

A COMPARISON OF THE INFLUENCE BETWEEN USERS' ATTITUDE AND DEMOGRAPHIC ATTRIBUTES ON KANSEI EVALUATION

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ABSTRACT:

To evaluate users' Kansei impressions, most research studies compare the responses among subjects with different background on the basis of subjects' demographic attributes (defined as "objective conditions" here), such as sex (male or female), age, occupation, and educational background. However, previous studies show that users' personal attitudes (defined as "subjective conditions" here) towards products could affect their Kansei evaluation. The purpose of this study was to investigate whether or not users' "subjective conditions" might pose a stronger impact than their objective conditions towards products in Kansei evaluation. Data were collected by means of an experimental questionnaire which was divided into two parts. The first part was designed to acquire subjects' information about their objective (sex, age, occupation, and educational major included) and subjective conditions (responses of personal attitude to the product stimuli) while the second part assessed their Kansei impressions and preferences on 16

mobile phones. ANOVA analysis was used to explore whether there were any differences between the outcomes of impressions and preferences among subjects with different objective or subjective conditions. The results showed that the mean differences in the outcomes of 5 Kansei evaluations based on both objective and subjective conditions were more significantly resulted from the “major” and “sex” of participants’ conditions than other conditions in the event. In addition, subjects’ attitudes (subjective condition) towards the 16 stimuli unexpectedly did not cause significant differences in the 5 Kansei evaluations, which was against our initial hypothesis that users’ Kansei impressions were mainly influenced by their attitudes rather than by their demographic attributes in the study.

Keyword: objective conditions, subjective conditions, users’ attitude, Kansei evaluation, ANOVA

1. INTRODUCTION

In order to understand and fulfill a user’s needs, many research studies investigate users’ product perceptions towards Kansei by means of a SD (Semantic Differential) questionnaire. Through comparing the responses among subjects with different backgrounds, most studies analyze data with compared groups on the basis of subjects’ demographic attributes (defined as “objective conditions” here), such as sex (male or female), age, occupation, and educational background. However, one of our previous studies revealed that based on their attitudes towards the products, the subjects showed different responses to the experimental questions about Kansei in which mobile phones were used as stimuli and interviews were adopted to explore the subjects’ attitudes towards the products and their Kansei impressions. The results showed that while some subjects perceived mobile phones as a sole device of communication, others regarded it as a representation of their own identity including personal taste and social status. Consequently, the Kansei feelings on the same product between these two groups of subjects were significantly different. Therefore, this study aimed to further examine whether or not personal attributes (defined as “subjective conditions” here) pose a stronger impact than “objective conditions” in influencing users’ Kansei impressions and preferences on products. Mobile phone products were retained as stimuli in this study and morphological analysis was introduced to define the design elements of a mobile phone product with the focus group recruited. 16 combinations of product characters (including the attributes and categories of each attribute) were computed by means of orthogonal design rule based on the result of morphological analysis and 16 stimuli (pictures of real products) were selected to match the combinations individually. Finally, ANOVA analysis was

employed to explore whether any differences could be detected between the outcomes of impressions and preferences among subjects with different objective or subjective conditions.

1.1. KANSEI ENGINEERING

Newly developed in Japan, “Kansei engineering” (also known as Kansei evaluation) is a consumer-oriented technology for developing a new product (Nagamachi, M. 2002). It aims to translate customers’ feelings and demands into design features of products developed that include attributes and categories of each attribute (Nagamachi, M. 1995). Kansei engineering focuses on evaluating the sensory aspect by using the five human senses to perform a semantic differential evaluation of tested products (Nagamachi, M. 1995 & 2002 and Amasaka, K. & Nagasawa, S., 2000). Then factor analysis, regression analysis, and conjoint analysis are usually implemented to establish the relationship between products’ Kansei images and the design features of products. In addition, some attributes of subjects’ demographic conditions are brought into the discussion when comparing the effects among the different events of each attribute individually.

