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Analysis of the Turkish tulip-shaped tea glass's emotional design features using Kansei Engineering Methodology

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Abstract

The traditional tulip-shaped tea glass is considered to be a widely used, culturally valued and emotion laden industrial product in everyday lives for people living in Turkey and it continues to inspire designers for contemporary adaptations. The aim of this study is to identify the emotional design features of the renowned tea glass. The conceptual background of this study pertains to the visceral and behavioral levels of emotional design. The methodology of the study is Kansei Engineering which was developed in the 1980s in Japan to translate consumers' feelings and perceptions of a product (Kansei) into design elements. In the current study initially an online survey with 573 participants was conducted to understand the feelings of people towards the tea drinking experience and tea glass. Kansei of the users were collected. Based on the interviews with expert designers, relevant Kansei words and the essential product characteristics for the study were selected. The products with distinct design features were collected from the market and photographed. Using a semantic differentials scale with 9 Kansei words and 18 product samples, an online survey was conducted with 90 participants. Statistical analysis used as a part of the Kansei Engineering methodology included principal component analysis and ordinal logistic regression. Based on the findings of the proposed model, the relationship between the feelings of people and the design features were determined and prepared for the use of industrial product designers and design researchers.

Keywords
Emotional design, Industrial product design, Kansei Engineering, Turkish traditional tulip-shaped tea glass.

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1. Introduction

The tulip-shaped tea glass is considered to be a widely used, culturally valued and emotion laden industrial product for the everyday lives of people living in Turkey. The glass design and manufacturing company Şişecam has been producing the variations of the tulip-shaped design since 1935. "The basic form continues to inspire designers for contemporary adaptations while it remains affordable and accessible to all segments of society." (Sağıroğlu, 2014, p. 15). The high demand on the market for the tulip-shaped design has not diminished throughout the years. It is possible to see one variation in almost every household in Turkey. Furthermore, it encompasses a socio-cultural and emotional meaning indicating psychological attachment (Timur Öğüt, 2009; Ger & Kravets, 2009).

Norman (2004) in developing the concept of "emotional design", argues that people do not just use products, they are emotionally involved in them. He conceptualizes the human-product relationship in three levels of design as visceral, behavioral, and reflective. Visceral level is about the physical features of the design and its immediate emotional impact on people. Behavioral level is about the usage and performance of the design. Reflective level is about the self-image of the user and its presentation to others through the product itself. The visceral level design is concerned with attraction, which is an immediate response to a stimulus, hence, a subconscious behavior. It evolves from basic instincts, common to every human being. For a product to be perceived as attractive, it should trigger physiological activities in the human body. The behavioral level is quite significant in its own right. While functional characteristics of the product as usability and ergonomics should meet the requirements, other characteristics should also be considered for a successful product. As Norman (2004) claims "attractive things work better" (p. 17). Hence, for industrial design discipline focusing on attraction, all senses and emotions of people is crucial.

According to the research conducted by Townsend & Sood (2014), people intend to buy the products that seem more beautiful and visually attractive than the products that function better, although when asked they claim to prefer the products that are more functional rather than visually attractive. When it comes to deciding on which products to buy and use, we see that people are not quite aware of their own decision-making processes. Tversky & Kahneman (1981) have shown how preferences of individuals are inconsistent when faced with alternatives, depending on how those alternatives are framed. Kahneman (2011) uses the analogy of two systems in the brain, to explain the decision-making behavior of people for different situations. System 1 is imagined working fast, automatically, and subconsciously in an emotional way, whereas system 2 works slow, effortful, and consciously in a logical way. Examining the decision-making experiments, it is stated that people are not always consistently rational decision makers (Kahneman, 2011). The purchasing decision of industrial products is also made emotionally rather than rationally.

Accordingly, one can conclude that attractiveness is essential, and the real process of decision-making occurs on an emotional level, subconsciously, and fast. Therefore, it would be beneficial to use methods which are able to extract users' subconscious preferences. After examining people's emotions towards an industrial product, next step would be establishing a strategy to implement those needs into the design process. One method developed to answer the question of how to design a product in order to trigger people's emotions is the Kansei Engineering (KE) (Nagamachi, 1995).

Kansei Engineering was originated in Japan. Its applications are used for new product development cases commonly in the automotive, construction machinery, electric home appliances, office machinery, house construction, costume and cosmetic industries (Nagamachi, 2002). Since frequently used in engineering and production companies, KE applications are more focused on high-tech complex product groups. However, it is applicable to every kind of consumer product (Tama, Azlia & Hardiningtyas, 2015). Lévy (2013) claimed "for over three decades, Kansei Engineering has expanded greatly and has become a significant discipline both in the industrial and the academic worlds" (p. 83).

The purpose of this study was to analyze the emotional components of the Turkish tulip-shaped tea glass. The design of this traditional product evolved throughout many decades accumulating corresponding collective emotions. Hence, assessing and evaluating the form characteristics which affect people's perceptions was found to be crucial for this iconic design. For this study, the Kansei Engineering method was chosen since it enables modelling the relationship between the design features and the corresponding feelings of the users empirically with quantitative data analysis.

