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THE CHARACTERISTICS OF *KANSEI* QUALITY EVALUATION BY DESIGN EXPERIENCE

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ABSTRACT:

In this paper, we discuss 'design experience' is one of the factors which differ between designers and users by the result of *Kansei* quality evaluation. In this research, we want to clarify design experience grows what kind of characters, and how these characters influence *Kansei* quality evaluation by two experiments. The first one was let the subjects categorize many images of benches, based on visual and tactile information, then to let them choose their favorite ones. The next was investigation about comparing these conceptual structures of preference to cellular phones by PAC analysis. Therefore, our subject of two experiments divided two groups: One is Design field group, and the other one is Non-Design field group. From the result of the two experiments, the Design field group paid more attention to especially the appearance such as the 'form' and 'structure' of those products than Non-Design group, and they even checked the detailed points of the appearance as an important factor of *Kansei* quality evaluation. For this

reason, their evaluation criteria concentrated on appearance in *Kansei* quality evaluation. Moreover, they did not yield on evaluation of the appearance, that is to say, they have the tendency not reaching a compromise compared with the Non-Design field group. Consequently, the Design field group has a strong *Kodawari* to the appearance in the *Kansei* quality evaluation of products. The character of this *Kodawari* is one of the factors which give a distinction between the two groups.

Keyword : Design experience, Kansei quality, Evaluation

1. Introduction

There are several common approaches to research on evaluation of products. German philosopher Georg Simmel suggested the trickle down theory, according to which the difference in the evaluation of objects was best understood as a social phenomenon (Georg Simmel 1911). He explained the change in hierarchical fashion trends as being based on the gap between an advanced evaluation group and a less advanced group. He found that people evaluated the same object in different ways. Because people evaluate products differently, the gap between designer and user is a serious problem that is already well known in the design field.

Why does this gap in perception between designers and users occur? Even if the designer and the user see the same product, they differ in their methods of analyzing or evaluating the product and of deciding whether or not to buy it. When a product is purchased based on visual information about it, what aspect of the visual information most influences the each group's evaluation (designers and users)? Such differences in evaluation must be clarified.

In the design field, there is a lot of research on design methodology, which concerns the product and the designer in areas such as research about a quality or visual element of the product. There has also been a lot of research on a type of evaluation called *Kansei* evaluation and of users' *Kansei* evaluation of products. The definition is not easy although *Kansei* is a concept similar to emotion, sensitivity, and feeling. Therefore, we will discuss the definition of *Kansei* in detail in Chapter 2. However, there has not been enough research about the reason for the difference in *Kansei* evaluation between designers and users.

There has been some research about the influence of personality on *Kansei* evaluation (S.H. Lee 1998). However, there are many factors other than personality that affect *Kansei* evaluation. Therefore, research into more objective aspects of *Kansei* quality evaluation is required. There is a need for research from many approaches and various viewpoints. With this background, it is

necessary to consider the influence of design experience on *Kansei* quality evaluation. Therefore, we asked what characters are developed through design experience, how the characters manifest themselves in *Kansei* quality evaluation of products, and how the characters influence *Kansei* quality evaluation. The purpose of this research is to clarify how design experience affects a designer's *Kansei* quality evaluation of a product.

2. Previous research

2.1. *Kansei* and *Kansei* Quality

In his proposition on how the influence of *Kansei* is endogenous to knowledge processes, Yamanaka suggests the way *Kansei* supports inner knowledge shifts. Expression, assimilated to externalization in Kanaka's SECI model, is the vector of the shift between tacit and explicit knowledge. Experience assimilated to internalization in Kanaka's SECI model, is the vector of the opposite shift. *Kansei* covers the process between tacit and explicit knowledge (Fig. 1) (T. YAMANAKA 2003). In other words, *Kansei* works as a medium of tacit and explicit knowledge (T. YAMANAKA, L. PIERRE 2006).
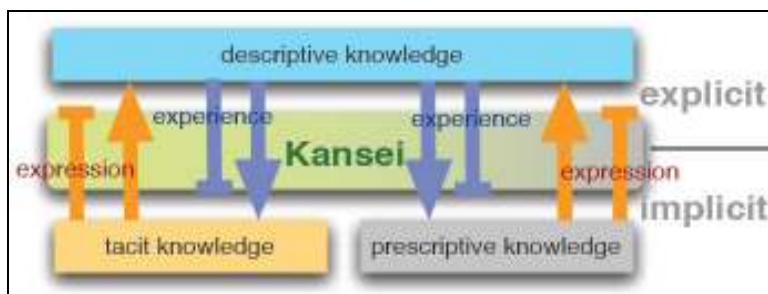

