The Relationship between Preference and Kansei Values

Preference Mechanism focused on Information Conciliation

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Abstract: Why do people want what they want? This question has fascinated researchers in design field, and continues to motivate them today. Preference has been addressed as an important theme in design whereas Preference Mechanism has not been well explained. This study shows the relationship between Preference Mechanism and product evaluation values using automotive images. This study investigates if reconciled-preference shows the same results in various Reality Sets (one product image, separated product image). Reconciled-preference images are prepared through item screening reflecting Subjective Preference (like-dislike). In this experiment, two types of stimuli are used as Reality Sets: (1) car-front images as Uninominal Reality Sets (2) car-front-side images as Binominal Reality Sets.

Subjective Preference and aesthetic, but also between Subjective Preference and pleasure; Binominal Reality Sets shows a statistical significant difference not only between Subjective Preference and aesthetic, but also between Subjective Preference and pleasure; Binominal Reality Sets shows a statistical significant difference between Subjective Preference and preference. It is worth noticing that Reality Sets affect product evaluation. It gives a perspective to understand what makes people modify their preferences in product evaluation.

Keywords: Kansei Information, Product Evaluation, Intuition

1. INTRODUCTION

Design is comprehensive creative activity between individual and the surrounding factors. Hence, designed products may contribute to (1) individual notice [1-3], (2) communication information to individuals [4], (3) influences of the quality of daily life and long-lasting effects [5]: (1) Individual notice; Ford Taurus, launched in 1986 showed an example for individual notice. It soon became one of the best selling passenger cars in America due to its unique shape [5]. The 1994 Dodge Ram pickup’s front-end resembled the cab on an 18-wheeler to suggest strength and power, and succeeded in attracting individual notice. (2) Communication information to individuals: Product form creates the initial impression and generates inferences regarding other product attributes [6]. For instance in real product, the first Apple Macintosh possessed a compact, simple form to communicate ease of use. Moreover, late Apple Macintosh suggests intuitive forms to have an easier communication while using it, such as tap to click with one finger to open a file, pinch to zoom in and out with two fingers. It is an idea based on intuitive human behaviors. (3) Influences of the quality of daily life and long-lasting effects: the perception and usage of beautifully designed products may provide sensory pleasure and stimulation. In contrast, objects with unattractive forms may evoke distaste. Moreover, aesthetic characteristics impact on users. Norman, D.A. asserts that the emotional side of design may be more critical to product success than its practical elements. Beautifully designed products make people feel good, which then puts individuals in an open frame of mind to be creative and find solutions to the problems they face [7].

One of the curious aspects of design of product is how designers know ‘the product is well designed’ in multi-faceted qualities of object. Another is why do individuals want to choose ‘the product’? Product can be evaluated after being chosen by users. Then how are individuals informed by multi-faceted qualities of object? The relationship between form and recognition give reasonable consideration.

Recognizing the external features, e.g. form of various objects in the world, is an innate human ability. People categorize objects according to their similarity through recognition process. Individuals categorize perceptually similar stimuli into qualitatively different categories to allow for more efficient processing of the perceptual world [8, 9]. For instance, people will have no problems in perceiving the changes in facial identity [10] and facial expressions [11]. It has been noted in many face perception studies that people reliably and automatically make personality inferences from facial expression despite little evidence for their accuracy. Because of that
the human face is a complex multi-signal system from which we can infer a great deal of information at no more than a glance— in other words, after only 100 ms of exposure [12]. Such information is encoded and perceived in product, like car fronts [13]. The idea about the relationship between facial expression and car-front-face has been proposed [14], and investigated systematically [15]. It found that a happy or angry face influenced the likeability of a visual target only when the face was displayed subliminally [16]. Also, it is widely accepted that unconscious process can modulate judgments and behavior. The stimuli, in this study, were metaphorically related to the human face, also hypothesized that affected emotional reaction is similar to human facial. These ideas are based on the metaphor theory.

Metaphor is a device for seeing something in terms of something else [17]. In other words, metaphor is the way we understand new things conceiving of them in terms of things we already know. Therefore, metaphor within products can be a powerful tool for conceptualizing, orienting, and personifying products [18]. Although the number of possibilities of different object shapes in the world is endless, each shape can be effortlessly categorized, even if the shapes are unfamiliar [19].

By the Gestalt psychology that dominates in the object recognition process, people recognize objects by the total images. The overall features affect such recognition manner. By the manner, i.e. whole is different from the sum of its parts. It is recognized in different ways, even though in the same pattern, shape, and configuration. Sometimes, not all of the things are always what they seem to be. In other words, different layers are involved in the visual processing of object features and some specific features will be seen as a whole unit. Similar to the global and local feature recognition, two procedures can explain in terms of information processing: top-down or conceptually driven processing and bottom-up or data-driven processing [20]. In the top-down processing, for product form, a visual cognition starts from the recognition of global images. In the bottom-up processing, it starts the recognition of local features of product form. A study by Chang et al. showed that total images and local features influence the subjects’ product form classification in mobile phones. According to the research, local features played a relatively more important role than the total images [21].