2. Study

Kansei Engineering

Kansei Engineering is a method designed by Mitsuo Nagamachi, which "… was developed as a consumer-oriented technology for new product development. It is defined as translating technology of a consumer's feeling and image for a product into design elements" (Nagamachi, 1995, p. 3). The word Kansei generally refers to sensitivity, sensibility, feeling and emotion. It has also been used as the translation of Immanuel Kant's philosophical concept of the German word *Sinnlichkeit* (Yamanaka, 2017). "According to Nagamachi, the closest interpretation of Kansei is psychological feeling people have with product, situations or surroundings" (Lokman, 2010, p. 3) and since Kansei is a latent feeling, it cannot be measured directly. It is only possible to observe the causes and consequences of the Kansei.

Kansei Engineering has been conceptualized in a model by Schütte, Eklund, Axelsson & Nagamachi (2004) in Figure 1.

In the initial *choice of domain step of* the model, the target group of the product of concern is defined and all kinds of representations of the product concept are collected. In the *span the semantic space* step the Kansei of the domain is determined. According to Lokman & Nagamachi (2009), people's physiological or behavioral responses can be measured via neural or body reactions, and psychological responses can be measured by linguistic tests. According to the product and usage scenario, researchers can decide on the method for reaching the human Kansei and measuring the appropriate expressions. Data can be collected through self-report instruments, focus groups, ethnographic techniques etc. For the analysis of Kansei Words (KW); Correlation Coefficient Analysis, Principal Component Analysis (PCA) and Factor Analysis could be employed in order to obtain the most essential Kansei (Lokman, 2010). In the *span the space of properties step* important design elements which have possible effects on the consumers' Kansei for the product (such as color, size, shape etc.) are determined. In the *synthesis* step a statistical "analysis is performed to discover how the design of a product influences consumer's Kansei" (Lokman, 2010). After the analysis, if the validity tests are carried out and have satisfactory results then it is possible to build a model for explaining the KW with the product properties.

In this study, which aims to identify the relevant design elements which are important for the associated feelings of consumers in terms of guiding industrial product designers, KE methodology was used with several modifications and implemented in three phases. The first phase corresponds to the *choice of domain step* of KE which includes the tea drinking experience survey. The

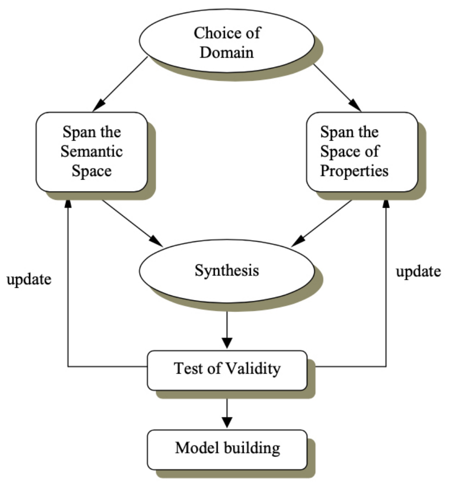

Figure 1. *The model of the Kansei Engineering concept by Schütte et al. (2004).*

second phase corresponds to the *span the semantic space* and *span the space of properties* step of KE which includes expert designer interviews. The final phase corresponds to the synthesis step of KE which includes the Kansei survey analyses. Every phase is detailed in two subsections including the method and the corresponding analysis and results parts.

2.1. Phase I: Choice of domain, tea drinking experience survey

Since the industrial product in this study is the tea glass, the *choice of domain* step of KE methodology is the tea drinking experience. In order to understand Turkish people's attitudes towards the tea drinking activity and their opinions and preferences concerning the tea glass designs from the market a survey was prepared.

2.1.1. Phase I: Method

An online survey was prepared using a professional online survey software. The main purpose was identifying people's values and emotions and determining their thoughts and habits about tea drinking activity and their interaction with the tea glass. The survey link was distributed through the researchers' social media contacts who volunteered to participate. Participants were asked to share the link with their contacts who enjoy drinking tea frequently. In total 573 people from Turkey completed the survey. The sample consisted of people who enjoy drinking tea, with 88% who have reported drinking tea at least once a day. 60% of the participants were women, 40% were men. They were the inhabitants from 41 different cities of Turkey with a high participation from Istanbul 76%, followed by Izmir 5%, Ankara 4% Bursa 2%. The ages of the participants varied between 15 and 83 with the mean value of 34 years.