Fig. 1: *Kansei* and three types of knowledge

For any given object there is a denotative and a connotative definition (Fig. 2). The denotative definition of an object is not affected by a person's evaluation of it. However, the connotative definition of an object differs according to the intuition of each individual evaluating it. The meaning important to *Kansei* is the connotative definition, and the connotative definition of the object relates to *Kansei* quality. That is, *Kansei* is an ability to feel and understand aspects of the connotative definition of the object (Y. TANAKA 1969).

Fig. 2: Meaning of object

In Kano's research on the quality of products, he suggests that a product has three kinds of qualities: 'must-be quality', 'one-dimensional quality', and 'attractive quality'. The idea of quality is considered by the relationship between a physical fullness of product and the users' satisfaction (Fig. 3). No matter who evaluates the "must-be quality" and "one-dimensional quality" of a product, the result of the evaluation is the same. However, evaluation of "attractive quality" differs based on the intuitive response of each individual. That is, this attractive quality is one type of *Kansei* quality (N.KANO 1984).
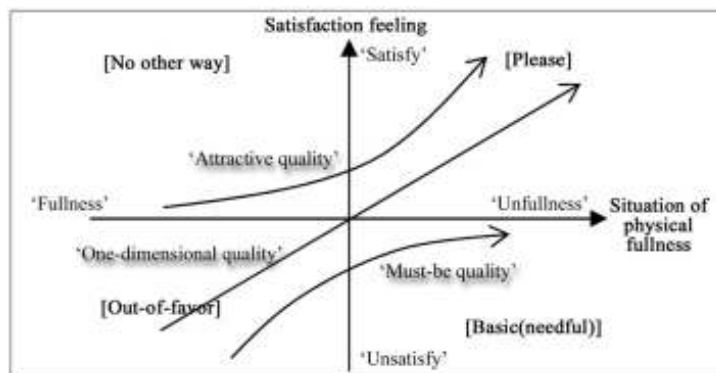

Fig. 3: Physical fulfillment due to product and user's satisfaction

The above-mentioned research results show that evaluation of *Kansei* quality differs based on the method of evaluation and interpretation of each individual. This is because *Kansei* quality relates to the connotative meaning of an object (product) and is based on tacit knowledge.

2.2. *Kodawari*

Kodawari is a Japanese term that means "to focus obsessively on the trifling details of an object", and "to care about a problem beyond necessity". *Kodawari* also carries the connotations of "obsession (obsessiveness)", "adhesion", and "prejudice" (S. NISHIMURA 1998, I. KANEDA 1997). From the viewpoint of clinical psychology, the word has the negative connotation of "a

condition in which someone cannot pay attention to relevant points". However, *Kodawari* also has positive connotations. For example, an object selected based on *Kodawari'* is an object is selected after careful consideration. The phrase "*Kodawari* above materials" means "commitment to materials". It means that only carefully chosen materials were used in the product. Therefore, *Kodawari* also means uncompromising.

Based on the research about people's impressions of the noun and verb forms "*Kodawari*" and "*Kodawaru*", many people have good impressions of them. In addition, young people have a better impression of both words than old people (http://pro.tok2.com/~nhg/research/research-29.html).

