

An Analysis of Emotion Space of Bra by Kansei Engineering Methodology

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Abstract

In this study, the technique of Kansei engineering was used to assess the emotion space of bra. Sixty styles of Wacoal high-quality bra were regarded as stimuli. Fifteen pairs of adjectives and four pairs of phases on color, pattern, style, preference were selected to prepare the questionnaire according to the Semantic Differential method: “modern-classical”, “vulgar-noble”, “charming-charmless”, “intellectual-rustic”, “painted-refreshing”, “active-serious”, “restrained-inflated”, “luxury-frugal”, “lovely-unlovely”, “personality-popular”, “cumbersome-simple”, “sweet-not sweet”, “romantic-actual”, “mature-naive”, “sexy-not sexy”, “good color-bad color”, “good pattern-bad pattern”, “good style-bad style”, and “like-dislike”. Five scales were set for each pair of phase. The survey was conducted among the undergraduate college students from Xi'an Polytechnic University. The data from the survey were analyzed using factor analysis and cluster analysis. Four factors were extracted and labeled as “personality”, “age”, “taste”, “fashion”. The results also indicated that color was the most important factor when designing a bra, especially the base color of the bra, which decided the basic emotion of the bra.

Keywords: Emotion Space; Bra; Kansei Engineering; Semantic Differential Method; Factor Analysis; Cluster Analysis

1 Introduction

Kansei engineering, sometimes referred to as “emotional design” or “sensory engineering”, aims to translate consumers psychological feelings and impressions into perceptual design elements, allowing design and evaluation of products before launching them on the market. This technique, which was developed in Japan in the seventies by Professor Mitsuo Nagamachi, involves determining which sensory attributes elicit particular subjective responses from people, and then designs a product using the attributes which elicit the desired responses. [1] People's feelings are usually very different and complicated, so they need to be classified by using the method of semantic differential introduced by Osgood et al. [2] and by the factor analysis first devised by Spearman

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[3]. For example, if a female customer wants to wear a beautiful and graceful bra, we can produce a beautiful and graceful one from her estimation of several different bras and from analysis of these different materials. Kansei engineering could be used in any product design, especially in color research.

Kobayashi had developed three main dimensions of color emotions in his color image scale: warm-cool, soft-hard, and clear-grayish. These dimensions were found associated with the three color appearance attributes, hue, value and chroma respectively [4].

Li-Chen Ou et al. had studied color emotions for single-color and two-color, in which three factors were extracted by the method of factor analysis and were labeled “color activity”, “color weight”, “color heat” [5, 6].

In our previous study, some researches had been done by the method of Kansei engineering. The preference for two-color and three-color combinations was investigated and compared between Chinese and Japanese. It has been concluded that the color preferences for a few two-color combinations could change with the survey period, stimuli form and application of the combination to clothing. There were almost no differences in the manikin’s gender, but a few in the manikin’s nationality and age existed in some two-color and three-color combinations [7, 8].

Another research was about the visual impression of clothes. In that study, the visual impression for men’s stripe shirt with different width and color combination was surveyed, where three factors were extracted and labeled “activity”, “preference”, and “weight”. The results indicated that color combination played an important role and sometimes stripe width could change persons’ feeling [9].

Nowadays, there are only small quantities of bra companies, and they are weak in design. One of the reasons is that they do not know the feelings of consumers or cannot grow the consumer’s feelings into the product design. In this study, the emotion space of bra was surveyed.

2 Method

2.1 Stimuli and Questionnaire

In this study, sixty styles of Wacoal high-quality bra were selected. Some of these bras are pure color with different styles. Some of them have white or black or dim or vivid base color with different color patterns. The consumers will be moved and buy the product by the impression on color or pattern or style or the whole. These pictures of bras were made by PowerPoint presentation and regarded as stimuli.

The descriptive phases must be prepared for questionnaire. Some of the phases were searched from several famous fashion magazines, some were gathered from customers in bra shop, and the others were obtained from some fashion experts. Fifteen pairs of phases were decided to be shown in the questionnaire: modern-classical, vulgar-noble, charming-charmless, intellectual-rustic, painted-refreshing, active-serious, restrained-inflated, luxury-frugal, lovely-unlovely, personality-popular, cumbersome-simple, sweet-not sweet, romantic-actual, mature-naive, sexy-not sexy. Except for those, there were four pairs as preference: good color-bad color, good pattern-bad pattern, good style-bad style, and like-dislike. For each pair of phases, five scales were used. These emotional words and five scales were printed in answer sheets.