2. METHODS

To investigate the impact of personal attitude over subjects’ demographic attributes towards products by Kansei impressions and preference, an experimental questionnaire was devised. The questionnaire was divided into two parts. The first part focused on acquiring subjects’ information about their objective (sex, age, occupation, and major included) and subjective conditions (response of personal attitude to the product stimuli) while the second part aimed to assess subjects’ Kansei impressions and preferences on 16 mobile phones. Participants’ background information, the questionnaire design and administration as well as the analysis of the data gathered are described below.

2.1. SUBJECTS’ OBJECTIVE CONDITIONS

Users’ demographic attributes were identified as subjects’ objective conditions in this study. Therefore, descriptive statistics was introduced to analyze the collected data of subjects’ objective conditions. In this study, aspects which can be easily categorized were identified as “subjects’

objective conditions” including sex, age, occupation, and major at university major. 51 people took part in the questionnaire survey in which 30 of them were students and 21 of them were workers. About half of them (24) were major in “Industrial Design” and around a quarter of them (12) studied other fields of design (abbreviated as “Other Design”, such as visual art, architecture, etc.) while the rest came from non-design fields. There were 21 female and 30 male participants aged between 19 and 35 with a mean age of 25.02 (SD = 3.25). The average number of personal mobile phone products owned by the subjects was 3.73 units (SD = 1.36), ranging from 2 to 8 pieces. Further information of the participants’ background is presented in Table 1 and Table2.

	Industrial Design	Other Design	Non-Design	Total
SEX				
Male	12	6	12	30
Female	12	6	3	21
Total	24	12	15	51
OCCUPATION				
Student	12	8	10	30
Worker	12	4	5	21
Total	24	12	15	51
EDUCATION				
Under Graduate	10	5	9	24
Graduated	14	7	6	27
Total	24	12	15	51
NUMBER OF MOBILE PHONES POSSESSED (SO FAR)				
2	4	2	4	10
3	7	2	5	14
4	5	5	5	15
5	4	2	0	6
6	4	0	1	5
8	0	1	0	1
Total	24	12	15	51

Table 1: Background information of participants (1)

2.2. USERS’ SUBJECTIVE CONDITIONS

In this study, subjects' attitudes towards mobile phone products were identified as their subjective conditions. Based on related references, first focus groups were recruited to conclude users' primary concerns for the products through brainstorming. Then three questions were formed as the criteria for user appraisals (absolute evaluation, impulsive act and practical consumption) and 14 possible answers (factors) to those questions were listed and used to gather subjects' opinion on mobile phone products. The three questions asked were: (Q1) which three factors would I consider most important when evaluating whether a mobile phone product is good or bad? (Q2) which three factors would I consider as essential to attract me to want to have a product on an impulse; (Q3) which three factors would I consider as my biggest concerns when I decide to buy a new mobile phone (Table 3).

	2	3	4	5	6	8	Total
SEX							
Male	8	7	10	2	3	0	30
Female	2	7	5	4	2	1	21
Total	10	14	15	6	5	1	51
OCCUPATION							
Student	6	9	8	2	4	1	30
Worker	4	5	7	4	1	0	21
Total	10	14	15	6	5	1	51
EDUCATION							
Under Graduate	5	6	8	4	1	0	24
Graduated	5	8	7	2	4	1	27
Total	10	14	15	6	5	1	51

Table 2: The Background of participants (2)

	Item 1: The most concern	Item 2: The secondary concern	Item 3: The third concern
(Q1) which 3 of factors are the most important elementsto evaluate good or bad?			
(Q2) which 3 of factors are attractive essentials on an impulse			
(Q3) which 3 of factors are the most important concerns to buy a new one			

Table 3: 3 conditions of individual's appraisals of mobile phone products

In addition, 14 possible answers included 13 specific definition factors and the rest of any of other possible factor (Table 4). Then, all participants were asked to respond to the 3 questions with the 14 possible factors prepared in advance. Also, they were instructed to mark the factors in order according to the extent of importance (1 = first most important, 2 = second most important and 3 = third most important).

