can be defined in a vector space by semantic terms (words). This means that collecting a large number of descriptive words in a field to be addressed. First, a number of words describing the product were collected. This number decreased in several steps until the words with the highest impact on the user's mind remained. Figure 3 illustrates that.

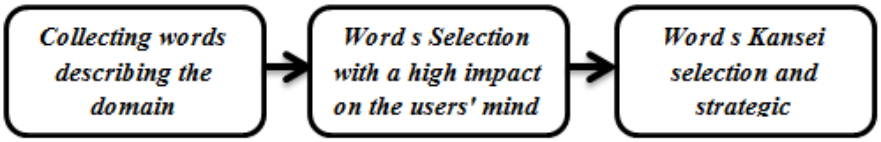

Figure3. Limitation of semantic space (Source: Schütte, 2003)

3.2.1. Collecting words describing the domain

The resulting output of words representing the domain is collected by describing the desired product. All available resources such as literature, expert interviews, and users' opinions need to be used in order to get all the words that are associated with the product. To ensure, collection of words continues until no new words takes place.

3.2.2. Words Selection with a high impact on the users' mind

The number of raw collected words for a continuous evaluation is enormous. In fact, a few words may be less interesting in the context of product development. Therefore, the words are grouped according to their dependencies (Bergman and Klefsjö, 1994).

3.2.3. Words Kansei selection and strategic planning

Pre- selected words are combined with the visual words. Following this approach, the words are called Kansei words. They are an integrated part of the input product development process. However, their applications are limited in time.

3.3. Space limitation of product properties

Similar to semantic space, the space of product properties is discussed. This space is descriptive of product properties in engineering concepts that will be linked to pre-selected Kansei word. The output is selected from selected product groups in domain, collected relevant product characteristics and according to their impact on users. In addition, the representative products are also collected. Figure 4 illustrates this approach.

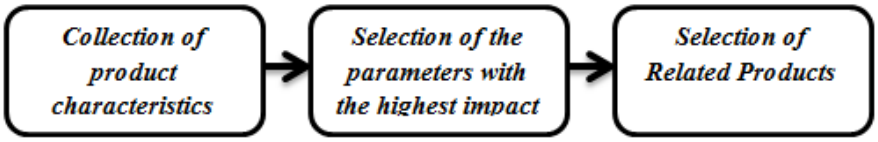

Figure 4 – Limitation of properties space (Source: Schütte, 2003)

3.3.1 Collection of product characteristics

In order to collect words in semantic space, features were collected from a variety of sources, such as technical specifications, expert interviews, literature, etc.

3.3.2. Selection of the parameters with the highest impact

Characteristics, that are more important to users, tend to discussed in the higher frequency than other ones. A possible visualization technique is Pareto diagram. In this particular study, the features are selected. In literature, the selected characteristics are called product properties in order to distinguish them from words had already been chosen (Nagamachi, 1997).

3.3.3. Selection of Related Products

Kansei engineering is a challenging way for users to rank their feelings on meaningful scales. Therefore, customers will need to have experience and they are forced to interact with the product during the ratings process. Therefore, products presenting properties should be differently. Depending on the method used to communicate the semantic space and properties space, products are selected according to certain rules.

3.4. Synthesis

The most important step that makes Kansei engineering unique is its ability to connect describing words (Kansei words) with the properties of the product. Data is collected using semantic scales and evaluated by statistical methods and finally, there is meaningful relationship between the limitation of semantic space and product properties.

3.5. Modeling and validation Test

The final step is the modeling and validation. The last step is performed to study prediction model and verify the optimistic reliability. At this point of Kansei approach, a model of Kansei is available but nothing is not been said about the validity of the model. Finally, according to the results obtained in the synthesis step, a mathematical or non-mathematical model is made. However, before using a pattern or selected patterns as predicted ones for the future products, they will be credited to the test. However, not only validation methods are available for semantic differences, but there is a need for validity of a more unified concept.