The stimuli were generated by a computer and displayed by a projector in 3500 lm with a resolution of 1024×768 pixels. The screen was shown to the respondents by about 13° (vertical direction) and 17.5° (horizontal direction) visual angle from a distance of 10 meters. The respondents were gathered in a dark room with just enough light for reading the questionnaire. The respondents were asked to watch the stimuli and answer the questionnaire.

2.2 Respondents and Survey Period

The survey was conducted in November 2010. A total of 39 undergraduate students were surveyed at Xi'an Polytechnic University. All the students were aged from 20 to 24, and had normal color vision.

2.3 Analysis Methods

The Semantic Differential method was used in this survey, and the data from the survey was conducted by using the factor analysis and cluster analysis.

3 Results and Discussion

3.1 Results From the Basic Statistic

The basic statistic was performed first. The means of sixty stimuli to nineteen pairs of phases were obtained and shown in Table 1. From Table 1, we can see S5, S6, S8, S15, S27, S30, S31, S32 were liked by the respondents, and S33, S34, S36, S47, S49, S50 were disliked. On color or color combination, S5, S7, S9, S15, S27, S29, S30, S31, S32, S41 were thought as good, and S47, S51 were thought as bad. On pattern, S3, S5, S6, S7, S27, S32 were thought as good, and S33, S37, S49, S50, S51 were thought as bad. On style, S3, S5, S6, S8, S14, S15, S27, S29, S30, S31, S32, S41, S43 were thought as good, and S33, S47 were thought as bad. To each stimulus, the concrete emotion could be seen from the line graph. Fig. 1 shows the comparison of respondents' impressions between the stimulus with S5 and S27 as examples.

3.2 Results From Factor Analysis and Discussion

When doing the product design, we must classify the consumers' emotions, because it's impossible to make one product for one certain consumer. Therefore, it's necessary to obtain the emotion space of consumers. In this study, factor analysis was used to reduce the dimensions of consumers' impression. In the software SPSS (version 15.0), PCA (Principal Component Analysis) was selected. Except for the phases on color, pattern, style and preference, the remaining fifteen phases were regarded as variables. Firstly, KMO test was performed, the result 0.773 meant the factor analysis was available. Eighteen values were set over 1, and four factors were extracted which are shown in Table 2. The variance of each factor are shown in the table.

The variance of the first factor was 32.337 and the total variance was more than 84. The factor rotation method was varimax, and the rotated results are also shown in Table 2.

Table 1: The means of nineteen phases to sixty stimuli (Pa: phase, S: stimulus)

	Pa1	Pa2	Pa3	Pa4	Pa5	...	Pa15	Pa16	Pa17	Pa18	Pa19
S1	2.68	2.97	3.92	2.58	3.89	...	2.66	2.61	2.97	2.95	3.29
S2	3.55	3.05	2.37	3.29	2.24	...	2.63	3.16	2.84	1.84	2.21
S3	3.47	3.39	3.24	2.50	3.66	...	2.29	2.89	3.11	2.21	2.92
S4	3.42	2.84	3.39	2.97	3.53	...	2.95	2.95	2.68	2.92	3.05
S5	1.55	3.53	2.45	2.74	2.74	...	1.89	1.97	3.13	1.66	1.74
S6	3.18	3.66	2.89	2.39	3.21	...	2.11	2.50	3.18	2.32	2.32
S7	3.39	3.24	1.79	3.45	2.34	...	2.55	3.37	3.00	2.08	2.08
S8	2.61	3.05	3.76	2.39	4.08	...	2.47	2.47	2.53	2.68	2.95
S9	2.89	3.29	3.45	2.63	4.00	...	2.61	2.66	2.61	3.18	3.76
S10	2.34	2.63	1.92	3.68	1.82	...	3.29	3.47	3.61	2.21	2.55
...
S51	3.87	2.50	2.21	3.95	1.97	...	3.18	3.47	3.13	2.32	2.76
S52	3.00	2.71	3.26	3.16	3.50	...	2.74	3.08	2.42	3.08	3.55
S53	3.79	3.26	2.92	3.32	2.84	...	2.74	3.13	3.45	2.24	2.87
S54	3.55	2.97	2.82	3.34	2.76	...	3.16	3.37	3.39	2.66	3.21
S55	3.32	2.89	2.47	3.47	2.24	...	2.82	3.26	2.76	2.74	2.74
S56	2.63	3.16	3.55	3.11	3.89	...	2.92	2.74	2.97	3.32	3.39
S57	2.89	3.03	3.26	3.26	3.50	...	2.84	2.84	2.42	3.47	3.26
S58	2.82	3.08	3.32	3.37	3.39	...	2.55	2.92	2.37	3.50	3.37
S59	2.89	2.84	3.39	2.97	3.24	...	2.76	2.82	2.71	3.58	3.32
S60	2.74	3.05	2.34	3.29	2.34	...	2.74	3.08	2.47	2.68	2.92