3. Methods

We conducted two experiments: the first about methods used in analyzing products and the second about a conceptual structure of preference for a cellular phone (Fig. 4).
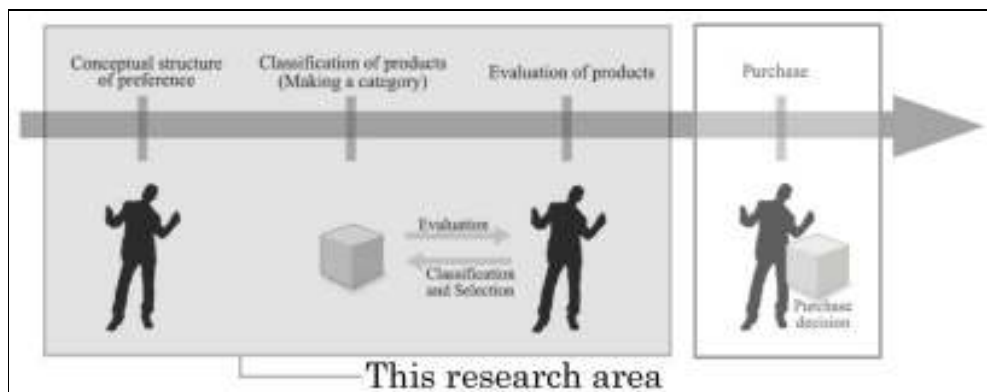

Fig. 4: This research's process and area

3.1. Experiment 1: Comparison of categorization and selection of products

The purpose of the first experiment was to clarify how their design experience affects how designers classify and select products. When a person selects a favorite among many products, he or she compares the products by categorizing them and then selects one. Therefore, in the first experiment, we compared people's styles of analyzing the *Kansei* quality of a product based on their design experience. We asked subjects to freely classify images of 50 benches according to the their own standards and to select five favorite benches from the 50. There were 42 subjects. The subjects of Design field group were 23 (with an average of 6.9 years of design experience), and the subjects of Non-Design field group were 19.

3.2. Experiment 2: Comparison of preference structure using PAC analysis

The purpose of the second experiment was to clarify how design experience affects the preference structure a subject held before looking at a product. However, a preference structure is differing on the individual. Therefore, we compared subjects' preference structures for a favorite cellular phone using PAC analysis, which is one method of attitude structure analysis based on the individual. This PAC analysis proposed by Naito on 1993 is to actualize the hidden some consciousness using a qualitative analysis (word association based on the conversation between a researcher and a subject) and a multivariate analysis (cluster analysis) (T. NAITOU 1997).

The subjects wrote the standard criteria for a favorite cellular phone to card freely, and then they rearranged the card written standard criteria according to importance ranking on their favorite evaluation. Next, they evaluated the degree of similar of combinations made from the written criteria considering 7 levels. Finally, we investigated the subjects' preference structure from the result of evaluation using a cluster analysis. There were 20 subjects. The subjects of Design field group were 10 (with an average of 7.4 years of design experience), and the subjects of Design field group were 10.

4. Results

4.1. Experiment 1: Comparison of categorization and selection of products

We compared the number of divided product groups, the number of groups to which the selected product belongs, and the time taken to separate and select products. Fig. 5 shows results for Experiment 1, where subjects classified and selected products.

Fig. 5: Example (Left: Design field group, Right: Non-Design field group)

The designers separated the phones into an average of 7 groups, and the non-designers separated the phones into an average of 5.16 groups (F (1, 40) = 7.737, P < 0.01).

Table.1 shows the results of the principal component analysis. Especially, we paid attention to the second component and considered. Since the second principal component becomes stronger, when "the number of divided groups" becomes increase and "the number of groups to which the selected products belong" becomes decrease. That is, the component has a relationship with the two factors. However, the component has weak relationship with "time taken to divide".