4. Analysis of findings (Case study)

In the article, we intend to step in way of changing emotional features and users' feeling to design packing characteristics of new product and their initiation using a regulated method; in order to do that, a case study on the new health product packaging of Firooz Group is carried out and engineering Kansei is used as a tool for developing new ideas.

4.1. Selection a domain

In the first step, for Firooz health products in packaging field, original tape from the domain definitions are shown in Table 1. The domain chosen based on a questionnaire distributed among 10 cases of expert designers is achieved.

Table1. Selection a domain (Source: Author)

Item	*Domain end*	*Domain start*
Sexual	*Men*	*Weman*
Age	*40*	*18*
Zone	*Tehran North*	
products	*Modern Packing*	*Traditional Packing*

4.2. Limitation of semantic space

In the first step, using appropriate resources including journals, literature on the subject, experts, users' experience, and studies related to Kansei, etc., 94 words related to the field of health products packaging (sunscreens) were collected. The collected words are contained in Table 2. In the next step, the collected words are grouped in 10 distinct groups by the oponions of expert designers and based on the description of the product,

(Table 3). Then, a questionnaire was distributed between 10 expert designers to reduce the number of words. In this regard, from the collected 94 words, a certain number of words as Kansei words (Kansei words) are presented. By observing the results, it can be concluded that from existed 94 words, the number of 14 words can be selected Kansei words because they attacted the greatest attentions of expert designers. Table 4 shows selected Kansei words that indicate semantic space of Kansei engineering methodology in this study.

Table2. Kansei Words (Source: Author)

Word	Row	Word	Row	Word	Row	Word	Row	Word	Row	Word	Row
Intelligible	81	Popular	65	New	49	Valid	33	Mandy identity	17	Enjoyable	1
Compatible	82	Succulent	66	Modern	50	Recyclability	34	Coloring	18	Metal	2
Systematic	83	Titivation	67	Memorable	51	Clarity	35	Innovative	19	Plastic	3
Valuable	84	Bracing	68	Stimulator	52	Thriller	36	Heavy	20	Tube	4
Brand	85	Freshness	69	Originality	53	Deluxe	37	Simplicity	21	Easy Access	5
Mean of communication	86	Lovely	70	Distinct	54	Aristocratic	38	Protection	22	Easy Relocation	6
Applied	87	Racy	71	Fortified	55	Effective	39	Quality	23	Satisfactory	7
Advertising performance	88	Transparent	72	Self-Assurance	56	Ease of use	40	Healthful	24	Economic Advantage	8
Mobility	89	Subtle	73	Creativity	57	Performance	41	Safe	25	Charming	9
Thrift	90	Wonderful passion	74	Elegance	58	Impressive	42	Comfortable	26	Efficient	10
Resistance	91	Respect	75	Soft	59	Unique	43	Persistent	27	Usage best	11
Narrow	92	Entertainment	76	Coordination	60	Strong	44	Design best	28	Gracious	12
Broad	93	Complex	77	Solidarity	61	Hardy	45	Competitive	29	Optimal use	13
Nostalgia	94	Place low	78	Fantasy	62	Inscrutable	46	Reliable	30	Beautiful	14
		Tranquility	79	Classical	63	Supple	47	Convenience	31	Form best	15
		Large	80	Style	64	Integrated	48	Attractive	32	Helpful	16

Table3. Classification of collected Kansei words (Source: Author)