F01. appearance	F02. functionality	F03. interface manipulation	F04. graphic design of interface	F05. size
F06. weight	F07. brand	F08. price	F09. quality	F10. the place of production
F11. appraisal (from others)	F12. product name (or slogan)	F13. limit of quantity	F14. others	

Table 4: 14 possible answers (factors) to individual’s opinions on mobile phone products

2.3. 16 STIMULI OF MOBILE PHONE PRODUCTS

Mobile phone products’ attributes and categories of each attributes were extracted and concluded by focus group recruited through the method of morphological analysis. With reference to Tjalve’s (1979) and Max Bill’s outlooks on conceptual product design, 10 attributes and categories of each attribute were recognized as the fundamental elements of mobile phone product design (Table 5). Then, 16 combinations of product characters were computed by means of orthogonal design rule based on the results of the morphological analysis and 16 stimuli (pictures of real products) were picked out to match the combinations individually (Fig.1).

2.4. 5 TYPICAL ADJECTIVE PAIRS OF KANSEI EVALUATION

Five typical adjective pairs were also identified by the focus groups recruited, including “ordinary-unique”, “plain-complex”, “decorative-functional”, “pretty-ugly”, and “pleasant-unpleasant”. The first 3 pairs were ascribed to subjects’ appraisals of form (shape) design resulted from individual sense impressions; the last pair was intended to reflect their preferences; the fourth pair was meant to reflect subjects’ taste in aesthetics.

Attributes	Category1	Category2	Category3
F1.form ratio	thin	plump	
F2.shape lines of both sides	curve	straight	
F3.size of 4 round corners	big R	small r	tiny (unawared)
F4.shape of 4 round corners	all the same	mirrow	diagonal
F5.keyboard arrangement	regular	gestalt	
F6.styles of number keys	independent	dependent	
F7.form of function keys	separate	(gestalt) joint	
F8.both keys of number and function	separate	(gestalt) joint	
F9.both screen and function keys	separate	(gestalt) joint	

Table 5: Mobile phones products' attributes and categories of each attribute.

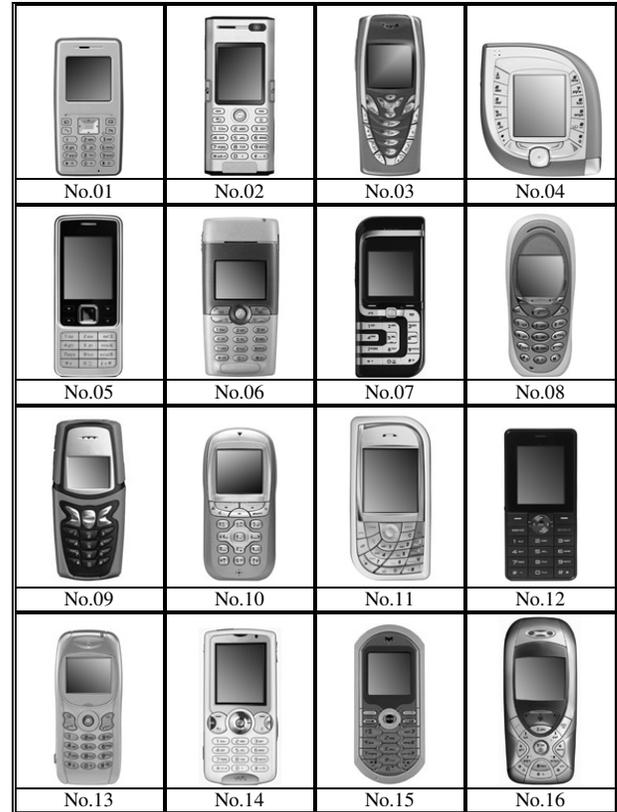


Fig. 1: 16 stimuli of mobile phone products.