Table.1: Result of Principal component analysis

	the 1st component	the 2nd component	the 3rd component
Eigenvalue	1.845	0.637	0.519
Proportion(%)	61.487	21.224	17.289
Cumulation(%)	61.487	82.711	100

	the 1st component	the 2nd component	the 3rd component
Time taken to divide	0.601	-0.136	0.788
Number of divided groups	0.556	0.779	-0.290
Number of groups to which selected products belong	0.574	-0.612	-0.544

These results explain the 2nd component shows the character of subject's notions of *Kodawari*. If a subject has strong *Kodawari*, he or she tends to divide benches into many groups based on many criteria. However, the favorite 5 benches belong to a small number of groups across subject evaluations. That is, the subject has strong *Kodawari* have a clear tendency to like or dislike products (N.G. Kang, T. Yamanaka 2003, 2004).

We investigated the relationship between the subject's *Kodawari* score and whether he or she had design experience using an analysis of variance. The results showed that Design field group tended to have a stronger *Kodawari* coefficient than Non-Design field group (F (1, 40) = 4.311, P<0.05). Figure 6 shows the relationship between *Kodawari* and the number of groups and how frequently benches selected as favorites were in the same groups (N.G. Kang, T. Yamanaka 2005).
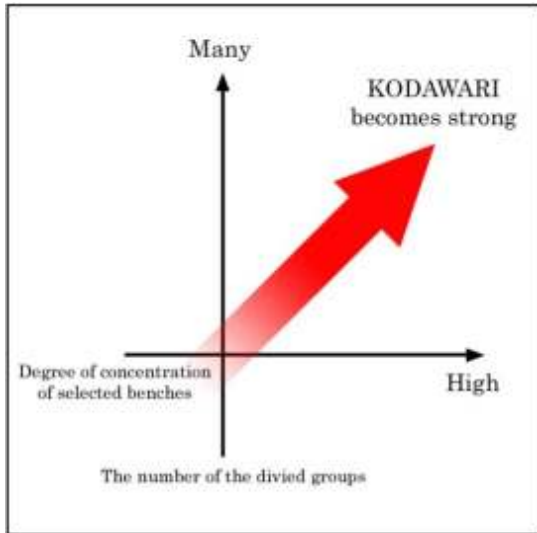
Fig. 6: Strong of *Kodawari* products

4.2. Experiment 2: Comparison of preference structure using PAC analysis

We compared the written standard criteria for a favorite cellular phone. The results showed that the Design field group's average number of criteria for a favorite cellular phone was 11.9, and the Non-design group's was 9.3. The differences in numbers of criteria were significant ($F_{(1, 18)}$ = 8.57, $p < 0.01$), meaning that the Design field group' structure of preference for a favorite product was composed with more criteria than that of the Non-Design field group. We then compared the correlation between the order of enumerated criteria and the order of importance criteria level and found that the Design field group's rank-correlation coefficient was lower than the Non-Design field group's (Design field group: 0.359, Non-Design field group: 0.650 ($F_{(1, 18)}$ = 7.09, $p < 0.05$)). Moreover, only three subjects (30%) in the Design field group showed a significant coefficient or significant tendency toward a coefficient on a nonparametric test of Spearman's rank- correlation coefficient. However, seven subjects (70%) in the Non-Design field group showed a significant coefficient or a significant tendency (Table. 2).

Table.2: Result from nonparametric test of the Spearman rank-correlation coefficient

Subject number	1	2	3	4	5	6	7	8	9	10
Design field group	0.402	0.544	0.462	0.259	-0.071	-0.143	0.692	0.364	0.350	0.727
Non-design field group	0.800	0.442	0.758	0.782	0.538	0.943	0.782	0.524	0.321	0.559

	1	2	3	4	5	6	7	8	9	10
Design field group	p>0.154	p>0.055	p>0.112	p>0.417	p>0.817	p>0.760	p>0.006	p>0.272	p>0.265	p>0.011
Non-design field group	p>0.003	p>0.011	p>0.200	p>0.008	p>0.009	p>0.005	p>0.008	p>0.182	p>0.482	p>0.059