Group 10	Group9	Group8	Group7	Group6	Group5	Group4	Group3	Group2	Group1
Innovative	Persistent	Mandy identity	Economic Advantage	Healthful	Deluxe	Design best	Enjoyable	Easy Access	Metal
Creativity	Recyclability	Self-Assurance	Competitive	Succulent	Aristocratic	Complex	Satisfactory	Easy Relocation	Plastic
	Compatible	Respect	Brand	Bracing	New	Place low	Charming	Optimal use	Tube
			Advertising performance	Freshness	Modern	Large	Gracious	Simplicity	Quality
			Thrift	Mobility	Fantasy	Usage best	Attractive	Efficient	Heavy
					Classical	Beautiful	Unique	Comfortable	Strong
					Racy	Form best	Memorable	Reliable	Hardy
					Entertainment	Coloring	Popular	Valid	Inscrutable
					Nostalgia	Narrow	Distinct	Clarity	Supple
						Systematic	Lovely	Effective	Integrated
						Broad	Impressive	Ease of use	Fortified
							Thriller	Performance	Elegance
							Stimulator	Intelligible	Soft
							Wonderful passion	Mean of communication	Coordination
							Valuable	Applied	Solidarity
								Convenience	Transparent
								Titivation	Subtle
								Tranquility	Helpful
								Safe	Protection
								Originality	Resistance
									Style

Table4. Kansei Words (Source: Author)

Kansei word	Row	Kansei word	Row
Charming	8	Easy Relocation	1
Place low	9	Optimal use	2
Comfortable	10	Supple	3
Thrift	11	Ease of use	4
Form best	12	Inscrutable	5
Creativity	13	Distinct	6
Beautiful	14	Hardy	7

4.3. Limitation space of product properties

As shown in Figure 4, this step can be divided into three parts. In this regard, in order to obtain existed concepts in the first two sections of this step that is to collect product characteristics and selection of features with highest impact, by studied investigations on existed products, customers' comments, technical solutions and possible designing concepts etc., we achieved to identify 27 of the products properties that is health products packaging (sunscreen) through 10 expert designers. The collected properties from various sources can see in Table 5.

Table5. Product properties identified from multiple sources (Source: Author)

Product properties			
Broad	Tube	Connecting latching cap	Hot color
High volume	Cylindrical	No cover	cool color
Low volume	Cubic	Plastic	Screw output
Transparent wrapper	Uniform Form	Glassy	Pump output
Dark Wrapper	Non-uniform form	Flexible	Roll-on output
Brand	Narrow tip	inflexible	Separate push cap
	Tip	Bottom half of round	Separate screw cap

After collecting the desired product properties, through open interviews with 10 qualified vendors, we will identify important and less important properties of the product contained in Table 5, according to experiences obtained for qualified vendors in the field of the range of emotional and psychological needs of customers than packing health products due to its close relation with customers and users of the desired product.

Finally, to better evaluation, we used Pareto diagram (Dehgard, 2002) to decide on the selection of important and less important properties. In this context, either drawing Pareto diagram or targeting the responses expressed by 10 qualified vendors, we will select the most important scores and the most important cases. as drawn in the Pareto diagram and outlined in Diagram 1 , 12 numbers of the most important items (properties) including Brand, Plastic, Broad, Dark Wrapper, Flexible, High volume, Hot color, Uniform Form, Narrow tip,Pump output,Separate push cap and Tube for selecting products, will be selected .

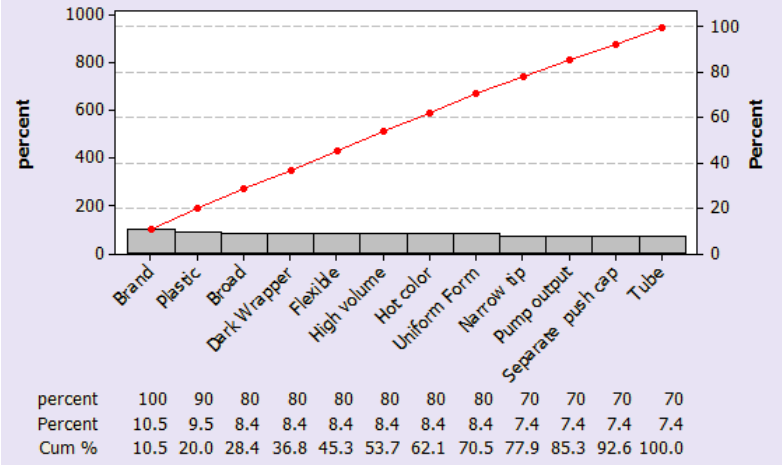

Diagram1. Pareto diagram for preferred properties selection (Source: Author)

After passing the first two parts of the third step of Kansei engineering methodology, it turns to select related products, according to selected cpropertises identified in the Current market. In this regard, by use of comments of the designers, qualified vendors, 8 cases of related products or superior properties will be identified.