The participants were asked to respond to questions under two themes. Apart from the demographic questions there were in total 10 items in the questionnaire. The first theme with 4 items consisted of the emotional concepts of the tea drinking experience. Sample questions include: When you think of tea, what comes to your mind first? How would you describe the ambiance around you when you think of your happiest moment as you drink tea? The second theme with 6 questions was for understanding the physical aspects regarding their tea glass design preferences. Sample questions would be: Would you describe your favorite tea glass design in detail? (form, material, functions etc.). Which materials do you prefer for drinking tea? (multiple choice from; glass, porcelain, plastic, paper, metal, wood, other[ ]). Which of the following glasses would you like to use for drinking tea? (multiple choice)

The 20 different tea glasses in various forms and materials were shown to participants and they were expected to choose the designs they liked and from which they would prefer to drink tea. They are given in Figure 2.

Figure 2. *Tea glasses tested, with 5 highest preference.*

2.1.2. Phase I: Analysis & results

Top 5 products which were preferred at least by 25% of the participants are shown in green boxes in Figure 2. They all possess similarities to the tulip-shaped form.

In terms of the preferences pertaining to the physical aspects described, which corresponds to the behavioral level of design, there are several conclusions. The material preference was mostly glass with 92%, followed by 32% china/porcelain. The fact that glass is transparent and allows people to see the color of the tea was mentioned. When asked about the handles 55% of the people preferred forms without handle, 45% said that they would rather have tea glass with handles. However, as they were asked to make a choice from the existing designs in the market, it was observed that they preferred designs without handles. Regarding usability the most frequent comments were summarized as follows: "one has to hold the glass by the rim for saving the fingertips from burning because it's served boiling hot", "the tulip-shaped tea glasses' curvy shape keeps the tea warm", "it enables for the palm of the hand to warm up when needed in cold places". The results of this part of the survey had the following implications: It became clear that people prefer glass as material for drinking tea. Turkish people are quite used to the traditional tulip-shaped tea glass. Hence for the *choice of domain* it was decided to include only the glass material and tulip shaped tea glass samples for the study.

The emotional content from the text which came from the open-ended questions; such as the free association and the request for describing the feelings when imagining oneself drinking tea in the most comfortable situation; were analyzed. The most frequent words that came up in the responses with reference to emotions were determined: happiness, pleasure, peace, comfort, sincerity, joy, love, thankfulness, warmth, friendliness, tradition, family, relaxation, hospitality, deliciousness, value, dialogue, taste, morning, familiarity, delight, affordability, good health, appreciation, indispensability, passion, nostalgy, importance, wealth etc. Those words used by people as they described their tea drinking experiences were found to reflect their emotions as they enjoy their tea.

The above-mentioned implications concerning characteristics of the tea glass and the emotional concepts resulting from the tea drinking experience survey formed the input for the next phase.

2.2. Phase II: Span the semantic space and span the space of properties, expert interviews

After the *choice of domain* phase, the results of the survey were discussed with three industrial product design experts with experience in designing tea glasses.

2.2.1. Phase II: Method

Semi-structured interviews were conducted individually with three industrial product design experts with the aim of deciding on the KW and determining the important product properties affecting the tea glass design. The reason why three experts were consulted was to obtain ideas from experts with different perspectives and experiences from the academia and industry. Two of the experts were eminent university professors and the other expert worked at one of the top Turkish furniture and product design companies. They all had their designed products on the market. In each interview their personal know-how regarding glass design process was discussed.

The expert designers were introduced with the tea survey results which included all the keywords addressing the emotional concepts about tea drinking and tea glass. They were asked to select the most important ones among them. With their directions, the collected words were selected and grouped to represent the Kansei which cover the visceral and behavioral levels of design. The KW were prepared for the semantic differentials scale to be used in the KE survey. Also, the important product properties affecting the tea glass design were examined. The properties which are crucial, and which can be identified by the users were listed and the possible design characteristics were determined. The products available on the market were reviewed and 18 of them with different properties were selected to be included in the next step.

2.2.2. Phase II: Analysis & results

The concepts discussed were summarized in the following nine words which the expert designers agreed on for capturing the Kansei regarding the visceral and behavioral level designs of tea glasses. The concepts regarding the reflective level design such as expensive/cheap, traditional/modern were especially excluded from the KW list. KW were selected and a semantic differentials scale with 5-points was prepared (Osgood, Suci & Tannenbaum, 1957). It is given in Table 1.

The products from the market were examined with expert designers and the product categories regarding the crucial product design properties were analyzed. The important features were summarized to be; having a handle or not, rim's width, rim's finishing, the place of the thinnest part, the width of the thinnest part, volume, weight, glass thickness, base thickness. It was also pointed out that the most important features pertained to the ratios between the rim and the thinnest part and also between the thinnest part and the below part of the glass rather than the actual measures. Although all of those features were important in perceiving the design as a whole, some of them were deliberately excluded. Because they are not easily perceivable during an online survey just by seeing the image of the glass. The weight, volume, glass thickness concepts were excluded from the list. The chosen design features to be included in the next step was reduced to 8 items with 18 categories. The final item/category classification list which was developed as a result of the interviews with expert designers is given in Table 2, while the visual representation of the items is shown in Figure 3.