In Experiment 2, the 20 subjects mentioned 213 criteria for a favorite cellular phone. The 213 criteria were summarized in nine categories by three experimenters using the KJ method. The nine categories were "whole form", "partial form", "color", "material", "display screen", "button", "addition function", "sound and speaker", and "other" ("incomprehensible"). We investigated to which category the mentioned standard criteria belong. Figure 7 shows the number of summarized categories of subject group. The mentioned criteria of the Design field group most concentrate into one category: whole form. However, the mentioned criteria of the Non-Design field group were scattered into various categories than Design field group.
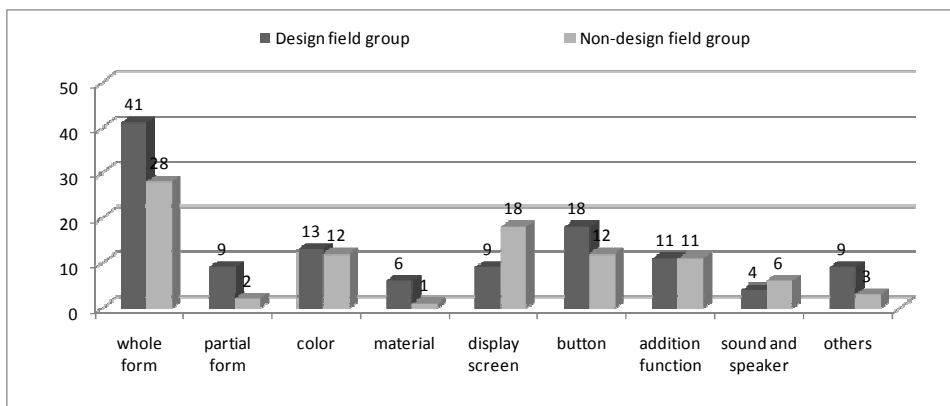

Fig. 7: Result of summarized criteria' categories

Generally, in PAC analysis, data are reduced to the criteria which received the top 30% highest scores in importance ranking. In this experiment, the average number of criteria generated by each subject was approximately 11, thus we analyzed the top 4 most important criteria from each subject which resulted in 80 criteria in total.

We found that the most important four criteria mentioned by the Design field group belong to fewer categories than the Non-Design group. On average, Design field group's criteria into 2.3 categories, whereas Non-Design field group's them into 3.2 (F (1, 18)=6.23, p＜0.05) (Fig 8).

Further investigation of these results shows that the important criteria of Design field group most concentrate into one category: whole form. However, the important criteria of the Non-Design field group were more scattered into various categories than Design field group (Fig. 9).