2.5. PROCEDURES

This study attempted to investigate the influence of users' attitudes (subjects' objective conditions) and demographic attributes (subjects' subjective conditions) on Kansei evaluation. For this purpose, experimental questionnaires were designed with two parts in this study: The first part aimed to acquire both subjects' information on objective and subjective conditions while the second one was to assess subjects' Kansei impressions and preferences on 16 mobile phones.

The main purpose of part 1 was to divide subjects into several groups based on different items of conditions. There were a total of 4 attributes belonging to objective conditions and personal attitude towards mobile phone products was attributed to subjective conditions in this case. Concretely, subjects' information on 4 separate items: age, sex, occupation and major were defined as objective conditions (shown in section 2.1.). There was only 1 attribute which involved 4 items of personal values ("appearance", "functionality", "price" and "brand") belonging to

subjective conditions with reference to the analytic results of subjects' responses to the questions about the 3 appraisals (shown in section 2.2. and 3.1.).

The aim of part 2 of the questionnaire was to gather subjects' responses about the 16 stimuli based on individual value towards Kansei. Then the results observed were analyzed by means of ANOVA analysis to probe into the influence between user's attitude (subjective conditions) and demographic attributes (objective conditions). The outcomes which resulted from Kansei evaluation were compared in accordance with each item of conditions one by one (shown in section 3.2. and 3.3.)

3. RESULTS AND DISCUSSION

3.1. USERS' SUBJECTIVE CONDITIONS

To interpret the connections between the 3 kinds of appraisals and the possible factors more systematically, the observations were analyzed through frequency distribution of descriptive statistics. Then a cumulative score on each question (marked "sum"; the highest score = 153 = 51 x 3) was obtained by adding the frequency of the same factor in the 3 sequence items.

In response to question 1 (to evaluate whether a mobile phone product is good or bad), "appearance" was considered as the most important factor (sum = 40; 26.1%) followed by "functionality" (sum = 29; 19.0%), "interface manipulation" (sum = 20; 13.1%) and "brand" then lastly "quality" (these two items have the same sum = 18; 11.8%). Effects on other factors were ignored because each sum of them was less than 16 (10.5%).

In response to question 2 (to find out the attractive essentials of a mobile phone product), "appearance" was obviously regarded as the most important factor (sum = 46; 30.1%), followed by "functionality" (sum = 34; 22.2%) then "price" (sum = 18; 11.8%). Effects on other factors were ignored because each sum of them was less than 16 (10.5%).

In response to question 3 (to clarify which factors would determine a user's decision to buy), "appearance" was again regarded as the most important factor (sum = 41; 26.8%), followed by "price" (sum = 35; 22.9%), "functionality" (sum = 27; 17.6%), and lastly "brand" (sum = 17; 11.1%). Effects on other factors were ignored because each sum of them was less than 16 (10.5%).

While observing the “sum” above, only 3 kinds of factors (“appearance”, “functionality”, and “price”) appeared at least once over twenty percent of concerns. In addition, another factor “brand” was also regarded as a substantial factor which appeared twice on the different situations of users’ appraisals. Therefore, these 4 factors which were attributed to users’ attitudes towards mobile phone products were recognized as the only attributes of users’ subjective conditions in this study.

3.2. USERS’ MULTIPLE RESPONSES TO MOBILE PHONE PRODUCTS

Before comparing the influence between users’ demographic attributes and their attitudes towards 16 stimuli of mobile phone products, the previously observed data of participants were examined again to eliminate data which was improper. The data of 4 participants were also excluded in the event because of the ambiguity or the minority of them. For instances, only one of participants was 19 (the others’ age were from 21 to 35) while some of them showed insignificant preferences for any of the subjective conditions that were recognized in this study including “appearance”, “functionality”, “price” and “brand”. As a result, the data of 47 participants were kept for analysis in which 26 of them were students and 21 of them were workers. Almost half of them (24) were major in “Industrial Design” and about one-fifth of them (9) were major in other fields of design (abbreviated as “Other Design”, such as visual art, architecture, etc.) and the rest were major in any other (“Non-Design”) fields. In addition, there were 20 female and 27 male participants aged between 19 and 35. The average age was 25.02 (SD = 3.12). On average, the subjects had owned 3.72 units of personal mobile phone products (SD = 1.21), ranging from 2 to 6.