4.4. Synthesis

At this step, the degree of correlation between each of the selected product properties or selected products can be determined (Table 6).

Table6. The degree of selected properties with selected products (Source: Author)

Row	products	Properties											
		Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1		1	1	1	0	0	1	1	1	0	0	1	0
2		1	1	0	1	1	0	0	1	1	0	0	1
3		0	1	0	1	1	0	1	1	0	0	0	1
4		1	0	0	0	0	0	0	1	0	1	1	0
5		0	1	0	1	1	0	0	1	0	0	0	1
6		1	1	1	1	0	1	0	0	0	1	0	0
7		0	1	1	1	0	1	0	0	0	1	0	0
8		1	1	0	1	1	0	0	1	0	1	1	1

After determining the degree of relation of each selected properties with selected products, it turns to weigh the products based on s Kansei words, the results are shown in Table 7.

Table7. Weight of Kansei words over selected products (Source: Author)

Kansei word ➡ / selected products ⬇	Easy Relocation	Optimal use	Supple	Ease of use	Inscrutable	Distinct	Hardy	Charming	Place low	Comfortable	Thrift	Form best	Creativity	Beautiful
NUM 1	1.1	2.1	0	3.2	16.9	7.1	7.9	11.6	1.1	2.1	6.3	10.1	3	3
NUM 2	22	4	30	10.1	18.5	4.6	15	6	37	12.6	16	19	1.9	2.9
NUM 3	7	2	25.8	3.8	10.6	16.7	17.1	10.4	5	12	16.3	3.5	8.8	2
NUM 4	25.5	23.8	0	18.8	19.8	17.5	4.7	18	35	16.4	5.7	21.8	3.1	32.6
NUM 5	5	2.1	23	5.3	11.1	9.1	15.7	7.6	5.8	6.1	17	3.6	1.3	1.9
NUM 6	2.1	23.1	0	20	0	15	13.6	16.7	3.2	14.8	10	20.3	12.6	44.7
NUM 7	19	22	0	16.8	0	10	11	10	3.1	12	10.9	2.1	2.1	7.6
NUM 8	18	20.5	21	21.8	22.7	19.8	14.7	19.4	9.6	23.6	17.7	19.5	67	4.9

After specifying the degree of relation between selected properties and Kansei words or selected products, which their results contained in Tables 6 and 7, it is time to achieve a combination of the Kansei words and selected properties on the basis of selected products. The purpose of combining Kansei words and selected properties is to achieve properties that cover a high weight Kansei words expressing users'emotions and feelings in order to designers design final product according to the emotions of users in this regards (table 8).

Table8. Weight of selected properties for each Kansei word (Source: Author)