2.3. Phase III: Synthesis, Kansei Engineering survey

In the synthesis stage participants were asked to evaluate the products based on their perceptions regarding the KW. The goal was to find the relationship between the KW and the design features of the tea glass designs with statistical analyses.

2.3.1. Phase III: Method

For the survey, products with mutually exclusive design characteristics were purchased from the market. They were the variations of the tulip-shaped tea glass including the first five designs which were the most highly preferred in the previous tea drinking experience survey. In total, 18 glasses from the market were selected to be used in the survey.

In order to conceal the effects of the marketing related concepts such as the brand image and pricing, the packaging and the saucers were removed.

Table 1. *Semantic Differentials scale with 5-points.*

	1	2	3	4	5	
Ugly						Beautiful
Exhausting						Relaxing
Not easy to grip						Easy to grip
Tasteless						Delicious
Insincere						Sincere
Cold						Warm
Dull						Joyful
Useless						Useful
Unpleasant						Pleasant

The glasses were professionally photographed in a studio from three different angles. The same spoon was used for height reference. Tea was poured into the glasses in order to demonstrate the authentic usage of a tea glass. The selected samples were mutually independent in terms of the categories for the 8 items, with no two glasses having the same characteristics in all items. The products are displayed in Figure 4.

An online survey with a semantic differentials scale using 9 KW was prepared. The survey link was shared with the researchers' social media contacts. Participants were asked to share the link with their contacts. Participants responded to the 9 questions for each of the 18 different product samples. The order of the products was displayed randomly each time the survey was accessed; also, the ranking of the KW list was displayed in random order each time. In total, data from the 90 people who claimed to enjoy drinking tea and who responded to each and every question in the survey, were used. The participants were from 13 different cities of Turkey with a high participation from Istanbul 73%, followed by Ankara 7%, Izmir 4%, Bursa 3% etc. 68% of the participants were women, 32% were men. The ages of the participants varied between 18 and 65 with the mean value of 38 years.

2.3.2. Phase III: Analysis & results

The KW for each product sample were evaluated by every participant. To be able to see the dimensions of the KW from the data, Principal Component Analysis (PCA) was run on IBM SPSS Version 24. According to PCA results Kaiser-Meyer-Olkin measure was

Table 2. Item/Category Classification List.

#	Item	Category	Value Labels
1	Handle	no	0
		yes	1
2	Line (form)	convex-concave	0
		convex	1
3	Height	short (shorter than 80 mm)	1
		medium (between 80 and 90 mm)	2
		tall (taller than 90 mm)	3
4	Rim's Finishing	no	0
		yes	1
5	Base Thickness	thin	1
		medium	2
		thick	3
6	Ratio of the top to shortest radius	<= 1,3 (straight)	0
		> 1,3 (thin waist from the top)	1
7	Place of the shortest radius	1/2 and below	0
		above 1/2	1
8	Ratio of shortest and longest radius below	low ratio (large belly)	0
		high ratio (straight belly)	1

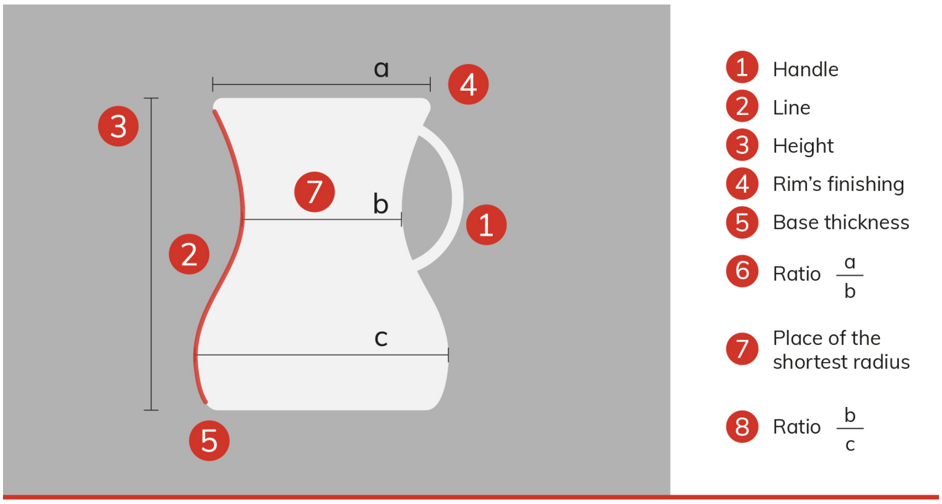

Figure 3. *Visual representation of the items.*

0.958, which indicates there is adequacy of sampling, (Laerd Statistics, 2015). With the rotation method using Varimax with Kaiser Normalization, PCA has grouped the KW *pleasant, beautiful, joyful, sincere, warm, delicious* and *relaxing* to the first component and the KW *easy to grip* and *useful* to the second component. The PCA rotated component matrix is given in Table 3.