Table 2: Rotated component matrix

Phase	Component 1	Component 2	Component 3	Component 4
charming-charmless	0.910	-0.218	-0.046	-0.008
restrained-inflated	-0.895	-0.024	0.208	0.024
painted-refreshing	0.842	-0.350	-0.183	0.003
luxury-frugal	0.758	-0.228	0.389	-0.282
personality-popular	0.692	0.297	0.396	-0.075
sexy-not sexy	0.616	-0.264	0.580	0.260
sweet-not sweet	-0.236	0.897	-0.165	-0.052
lovely-unlovely	-0.294	0.844	-0.274	0.139
romantic-actual	0.087	0.836	0.191	0.094
active-serious	0.142	0.709	-0.525	-0.073
mature-naive	0.440	-0.574	0.541	0.007
vulgar-noble	0.098	0.107	-0.915	-0.041
intellectual-rustic	-0.603	-0.109	0.640	0.309
modern-classical	0.097	0.161	0.109	0.915
cumbersome-simple	0.577	0.125	-0.056	-0.737
% of variance	32.337	23.290	17.948	11.112
Cumulative (%)			84.687	

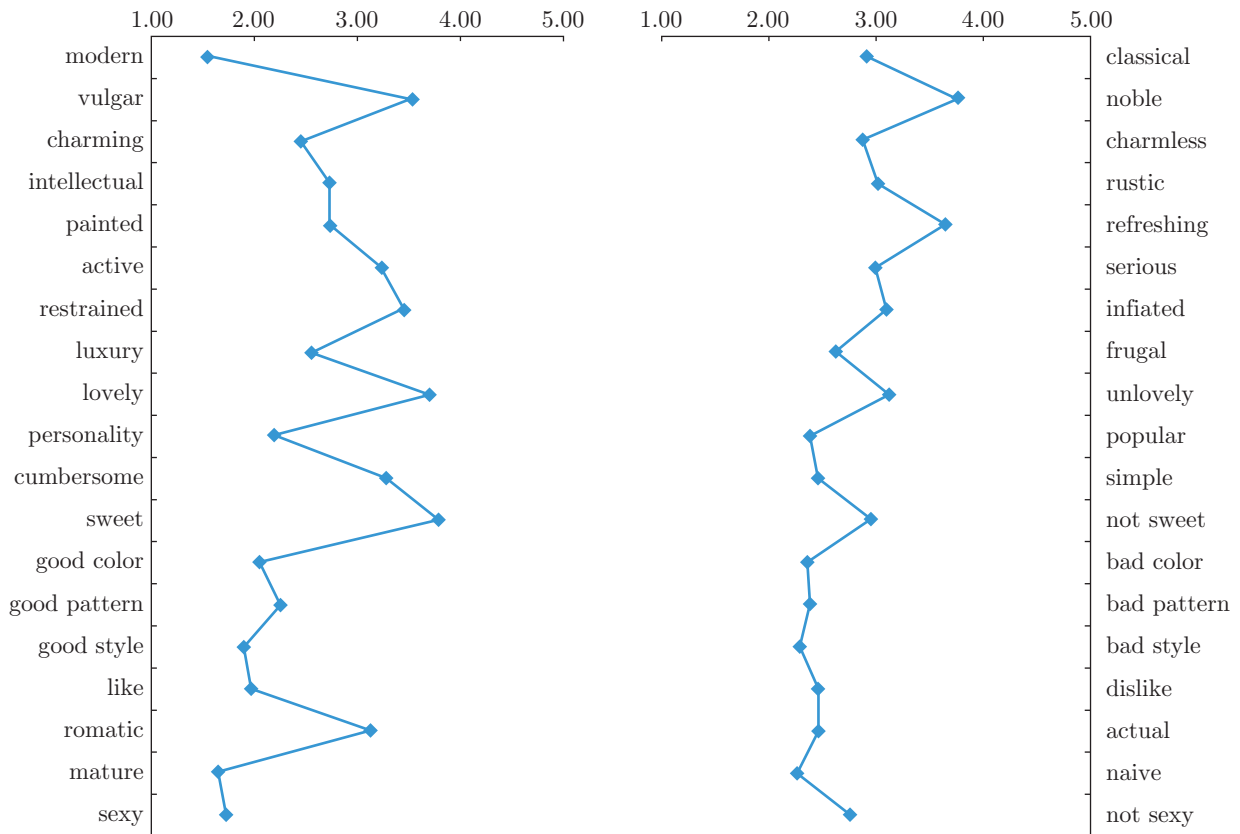


Fig. 1: The comparison of respondents' impressions between the stimulus S5 (left) and S27 (right).

From Table 2, the first factor included Pa3 (charming-charmless), Pa7 (restrained-inflated), Pa5 (painted-refreshing), Pa8 (luxury-frugal), Pa10 (personality-popular), Pa15 (sexy-not sexy); the second factor included Pa12 (sweet-not sweet), Pa9 (lovely-unlovely), Pa13 (romantic-actual), Pa6 (active-serious), Pa14 (mature-naive); the third factor included Pa2 (vulgar-noble), Pa4 (intellectual-rustic); the