Easy Relocation													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	1.1	1	1	1	0	0	1	1	1	0	0	1	0
2	22	1	1	0	1	1	0	0	1	1	0	0	1
3	7	0	1	0	1	1	0	1	1	0	0	0	1
4	25.5	1	0	0	0	0	0	0	1	0	1	1	0
5	5	0	1	0	1	1	0	0	1	0	0	0	1
6	2.1	1	1	1	1	0	1	0	0	0	1	0	0
7	19	0	1	1	1	0	1	0	0	0	1	0	0
8	18	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	68.7	74.2	22.2	73.1	52	22.2	8.1	78.6	22	64.6	44.6	52
Optimal use													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	2.1	1	1	1	0	0	1	1	1	0	0	1	0
2	4	1	1	0	1	1	0	0	1	1	0	0	1
3	2	0	1	0	1	1	0	1	1	0	0	0	1
4	23.8	1	0	0	0	0	0	0	1	0	1	1	0
5	2.1	0	1	0	1	1	0	0	1	0	0	0	1
6	23.1	1	1	1	1	0	1	0	0	0	1	0	0
7	22	0	1	1	1	0	1	0	0	0	1	0	0
8	20.5	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	73.5	75.8	47.2	73.7	28.6	47.2	4.1	54.5	4	89.4	46.4	28.6
Supple													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	0	1	1	1	0	0	1	1	1	0	0	1	0
2	30	1	1	0	1	1	0	0	1	1	0	0	1
3	25.8	0	1	0	1	1	0	1	1	0	0	0	1
4	0	1	0	0	0	0	0	0	1	0	1	1	0
5	23	0	1	0	1	1	0	0	1	0	0	0	1
6	0	1	1	1	1	0	1	0	0	0	1	0	0
7	0	0	1	1	1	0	1	0	0	0	1	0	0
8	21	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	51	99.8	0	99.8	99.8	0	25.8	99.8	30	21	21	99.8

Ease of use													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	3.2	1	1	1	0	0	1	1	1	0	0	1	0
2	10.1	1	1	0	1	1	0	0	1	1	0	0	1
3	3.8	0	1	0	1	1	0	1	1	0	0	0	1
4	18.8	1	0	0	0	0	0	0	1	0	1	1	0
5	5.3	0	1	0	1	1	0	0	1	0	0	0	1
6	20	1	1	1	1	0	1	0	0	0	1	0	0
7	16.8	0	1	1	1	0	1	0	0	0	1	0	0
8	21.8	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	73.9	81	40	77.8	41	40	7	63	10.1	77.4	43.8	4.1
Inscrutable													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	16.9	1	1	1	0	0	1	1	1	0	0	1	0
2	18.5	1	1	0	1	1	0	0	1	1	0	0	1
3	10.6	0	1	0	1	1	0	1	1	0	0	0	1
4	19.8	1	0	0	0	0	0	0	1	0	1	1	0
5	11.1	0	1	0	1	1	0	0	1	0	0	0	1
6	0	1	1	1	1	0	1	0	0	0	1	0	0
7	0	0	1	1	1	0	1	0	0	0	1	0	0
8	22.7	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	77.9	79.8	16.9	62.9	62.9	16.9	27.5	99.6	18.5	42.5	59.4	62.9
Distinct													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	7.1	1	1	1	0	0	1	1	1	0	0	1	0
2	4.6	1	1	0	1	1	0	0	1	1	0	0	1
3	16.7	0	1	0	1	1	0	1	1	0	0	0	1
4	17.5	1	0	0	0	0	0	0	1	0	1	1	0
5	9.1	0	1	0	1	1	0	0	1	0	0	0	1
6	15	1	1	1	1	0	1	0	0	0	1	0	0
7	10	0	1	1	1	0	1	0	0	0	1	0	0
8	19.8	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	64	82.3	32.1	75.2	50.2	32.1	23.8	74.8	4.6	62.3	44.4	50.2
Creativity													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	3	1	1	1	0	0	1	1	1	0	0	1	0
2	1.9	1	1	0	1	1	0	0	1	1	0	0	1
3	8.8	0	1	0	1	1	0	1	1	0	0	0	1
4	3.1	1	0	0	0	0	0	0	1	0	1	1	0
5	1.3	0	1	0	1	1	0	0	1	0	0	0	1
6	12.6	1	1	1	1	0	1	0	0	0	1	0	0
7	2.1	0	1	1	1	0	1	0	0	0	1	0	0
8	67	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	76.3	85.4	6.4	82.4	79	6.4	11.8	85.1	1.9	73.5	73.1	79