PCA result of the two components corresponded to the Kansei referring to Norman's (2004) visceral and behavioral emotional design levels as hypothesized. The result of the PCA not only confirms the expected emotional design levels but also makes it possible to calculate average scores of the Kansei components as visceral and behavioral level Kansei scores for each product sample if one wishes to compare the products.

In terms of explaining the relation of each KW (dependent variable) with the independent design features (item/category), ordinal logistic regression (OLR) analysis was used since the dependent variable is ordinal with 5 categories and the design features are nominal. In ordinal logistic regression the dependent variable has to be ordinal whereas the independent variables could be continuous, ordinal or categorical (Kleinbaum & Klein, 2010, p.635). Although several different multivariate analysis methods are used in KE, there is growing popularity for logistic regression with evidence of better performance (Alves, 2018; Marco-Almagro & Schütte, 2014; Erdoğmuş, Koç & Ayhan, 2011).

In this study the design features, independent variables, are all categorical where six of them are dichotomous variables with 0 and 1 values and two of them have categories of three as seen in Table 2. To be able to conduct the necessary analysis for the two independent variables with three categories dummy variables were produced as dichotomous variables with values 0 and 1. Although there are two major components found from PCA, OLR model was run for every KW for checking the results. For every KW the corresponding model which relates each KW to the design features were identified separately.

For using the OLR analysis, 2 assumptions were checked. First the assumption of no multicollinearity and the assumption of proportional odds. From the multicollinearity test results for the KW *beautiful* the Collinearity Tolerances were found to be greater than 0.1 which suggested that there was not a multicollinearity problem in the data.

Next, the assumption of proportional odds was checked by the test of parallel lines from OLR. The assumption of proportional odds was met, as assessed by a full likelihood ratio test comparing the fit of the proportional odds location model to a model with varying location parameters, $\chi2(30) = 40.528$, $p = 0.095$. As this assumption was not violated, each independent variable could be treated as having the same effect for each cumulative logit (Kleinbaum & Klein, 2010). Since its two assumptions were met, the cumulative OLR with proportional odds model was ready for interpretation. Also, according to the likelihood-ratio test for model fitting, the final model statistically significantly predicted the dependent variable over and above the intercept-only model, $\chi2(10) = 139.684$, $p < 0.001$. The estimated parameters for the KW *beautiful* are given in Table 4.

The interpretation of each independent variable's effect on the dependent variable KW *beautiful* is explained below:

1. The odds of glass designs without handle (X1_Handle=0) to be considered as more *beautiful* was similar to the glass designs with handle, with the odds ratio of 1.294 (95% CI, 0.974 to 1.719), Wald $\chi2(1) = 3.150$, $p = 0.076$. Since this is not a statistically significant effect ($p > 0.05$) we cannot conclude for the handle to be affecting peoples' decision regarding the KW *beautiful*.

2. The odds of convex and concave shaped (X2_Line=0) tea glass designs

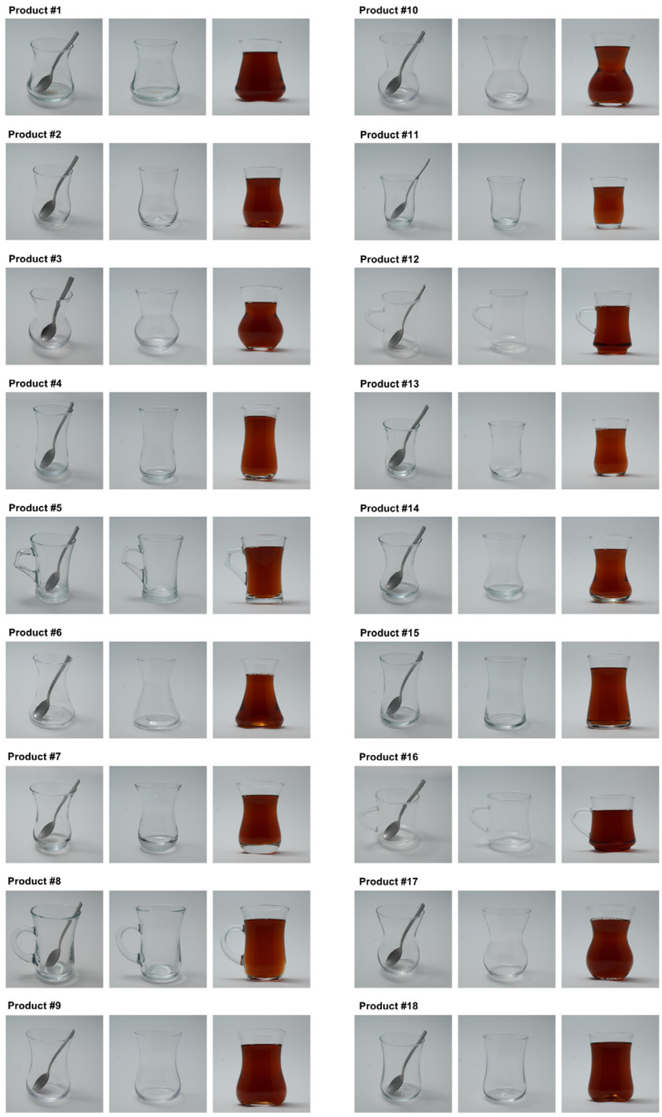

Figure 4. *18 sample products from the market.*

Table 3. *PCA rotated component matrix.*

	Component	
	1	2
Pleasant	0.859	
Beautiful	0.859	
Joyful	0.825	
Sincere	0.805	
Warm	0.787	
Delicious	0.786	
Relaxing	0.719	
Easy to grip		0.898
Useful		0.763