Moreover, we compared the number of criteria of the same category mentioned continuously. The comparison showed that the continuous criteria of the Design field group were concentrated in the category, whole form. However, the continuous criteria of the Non-Design field group were scattered into various categories (Fig. 10).
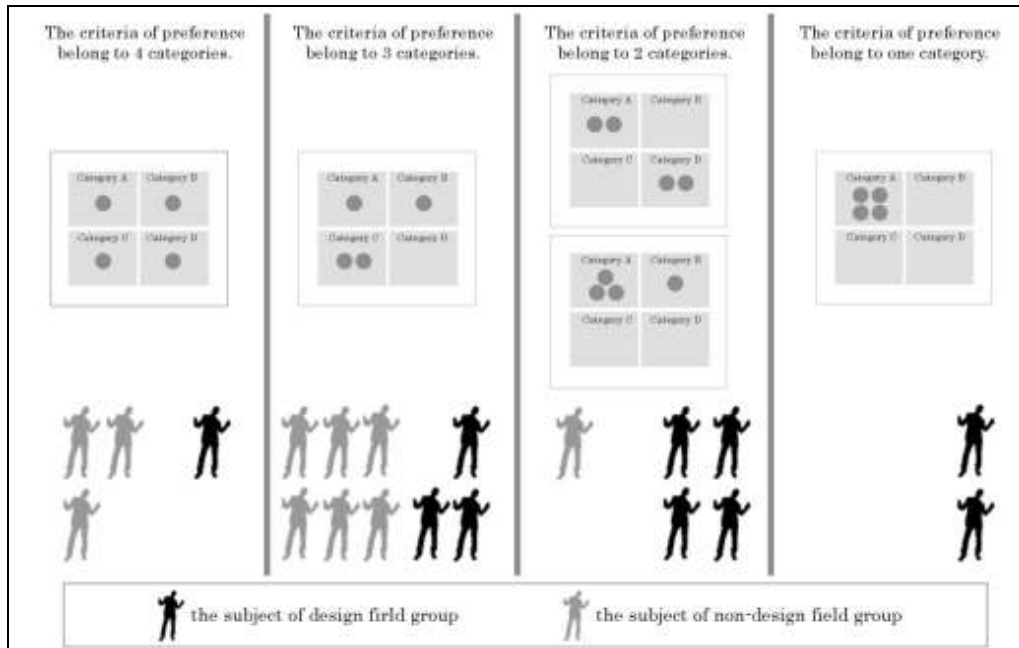
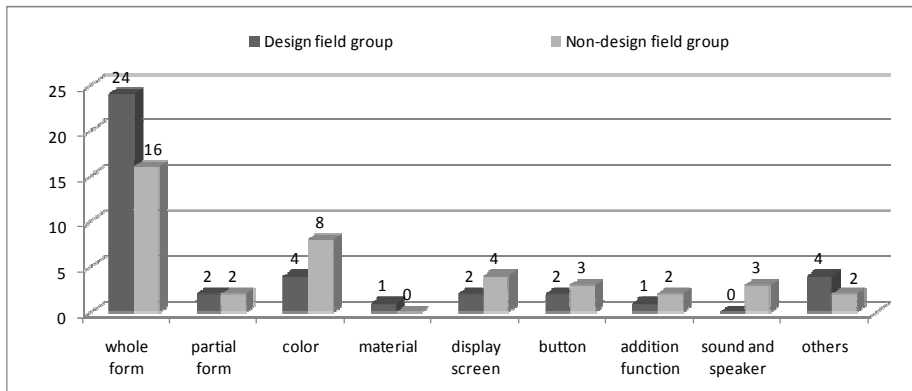Fig. 8: Composition patterns of 4 criteria of preference

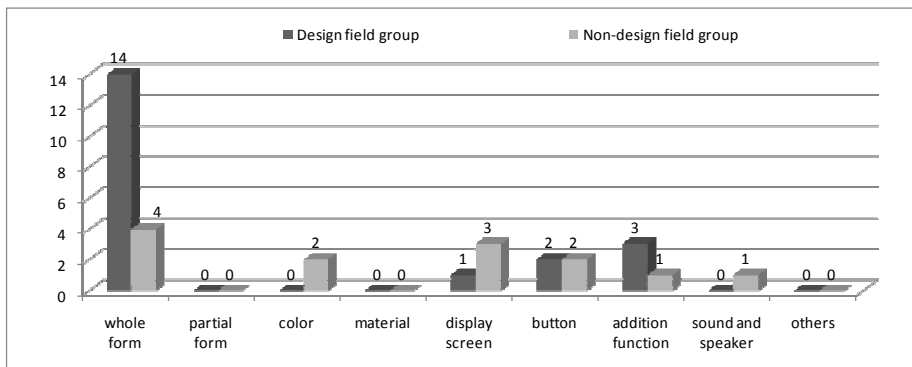Fig. 9: Composition of 2 groups' criteria

Fig. 10: Composition of 2 groups' continuous criteria

5. Conclusion

The results from Experiments 1 and 2 are summarized in Tables 4.