Hardy													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	7.9	1	1	1	0	0	1	1	1	0	0	1	0
2	15	1	1	0	1	1	0	0	1	1	0	0	1
3	17.1	0	1	0	1	1	0	1	1	0	0	0	1
4	4.7	1	0	0	0	0	0	0	1	0	1	1	0
5	15.7	0	1	0	1	1	0	0	1	0	0	0	1
6	13.6	1	1	1	1	0	1	0	0	0	1	0	0
7	11	0	1	1	1	0	1	0	0	0	1	0	0
8	14.7	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	55.9	95	32.5	87.1	62.5	32.5	25	75.1	15	44	27.3	62.5
Charming													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	11.6	1	1	1	0	0	1	1	1	0	0	1	0
2	6	1	1	0	1	1	0	0	1	1	0	0	1
3	10.4	0	1	0	1	1	0	1	1	0	0	0	1
4	18	1	0	0	0	0	0	0	1	0	1	1	0
5	7.6	0	1	0	1	1	0	0	1	0	0	0	1
6	16.7	1	1	1	1	0	1	0	0	0	1	0	0
7	10	0	1	1	1	0	1	0	0	0	1	0	0
8	19.4	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	71.7	81.7	38.3	70.1	43.4	38.3	22	73	6	64.1	49	43.4
Place low													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	1.1	1	1	1	0	0	1	1	1	0	0	1	0
2	37	1	1	0	1	1	0	0	1	1	0	0	1
3	5	0	1	0	1	1	0	1	1	0	0	0	1
4	35	1	0	0	0	0	0	0	1	0	1	1	0
5	5.8	0	1	0	1	1	0	0	1	0	0	0	1
6	3.2	1	1	1	1	0	1	0	0	0	1	0	0
7	3.1	0	1	1	1	0	1	0	0	0	1	0	0
8	9.6	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	85.9	64.8	7.4	63.7	57.4	7.4	6.1	93.5	37	50.9	45.7	57.4

Comfortable													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	2.1	1	1	1	0	0	1	1	1	0	0	1	0
2	12.6	1	1	0	1	1	0	0	1	1	0	0	1
3	12	0	1	0	1	1	0	1	1	0	0	0	1
4	16.4	1	0	0	0	0	0	0	1	0	1	1	0
5	6.1	0	1	0	1	1	0	0	1	0	0	0	1
6	14.8	1	1	1	1	0	1	0	0	0	1	0	0
7	12	0	1	1	1	0	1	0	0	0	1	0	0
8	23.6	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	69.5	83.2	28.9	81.1	54.3	28.9	14.1	72.8	12.6	16.8	42.1	54.3
Thrift													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	6.3	1	1	1	0	0	1	1	1	0	0	1	0
2	16	1	1	0	1	1	0	0	1	1	0	0	1
3	16.3	0	1	0	1	1	0	1	1	0	0	0	1
4	5.7	1	0	0	0	0	0	0	1	0	1	1	0
5	17	0	1	0	1	1	0	0	1	0	0	0	1
6	10	1	1	1	1	0	1	0	0	0	1	0	0
7	10.9	0	1	1	1	0	1	0	0	0	1	0	0
8	17.7	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	55.7	94.2	27.2	87.9	67	27.2	22.6	79	16	44.3	29.7	67
Form best													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	10.1	1	1	1	0	0	1	1	1	0	0	1	0
2	19	1	1	0	1	1	0	0	1	1	0	0	1
3	3.5	0	1	0	1	1	0	1	1	0	0	0	1
4	21.8	1	0	0	0	0	0	0	1	0	1	1	0
5	3.6	0	1	0	1	1	0	0	1	0	0	0	1
6	20.3	1	1	1	1	0	1	0	0	0	1	0	0
7	2.1	0	1	1	1	0	1	0	0	0	1	0	0
8	19.5	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	90.7	78.1	32.5	68	65.9	32.5	13.6	77.5	19	63.7	51.4	45.6