Table 4. *Parameter Estimates for the OLR model for the KW beautiful.*

Parameter		B	Hypothesis Test Wald Chi-Square	df	Sig.	Exp(B)
Threshold	[Beautiful=1]	-0.579	9.479	1	0.002	0.561
	[Beautiful=2]	0.516	7.610	1	0.006	1.675
	[Beautiful=3]	1.773	85.509	1	0.000	5.886
	[Beautiful=4]	3.040	225.404	1	0.000	20.898
[X1_Handle=0]		0.257	3.150	1	0.076	1.294
[X1_Handle=1]		0				1
[X2_Line=0]		1.200	79.934	1	0.000	3.319
[X2_Line=1]		0				1
[X33_Height=1]		-0.274	4.936	1	0.026	0.760
[X33_Height=2]		0.396	6.246	1	0.012	1.486
[X33_Height=3]		0				1
[X6_Rim=0]		-0.844	29.318	1	0.000	0.430
[X6_Rim=1]		0				1
[X77_Basethickness=1]		0.807	18.619	1	0.000	2.242
[X77_Basethickness=2]		0.607	12.098	1	0.001	1.836
[X77_Basethickness=3]		0				1
[X10_Ratioofthetoptoshortestradius=0]		-0.021	0.019	1	0.891	0.980
[X10_Ratioofthetoptoshortestradius=1]		0				1
[X11_Placeofhteshortestradius=0]		0.125	1.628	1	0.202	1.133
[X11_Placeofhteshortestradius=1]		0				1
[X12_Ratioofshortestandlongestradius=0]		-0.566	10.884	1	0.001	0.568
[X12_Ratioofshortestandlongestradius=1]		0				1
(Scale)		1				

to be considered more *beautiful* was 3.319, 95% CI [2.551, 4.317] times that of only convex shaped tea glasses, a statistically significant effect, $\chi 2(1) = 79.934$, $p < 0.001$. We can conclude that tea glass designs with convex and concave form are 3.319 times more likely to be found more *beautiful* than the ones with only convex form.

3. The odds of the glasses between 80 and 90 mm (X33_Height=2) to be considered more *beautiful* was 1.486, 95% CI [1.089, 2.028] times that of the glasses longer than 90 mm, a statistically significant effect, $\chi 2(1) = 6.246$, $p = 0.012$. Hence, the tea glass designs with heights between 80 and 90 mm are 1.486 times more likely to be found *beautiful* than the ones with longer than 90 mm. When we compare glasses shorter than 80 mm (X33_Height=1) with glasses longer than 90 mm, we see that the odds of glass designs which are shorter than 80 mm to be found more *beautiful* was 0.760 times of the designs which are longer than 90 mm, which means a lower probability. We can conclude that tea glass designs with heights between 80 and 90 mm perform better considering the KW *beautiful*.

4. X6_Rim=0 means no rim on the top part. X6_Rim=1 means glasses with rim. The odds of tea glass designs with no rim (X6_Rim=0) to be considered more *beautiful* was 0.430, 95% CI [0.317, 0.584] times that of designs with rim (X6_Rim=1) a statistically significant effect, $\chi 2(1) = 29.318$, $p < 0.001$. Hence, we conclude that designs with rim are 1/0.430=2.326 times more likely to be considered *beautiful* than the designs without rim.

5. The odds of tea glass designs with a medium thick base material (X77_BaseThickness=2) to be considered more *beautiful* was 1.836, 95% CI [1.304, 2.585] times that of designs with thick base material (X77_BaseThickness=3) a statistically significant effect, $\chi 2(1) = 12.098$, $p = 0.001$. Also the odds of tea glass designs with a thin base material (X77_BaseThickness=1) to be considered more *beautiful* was 2.242, 95% CI [1.554, 3.236] times that of designs with thick base material (X77_BaseThickness=3) a statistically significant effect, $\chi 2(1) = 18.619$, $p < 0.001$. We can conclude that the thinner the base material, the glass design is more likely to be considered *beautiful.*

6. The odds of glass designs with the ratio between the rim and the thinnest part to be small indicating a rather straight upper part's image (X10_Ratioofthetoptoshortestradius=0) to be

considered as more *beautiful* was similar to the glass designs with a larger ratio between the rim and the thinnest part indicating a rather thin waist upper part's image (X10_Ratioofthetoptoshortestradius=1), with the odds ratio of 0.980 (95% CI, 0.730 to 1.315), Wald $\chi2(1) = 0.019$, $p = 0.891$. Since this is not a statistically significant effect ($p > 0.05$) we cannot conclude for this design feature to be affecting the peoples' decision regarding the KW *beautiful*.