Subsequently, participants’ multiple responses to the 3 appraisal conditions were separately analyzed in order to find out whether the differences resulted from subjective conditions or objective conditions. Then the connections existed between participants’ conditions and factors’ order and weight would be calculated by means of multiple responses analysis. When discussing the age of participants’ conditions, however, they were divided into groups of 3 (G1: □23; G2: 24~25; G3: □26). As a result, no matter how the groups were formed, the first order and the second order of factors were “F1-appearance” and “F2-functionality”. The only difference was among the groups in the third order of factors. As shown in table 6, for examples, most participants considered “F01-appearance” and “F02-functionality” as the first factor when they evaluate a mobile phone product disregard of their gender. In addition, 3 kinds of the third factors’ order, which also showed difference in, are illustrated in Tables 7-9 individually.

However, these outcomes, as shown in the tables, induce an assumption of this study that users' subjective conditions (subjects' attitude) would be more effective than users' objective conditions (subjects' demographic attributes) to interpret their responses to a product itself. The discussion of this assumption is addressed in next section of this study.

The First Order										
	F01	F02	F03	F05	F07	F08	F09	F10	F11	Total
Male	13 / 1	1	4	1	1	4	3	0	1	27
Female	9 / 1	0	2	0	3	2	4	1	0	20
Total	22	1	6	1	4	6	7	1	1	47

The Second Order										
	F01	F02	F03	F05	F07	F08	F09	F10	Total	
Male	5	14 / 1	0	1	3	2	3	0	27	
Female	3	6 / 1	3	0	4	2	1	1	20	
Total	8	20	3	1	7	4	4	1	47	

The Third Order										
	F01	F02	F03	F05	F07	F08	F09	F10	F11	Total
Male	4	3	6 / 1	1	5	1	4	0	1	25
Female	2	4 / 1	2	1	2	2	3	2	1	19
Total	6	7	8	2	7	3	7	2	2	44

Table 6: The results of multiple response analysis were illustrated according to the data of participants' "sex".

The Third Order										
	F01	F02	F03	F05	F07	F08	F09	F10	F11	Total
G1 (≤23)	3	2	4	1	5	0	2	1	1	19
G2 (24~25)	1	3	1	1	1	2	2	0	1	12
G3 (≥26)	2	2	3	0	1	1	3	1	0	13
Total	6	7	8	2	7	3	7	2	2	44

Table 7: The third factor was computed by multiple response analysis according to the data of participants' "age-group".

The Third Order										
	F01	F02	F03	F05	F07	F08	F09	F10	F11	Total
Student	5 / 1	2	4	1	4	0	4	1	2	23
Worker	1	5 / 1	4	1	3	3	3	1	0	21
Total	6	7	8	2	7	3	7	2	2	44

Table 8: The third factor was computed by multiple response analysis according to the data of participants' "occupation".

The Third Order										
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	F01	F02	F03	F05	F07	F08	F09	F10	F11	Total
Industrial Design	4	3	4	0	2	1	6 / 1	2	0	22
Other Design	1	1	0	1	3 / 1	1	0	0	2	9
Non-Design	1	3	4 / 1	1	2	1	1	0	0	13
Total	6	7	8	2	7	3	7	2	2	44

Table 9: The third factor was computed by multiple response analysis according to the data of participants' "major".

3.3. USERS' KANSEI RESPONSES TO MOBILE PHONE PRODUCTS

The effects between the two conditions (participants' demographic attributes and attitude) upon Kansei evaluation were compared by means of one-way ANOVA analysis. Also, the "age-group" data, instead of the raw data of participants' real age, were used to proceed with ANOVA analysis. The results of the comparison are presented below (Table 10 - Table 14). In these tables, the 16 stimuli were labeled as S01-S16 and the 5 adjective pairs were labeled as A01-A05. Also, the mark "◎" or "★" in each cell of these tables indicates that the result of test for homogeneity or the mean difference is significant at the 0.05 level separately.