Beautiful													
Product num	Weight of Kansei word	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1	3	1	1	1	0	0	1	1	1	0	0	1	0
2	2.9	1	1	0	1	1	0	0	1	1	0	0	1
3	2	0	1	0	1	1	0	1	1	0	0	0	1
4	32.6	1	0	0	0	0	0	0	1	0	1	1	0
5	1.9	0	1	0	1	1	0	0	1	0	0	0	1
6	44.7	1	1	1	1	0	1	0	0	0	1	0	0
7	7.6	0	1	1	1	0	1	0	0	0	1	0	0
8	4.9	1	1	0	1	1	0	0	1	0	1	1	1
Total weight	100	88.1	67	55.3	64	11.7	55.3	5	47.3	2.9	89.8	40.5	11.7

4.5. Modeling and Validation Test

In order to implement the final step of Kansei engineering and achieving final goals that is obtaining realistic reliability of designed products based on the output of each step of Kansei engineering (Dehgard, 2008), we present an objective model based on selected properties obtained in the third step and application of such selected products.

Then after designing final pattern, using TOPSIS model, the mentioned pattern on the other side of 8 selected products by the experts' comments in the third Kansei engineering is placed and based on 12 selected properties as a criterion for TOPSIS model, we ranked. In this regard, at first, we will start with resulating and distributing questionnary among 10 experts in the field of designing for each option (8 selected products by designing pattern). The results of the survey are shown in Table 9.

Table9. Points for each item (product) over standards (Selected Product Properties) (Source: Author)

Row	Properties ➡ / Product ⬇	Brand	Plastic	Broad	Dark Wrapper	Flexible	High volume	Hot color	Uniform Form	Narrow tip	Pump output	Separate push cap	Tube
1		7	7	7	1	1	9	5	5	1	1	9	1
2		9	7	1	7	5	1	3	5	9	1	1	9
3		5	7	3	7	5	3	5	5	5	1	1	9
4		5	1	1	1	1	1	1	7	1	9	9	1
5		3	7	3	7	5	3	1	5	5	1	1	9
6		9	9	7	9	3	9	1	7	7	9	1	1
7		3	7	5	7	1	5	1	5	7	9	1	1
8		9	7	3	7	5	3	1	5	7	9	9	9
9	designing pattern	1	7	3	7	5	3	7	5	7	9	7	9

To solve the problem using the TOPSIS method, six sequenced step shall be carried out. In the following, we will explain findings obtained from six steps outlined in order to introduce the best option (best designing of product).

4.5.1. Quantify and Unmeasuring decision matrix

In the process, we are trying to unmeasure the existed scales in in decision matrix. In this regard, the formula (1) is used to implement this process.

Formula (1):

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^{2}}}$$

4.5.2. Weight to normalized matrix

In order to implement this step, we use Expert Choice software to determine the weight indexes or AHP method. Then, the resulting weight will be multiply in normalized matrix until weight to the normalized matrix to be finish.

4.5.3. Determining Positive and negative ideal solutions

Depending on the type of the indicator and its impact on decisions, positive and negative ideal will be determined the. For indicators that have a positive impact on the target, positive ideal will has the maximum value of that indicator. In this regard, the maximum and minimum values for each indicator in Table 10 are shown.

Table10. Maximum and minimum values of the indicators (Source: Author)

Values	*Brand*	*Plastic*	*Broad*	*Dark Wrapper*	*Flexible*	*High volume*	*Hot color*	*Uniform Form*	*Narrow tip*	*Pump output*	*Separate push cap*	*Tube*
Max	*0.191*	*0.017*	*0.022*	*0.019*	*0.030*	*0.078*	*0.033*	*0.021*	*0.035*	*0.058*	*0.037*	*0.031*
Min	*0.002*	*0.002*	*0.003*	*0.002*	*0.006*	*0.009*	*0.005*	*0.015*	*0.004*	*0.006*	*0.004*	*0.003*

4.5.4. Obtaining the range of distance of each option to positive and negative ideals

In this section, the Euclidean distance between each negetive and positive ideals based on the formulas 2 are calculated. The results are shown in Table 11.