7. The odds of glass designs with the thinnest waist in below or equal to the 4/8 portion of the glass (X11_Placeoftheshortestradius=0) to be considered as more *beautiful* was similar to the glass designs with the thinnest waist in above the 4/8 portion of glass, with the odds ratio of 1.133 (95% CI, 0.935 to 1. 374), Wald $\chi2(1) = 1.628$, $p = 0.202$. Since this is not a statistically significant effect ($p > 0.05$) we cannot conclude for the place of the thinnest waist to be affecting the peoples' decision regarding the KW *beautiful*.

8. The odds of tea glass designs with a large belly (the ratio of the middle part of the glass with the shortest radius to the part with the longest radius below is low, X12_Ratioofshortestandlongestradius=0) to be considered more *beautiful* was 0.568, 95% CI [0.405, 0.795] times that of designs with a straighter belly, a statistically significant effect, $\chi2(1) = 10.884$, $p = 0.001$. Hence, it is concluded that designs with a straighter belly are 1/0.568=1.761 times more likely to be considered *beautiful* than the designs with a larger belly.

The OLR model tested for the KW beautiful which was interpreted above was repeated for all the remaining KW as well. Similar results were found for seven of the nine KW whose data met the assumptions of OLR. In Table 5, the coefficients for interpretation of Kansei words *beautiful, pleasant, relaxing, delicious, warm, joyful* and *useful* are given since they all covered the test of parallel lines for proportional odds assumption. Kansei words sincere and easy to grip were left out because they did not meet the assumption of proportional odds.

Those coefficients indicate the odds ratio showing the likelihood of consumer preferences. The highest preferences are highlighted in Table 5. The following results for the eight design items representing the design features are listed below:

1. The design item having a handle or not was only significant for the KW *useful,* which belonged to the behavioral level. Designs with handle were found to be 1.7 times more likely to be considered *useful.* Although the coefficients for the designs without handle were higher for the visceral level Kansei, they were not significant, hence the odds were similar for designs with or without handle.

2. The tea glass designs with both convex and concave form were approximately 3 times more likely to be found more *beautiful, pleasant, relaxing, delicious, warm, joyful* and *useful* than the ones with only convex form.

3. Tea glass designs with heights between 80 mm and 90 mm performed better than designs that were longer than 90 mm considering the Kansei words *beautiful, delicious, warm* and *useful*. Tea glass designs that were longer than 90 mm performed better than the designs, which were shorter than 80 mm considering the Kansei words *beautiful, pleasant, relaxing* and *joyful.*

4. The designs with rim were approximately twice more likely to be considered *beautiful, pleasant, relaxing, delicious, warm, joyful* and *useful* than the ones without rim.

5. It was observed that the thinner the base material, the more likely the glass design was to be considered more *beautiful, pleasant, relaxing, delicious, warm, joyful* and *useful.*

6. The ratio between the rim and the thinnest part (upper part's image) of the glass did not show any significant difference in any of the KW.

7. For the Kansei words r*elaxing, delicious* and *warm* the place of the thinnest waist (belly's place) being 4/8 and below was approximately 1.2 times more likely to affect peoples' preferences.

8. The designs with straighter bellies were approximately 1.8 times more likely to be considered *beautiful, pleasant, relaxing, delicious, warm, joyful* and *useful* than the designs with larger bellies.

3. Discussion

Kansei Engineering methodology has proven to be a successful tool in converting consumers' desires into product design elements. From the most famous KE based design of Mazda Miyata car (MX-5) from 1990s until currently KE has been widely used in industry for products in many areas such as textile, electronics, cosmetics, food and home appliances. Moreover, research on KE continues to grow in engineering, experience design, ergonomics, statistics, computer science, branding and business (Levy, 2013).

Although KE methodology is widely used in designing of products it has not been studied extensively in the traditional industrial product design discipline. One reason for this could be the rigorous statistical analysis required in order to be able to use KE which may be beyond the scope of design curricula. However, currently multidisciplinary attempts and collaborations are proposed in design education (Meyer & Norman, 2020). The collaborations from the disciplines such as engineering, economics, psychology and marketing may encourage design educators to make more use of KE and train designers to use KE in analyzing the relationship between the products and the corresponding emotions of users and thus designing more attractive products.