However, the mean differences in the results of Kansei evaluation based on both objective and subjective conditions are more significantly resulted from the "major" and "sex" of participants' conditions than other conditions in the event.

	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16
A01	□									□		□				
A02				□		□										
A03										□		□				
A04		□				□				□						
A05			□			□			□	□						
* The mark "□" in each cell of this table indicated that the result of test for homogeneity was significant at the 0.05 level.																
* The mark "□" in each cell of this table indicated that the mean difference was significant at the 0.05 level.																

Table 10: The results of ANOVA analysis were referred to the data of participants' "sex".

	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16
A01						◎						◎				

A02										★						
A03																
A04																
A05									◎		★					

* The mark “◎”in each cell of this table indicated that the result of test for homogeneity was significant at the 0.05 level.

* The mark “★” in each cell of this table indicated that the mean difference was significant at the 0.05 level.

Table 11: The results of ANOVA analysis were referred to the data of participants’ “age-group”.

	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16
A01						◎										
A02							◎			◎						
A03	★												◎			
A04							★									◎
A05									◎	★						◎

* The mark “◎”in each cell of this table indicated that the result of test for homogeneity was significant at the 0.05 level.

* The mark “★” in each cell of this table indicated that the mean difference was significant at the 0.05 level.

Table 12: The results of ANOVA analysis were referred to the data of participants’ “occupation”.

	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16
A01									★							◎
A02						◎			★	★			★			◎★
A03		◎	★	★		◎				★			★			
A04		★			★							◎				
A05		★			★							◎				

* The mark “◎”in each cell of this table indicated that the result of test for homogeneity was significant at the 0.05 level.

* The mark “★” in each cell of this table indicated that the mean difference was significant at the 0.05 level.

Table 13: The results of ANOVA analysis were referred to the data of participants’ “major”.

	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16
A01																

A02				★								◎				
A03				◎										◎		
A04																
A05																
<p>* The mark “◎”in each cell of this table indicated that the result of test for homogeneity was significant at the 0.05 level.</p> <p>* The mark “★” in each cell of this table indicated that the mean difference was significant at the 0.05 level.</p>																

Table 14: The results of ANOVA analysis were referred to the data of participants’ “attitude”.

4. CONCLUSION

Based on the consequences illustrated in section 3.2., the mean differences in the 5 Kansei evaluations were more significantly resulted from both data of participants’ “major” and “sex”. In addition, subjects’ attitudes (subjective condition) towards the 16 stimuli did not cause significant differences in the 5 Kansei evaluations in the study. This outcome is unexpected as it is against our initial hypothesis that users’ Kansei impressions were mainly influenced by their attitudes rather than by their demographic attributes. Two reasons may explain the result. The first might be that some participants were not divided into groups properly. The second one is that it was inappropriate to group the members into several types based on their responses to the 3 conditions of appraisals only. Particularly, the basis of grouping only referred to the order and frequency of the results resulted from multiple responses to the 3 appraisals in the investigation. Perhaps it is necessary to ponder the weight of factor caused by the order in future studies.

Nevertheless, there was an interesting consequence resulted from ANOVA analysis and was related to the data of participants’ “major”. As shown in Table 13, the mean difference is significant at the 0.05 level in 13 cells and all of them indicate that the responses of “industrial design” group are significantly different from those of “non-design” group. However, this did not imply that the responses of “other design” group are correspondent with one of the groups. The “other design” group seems to be irrelevant to any matters except in the two cells of “13-2” and “16-2”. Although the response of “other design” group was significantly different from that of “non-design” group but that of “industrial design” group in the cell of 13-2, the observed situation was the opposite in the cell of 16-2. To sum up, the doubts which arise from the outcomes of the current study will be attached importance in our next study. In addition, the integrated data on

human's Kansei feelings, Kano satisfaction and users' preference might be investigated simultaneously and further discussed in future work.

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