Formulas (2):

$$d_i^+ = \sqrt{\sum_{j=1}^{n}(v_{ij} - v_j^+)^2} \qquad i=1,2,\ldots,m$$

$$d_i^- = \sqrt{\sum_{j=1}^{n}(v_{ij} - v_j^-)^2} \qquad i=1,2,\ldots,m$$

Table11. Positive and Negative Distances of each option (Source: Author)

Product									*Designing pattern*
Positive ideals	*0.067*	*0.202*	*0.197*	*0.201*	*0.204*	*0.181*	*0.196*	*0.184*	*0.195*
Negetive ideals	*0.020*	*0.051*	*0.051*	*0.062*	*0.046*	*0.095*	*0.072*	*0.080*	*0.080*

4.5.5. Determining the CL relative closeness of an option to ideal solution

In this step, we continue according to the formula (3) in order to calculate the relative distance of decision options. The result of this step can be seen in Table 12.

Formula (3):

$$CL_i = \frac{d_i^-}{d_i^- + d_i^+}$$

Table12. The relative distance of options (products) (Source: Author)

Product									Designing pattern
CL	0.233	0.201	0.201	0.235	0.184	0.344	0.268	0.303	0.290

4.5.6. Ranking options (Products)

In the final step, we will rank the options (products) and finally choose the best option. The result is shown in Table 13.

Table13. Ranking options (Products) (Source: Author)

Product									Designing pattern
CL	0.233	0.201	0.201	0.235	0.184	0.344	0.268	0.303	0.290
Ranking	6	7	8	5	9	1	4	2	3

As can be seen in Table 13, the relative distance of each option (8 selected products unanimously by the designed pattern) is displayed. In this case, the options of number 6 and 8 and designed pattern (9), have the maximum relative distance.

5. Conclusions

In this paper, by using Kansei engineering method, users' emotions and feelings were measured and by using it, we apply in designing specifications of the product in designing product packaging. In the first step of the Kansei Engineering method, it is noted that Firooz Health Group decided to focus on two different areas with different products. Of course, we expected that new packaging as new product in a potential market in the two areas to be considered. The group was consists of experienced women living in northern Tehran.

In the second step, a scale of difference semantic describing selected product groups semantically to assess customer perception was carried out. The result of this step is based on an average over 70 % of the answers which have a high degree of importance (very good, good) based on opinion of 10 expert designers as selected 14 Kansei words was obtained.

Similar to semantic space, product feature space was presented. This space is descriptive of characteristics of products in engineering concepts that are linked to pre- selected Kansei word. In the article, because of type of statistical community in the seconed step

(the limitation of semantic space), the necessary of another statistical community was felt in order to consider proper complement for statistical community of second step of Kansei engineering so that we can close to users' emotions and feelings. In this regard, through the comments of 10 expert designers, we identified 27 cases of product properties and finally, by drawing Pareto diagram and presence of 10 persons of qualified vendors, 12 cases of selected product properties were selected. Finally, in this step, based on selected properties and comments of expert designers and qualified vendors, 8 selected products linked to the selected properties in the market were selected. In the fourth step, semantic space and properties space were linked together. For each Kansei word, a number of characteristics of the product that was effective on Kansei word were found. After survey was carried out, as can be seen in Table 8, for each Kansei word, two selected properties as the highest weight selected properties were selected. As a result, this caused the designers pay more attention to users' emotions during designing the product. The final step was to model and validate. In this paper, use of designed TOPSIS method and other selected products that selected in the third step of Kansei Engineering Methodology by comments of the expert designers and qualified vendors based on 12 selected properties in the third step were ranked as accurate and appropriate design criteria. The results indicate that the designed pattern by Kansei engineering placed in third position among the current 9 products.

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