The tulip-shaped design was found to be crucial when it came to the tea drinking experience for Turkish people. They seem to have an emotional attachment to this particular design. Literature exists on the use, cultural meaning and historical roots of the tulip shaped tea glass (Sağıroğlu, 2014, Timur Öğüt, 2009; Ger & Kravets, 2009). This study, which aimed to introduce the emotional design features of the tulip-shaped tea glass gained through Kansei Engineering contributed to the literature by providing quantitative evidence on the relationship between emotions and design features. For each emotional perception of the consumers that were represented by the Kansei words beautiful, pleasant, joyful, relaxing, delicious, warm and useful it was possible to find a statistical model fitting the data.

Interpreting the results with the focus on the visceral and behavioral levels from Norman's (2004) emotional design framework led to the following conclusions. The visceral level Kansei words pleasant and joyful corresponded to the same design feature choices. Similarly, Kansei words delicious and warm were related to the same design features. The KW useful, which reflects the behavioral level was related with similar design features as the visceral level KW beautiful where its only distinction was identified in the design feature of having a handle or not. It was interesting to see the design choices which would lead to better performances for the Kansei words beautiful and useful were similar to each other with the only exception of the han-

Table 5. *Parameter Estimates of OLR model comparison for each KW.*

				visceral level						behavioral level
#	Items	Categories		Beautiful	Pleasant	Relaxing	Delicious	Warm	Joyful	Useful
1	Handle	X1=1	with	ns*	ns	ns	ns	ns	ns	1.664
		X1=0	without	ns	ns	ns	ns	ns	ns	1
2	Line	X2=1	convex	1	1	1	1	1	1	1
		X2=0	convex-concave	3.319	3.096	3.595	3.099	2.866	3.324	3.494
3	Height	X33=1	<80 mm	0.760	1	1	ns	ns	1	ns
		X33=2	80-90 mm	1.486	ns	ns	1.518	1.417	ns	1.473
		X33=3	>90 mm	1	1.377	1.325	1	1	1.333	1
4	Rim	X6=1	with	2,326	2,358	2,169	1,992	1,859	2,193	2,188
		X6=0	without	1	1	1	1	1	1	1
5	Base thickness	X77=1	thin	2.242	2.379	2.034	2.021	1.953	2.151	2.043
		X77=2	medium	1.836	1.817	1.715	1.548	1.539	1.657	1.687
		X77=3	thick	1	1	1	1	1	1	1
6	Upper part's Image	X10=0	straight	ns	ns	ns	ns	ns	ns	ns
		X10=1	thin waist	ns	ns	ns	ns	ns	ns	ns
7	Belly's Place	X11=1	up	ns	ns	1	1	1	ns	ns
		X11=0	middle or lower	ns	ns	1.260	1.217	1.229	ns	ns
8	Belly=Lower part's image	X12=1	straight	1.761	1.764	1.712	1.681	1.667	1.961	1.795
		X12=0	large	1	1	1	1	1	1	1

* indicates not significant for 95% confidence interval

dle. This may be explained by the fact that the tulip-shaped design evolved throughout the years so that it was collectively internalized and the preferred design features were considered both as beautiful and useful at the same time. Apparently, the tulip-shaped tea glass's special emotion laden characteristics will be studied and redesigned for years to come.

As to the limitations, concerning Norman's (2004) emotional design framework only the concepts regarding the visceral and behavioral levels of design were included and the reflective design was left out of the scope of this study. Although consumers' purchasing decisions are known to be affected by the price, packaging, and brand image as well (Townsend & Sood, 2012) the focus was deliberately on the design form. Moreover, two methodological limitations exist. The KW choice section which corresponds to the span the semantic space phase in the KE model was limited to the expert designer opinions. Literature indicates that determining KW in the span the semantic space phase could also be achieved by an additional survey and factor analysis for the Kansei words reduction (Lokman, 2010). Likewise, the data collection of the research was realized as an online survey therefore some tactile sensory information had to be disregarded. In the literature there are other methods such as eye tracking and neuroscientific tools used for data collection (Köhler, Falk & Schmitt, 2014).

4. Conclusion

As the Turkish traditional tulip-shaped tea glasses' design features were analyzed with the Kansei Engineering methodology, the results pointed out several design features/choices to be effective in terms of the emotional evaluation of tea drinkers' choices in Turkey. The results can be used in the industry for designing tea glasses which would lead to desired emotional responses from the consumer.

The results can also be used in design education. The findings can be introduced to novice designers as additional information which comes from quantitative data during the research phase of their design process.

Apart from carrying out this research in a theoretically more comprehensive way by including reflective level aspects of Norman's (2004) emotional design framework, the study may be carried further by research that may validate the KW and the corresponding design features. Tea glasses which are designed with the results of the KE can be tested for performance which will complete the KE methodology's validation step. Cross-cultural research may also be conducted especially with the British, Chinese or Japanese cultures where tea is an important part in cultural ceremonies.

KE provides tools for evidence-based research for designers during their research phase in their design process. This study was a demonstration of using such data and analysis. This procedure can be used for different products. Additionally, research studies can be carried out in implementation of KE in industrial product design and other design disciplines.

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