Table.4: Comparison of the two group's results on experiments

Experiment1	Design field group	Non-design field group
The number of divided product group	Many	Few
The number of groups to which selected product belongs	Few	Many
Kodawari score by Principal component analysis	High (=Strong Kodawari)	Low (=Weak Kodawari)
Content of Criteria	These criteria were concentrated on "form" and "structure"	These criteria were scattered in all categorise

Experiment3	Design field group	Non-design field group
The number of favorite criteria	Many	Few
The correlation between the order of enumerated criteria and the order of importance criteria level	Low	High (Positively correlation)
Principal component analysis	Appearance as important (Esthetic preference)	Function and operativity as important
The number of continuous criteria	Many	Few
Contents of continuous categories	These criteria were concentrated on the 'whole form'.	These criteria were scattered in all categorise
Categories of important criteria	These criteria were concentrated on the 'whole form'.	These criteria were scattered in all categorise

Based these data, we concluded that the Design field group paid special attention to the shape and structure of products and close attention to details in these categories. Therefore, their *Kansei* quality evaluation tended to lean toward the appearance of products. In other words, they characteristically valued shape and structure in *Kansei* quality evaluations. Unlike the Design field group, the Non-Design field group did not concentrate on some criteria at the expense of others. They paid attention uniformly to all criteria. The results showed that the Design field group's *Kansei* quality evaluations valued the shape and structure of products.

This result is interpreted based on the meaning of *Kodawari*, discussed in Section 2.2. Consequently, *Kodawari* in the context of a *Kansei* quality evaluation can be defined as to care about specific points beyond strict utility and to pay attention to detailed features of a specific point. Therefore, the Design field group focuses on specific points. Consequently, *Kodawari* is a

factor that affects *Kansei* quality evaluations. The designer group had strong *Kodawari* in the *Kansei* quality evaluation; it was affected as one of the factors from which the evaluation's result of products differs. The influence of design experience on the *Kansei* quality evaluation was demonstrated by our experiments. When the Design field group expresses an idea with a form, they extend an idea by intuitive abduction. Consequently, Design field group consider the whole form of a product, the appearance of form and structure, based on a deeper consideration than that of the Non–Design field group.

REFERENCES

Georg Simmel (1911) Philosopihische Kultur gesammelte Essais

http://pro.tok2.com/~nhg/research/research-29.html

I. KANEDA (1997) Japanese Dictionary of SHINMEIKAIKOKUGOJISYO, printed in Sanseidou co., p.438

N.G. KANG, T. YAMANAKA (2006) *Kansei* Quality of products, Proceedings of the first International Conference on *Kansei* Engineering & Intelligent Systems (KEIS '06), pp. 220-227, Aizukomatsu/JAPAN September 5-7

N.G. Kang・T. Yamanaka (2005) The Measurement of a Use's Preference by *Kansei* over a Products, and its Application to the Design Process, Design Research Society , International Conference 2004 FUTUREGROUND, Vol.1, p.97, Melbourne/AUSTRALIA, November 17-21

N.G. Kang・T. Yamanaka (2004) Research on quantification of a users' *KODAWARI* (Preference), Proceeding of 5th Korea-Japan Joint Symposium on Emotion & Sensibility, p.104, Teajoen/KOREA, July 4-5

N.G. Kang・T. Yamanaka (2003) Research on the method of measuring a user's Taste-*Kansei. -* Consideration through the classification of bench-, Journal of the ADC, Vol.1, p. 25, Tsukuba/JAPAN, October 14-17

N.KANO (1984) Attractive quality and Must-be quality, Quality, pp.39－48

S.H. Lee (1998) A Study of Design Approach by an Evaluation based on the *Kansei* Information, 'Image', University of Tsukuba

S. NISHIMURA (1998) Japanese Dictionary of KOUJIENN, Iwanami co., p.974

T. NAITOU (1997) Introduction to operate PAC analysis, printed in NAKANISHI co.

T. YAMANAKA (2003) *Kansei* and Experience in research and Education, University of Tsukuba

T. YAMANAKA, L. PIERRE (2006) Communication Tool Design Supported by *Kansei* Information Study, Proceeding of the 53RD Annual Conference of JSSD, pp. 194-195, Kanazawa/JAPAN July 1-2

Y. TANAKA (1969) Science of Communication, NIHON HYOURON Co. Press