fourth factor included Pa1 (modern-classical) and Pa11 (cumbersome-simple). The first factor expressed the character and the feature on sex, so it was named “personality”; the second factor expressed the characteristics about age, so it was named “age”; the third factor expressed the aspects related with education and living style, so it was named “taste”; the fourth factor expressed the feeling of time, so it was named “fashion”. The component plots of factors 1, 2, 3, 4 are shown in Fig. 2.

3.3 Results From Cluster Analysis and Discussion

In order to find the relationship between the products and the emotion space, cluster analysis was used to conduct the data analysis. These factor scores of all the stimuli to each factor were regarded as variables, and a hierarchical cluster analysis was performed. The corresponding stimuli to each factor are shown in Table 4. The results in Table 4 meant that S1, S4, S8, S9, S10, S13, S15, S16, S17, S19, S21, S24, S25, S26, S28, S34, S35, S37, S38, S40, S42, S44, S45, S46, S47, S48, S49, S51, S52, S55, S56, S57, S58, S59, S60 emphasized personality; S2, S3, S6, S7, S11, S12, S18, S20, S27, S36, S39, S41, S50, S53, S54 emphasized the feature of age; S5, S22, S29, S30, S31, S32, S43 emphasized the taste of the consumer; S14, S23, S33 emphasized the feature

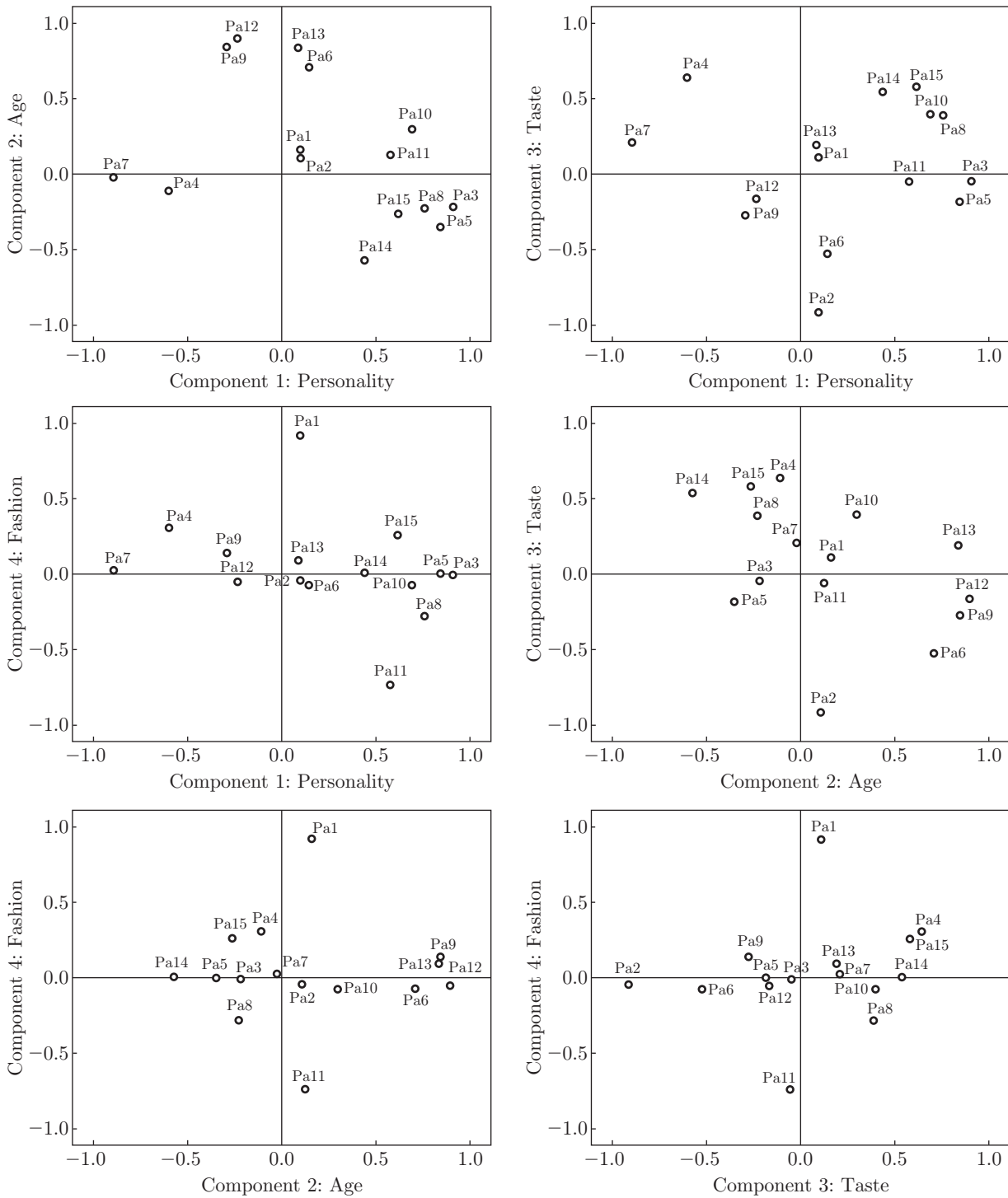


Fig. 2: The component plot of factor 1, 2, 3, 4.

of time.

From the above results, we could see most of the stimuli expressed personality more than others. It also indicated that the consumers would choose bra according to the feature related to character and sex. The second important aspect was the feature related to age. Combining the pictures of these stimuli, S1, S8, S9, and S15 were refreshing. S1 and S15 were in pure color, S8 and S9 were in monochrome color combination. S47, S48, S49, S51, S52 were in pastel base

color with colorful decorations, which looked luxurious. S56, S57, S58, S59, S60 were in pastel color, romantic lace, embroidery, which meant sweet and lovely. All these stimuli were in abstract pattern by embroidery or pierced. S2, S3, S6, S7, S11, S12, S18, S20, S27, S36, S39, S41, S50, S53, S54 were mature, and all the stimuli were in dark or grayish color. S5 and S22 were in leopard pattern, which meant noble. S29 was in Chinese red which was also a noble color. S30 and S43 were in coffee and carnation, a simple and fashionable style, which meant intelligent. S31 and S32 were in special wine red and rose red, with unique style, which meant noble and intelligent. S14, S23, S33 were in carnation, gray, grayish violet, and with no pattern or very simple pattern, which meant modern and simple.

4 Conclusion

In this study, sixty Wacoal bras were regarded as stimuli. The survey was conducted by using

Semantic Differential method, which was a typical method of Kansei engineering. Fifteen pairs of adjectives and four pairs of phrases on color, pattern, style, preference were selected to prepare the questionnaire. Firstly, the respondents' impressions were obtained from the basic statistic, and the impression comparison between any two stimuli could also be obtained. Then, the emotion space of these bras was carried out by performing the factor analysis. Finally, the corresponding relationship between each stimulus and emotion factor was obtained by performing the cluster analysis. From these results, some conclusions could be obtained.

(1) Four factors were extracted from the survey, and these factors were labeled “personality”, “age”, “taste”, and “fashion”. The factor “personality” was the most important, which would be paid attention by the bra company.

(2) Color, pattern, style were all important when designing the bra, but color was the most important factor, especially the base color of the bra, which decided the basic emotion of the bra.

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