Then, does it show the same results in different conditions of information? not only one product image, but also separated-product image shows more important role in local features than whole image? Furthermore, if the product evaluation showed different results between one product image and separated-product image, how different would it be? It can explain in the relation to reality.

Humans get information from external features, and the aspect of individual perspective is related to the individual. Figure 1 shows an espresso maker in different aspects. Which one is the real espresso maker? Surely, all of them are real. Difference is the aspects of objects. One of the ambiguous points in product evaluation is what if user’s evaluation makes a difference by the aspects of objects? Furthermore, what if user’s product evaluation makes a difference between one product image and separated-product image? In real, users consider not only one aspect but also separated-aspect of products due to the objects’ 3-dimensional existence. Because, human cannot see front and side at the same time such as works of Picasso P. and Jesus Gonzalez R. (Figure 2).

In the present study, it is investigated if users do product evaluation in the same way between one product image (e.g. a side of products) and separated-product image (e.g. a combination of the two sides of a product). It is named \textit{Uninominal Reality Sets} and \textit{Binominal Reality Sets}.

2. DEFINITION OF SUBJECTIVE PREFERENCE AND PREFERENCE

In this study, preference was re-defined into two words, and the re-defined words were used slightly differently. While “Subjective Preference” is a subject’s individual preference in the first task (named item screening), “preference” is an evaluation value in the second task (named product evaluation). This definition was to prevent from confusion of the usage of preference.

Figure 1: Which one is the real espresso maker?

![Figure 1: Which one is the real espresso maker?](image1)

Figure 2: Work of art by Picasso, P. (the left) and Jesus, Gonzalez R. (the right).

![Figure 2: Work of art by Picasso, P. (the left) and Jesus, Gonzalez R. (the right).](image2)
3. METHOD

3.1 Experiment design

Car, which was used as stimuli, is a complex structure that consists of body, headlights, fender, radiator grille, wheels, bumper, etc. Therefore, it needs to consider on the variations of Subjective Preference, i.e. various types of combination: (1) combination in one image namely Uninominal Reality Sets, (2) combination in two images namely Binominal Reality Sets. According to the previous study exploring the relationship between car shape and trait scores [16], people associated a human face with car-front-face image, and headlights marked as eye as the most impressive attribute of its expression. Hence, headlights were applied to the reconciliated car-front-face images, whereas wheels were applied to the reconciliated car-side images considering attributions balances between car-front-face and car-side. It hypothesized that product evaluation is related to what stimuli consists of. For instance, a combination of car image consists of factors coming from preferred images, will be evaluated affirmatively whether Uninominal Reality Sets or Binominal Reality Sets. An image consists of factors coming from non-preferred parts, will be evaluated negatively whether it shows one image or two separated images. Difference from a car image consist of completely like or dislike attribute, what if a car-front image consists of preferred car body and non-preferred headlights? On the other hand, what if a car-front image consists of non-referred car body and preferred headlights? People evaluate a car-front images consisting of preferred and non-preferred forms whether affirmatively or negatively? This was the core scope of this study. Hence, the experiment of this study involved stimuli reconciliation process in the procedure (Figure 3). In the process, the authors reunified car images that screened through item screening per subject.

3.2 Subjects

Twenty university students (11 males and 9 females) recruited from University of Tsukuba. No subjects have taken part in any kind of similar experiment before. All subjects were native Japanese speakers, and none of them majored in design.

3.3 Item screening

In this study, pre-task was conducted to prepare stimuli for the main experiment. In pre-tasks, there were two groups of stimuli: (1) one hundred car-front images as Uninominal Reality Sets (2) fifty car-front-side images as Binominal Reality Sets. There was no same image in both groups. In addition, eleven images each of uninominal stimuli (a combination of car body and headlights image: F) and binominal stimuli (a combination of front and side: F&S) were prepared for item screening. The selected car images filtered in a gray scale to avoid a color effect. License plates were erased. To prevent strange feeling of the subjects in shapes, we adapted the car front and side heights in the same, which were collected in similar category, such as sedan, coupe, convertible, and so on.

The subjects conducted item screening one week before participating the experiment (Figure 3). The pre-task consists of two pre-task: screening for experimental stimuli; screening for aesthetic reference. The aim of the screening for aesthetic reference was to prepare an aesthetic reference image per subject. With prepared aesthetic reference image and stimuli, subjects participated in the experiment (Figure 4).

3.3.1 Screening for experimental stimuli

Subjects chose a button in like-dislike (Figure 5). They evaluated one-hundred car-front images (F) as Uninominal Reality Sets and fifty combinations of front and side images (F&S) as Binominal Reality Sets. Through the item screening, three most preferred and three least preferred car-front images (F), and car-front-side images (F&S) were selected considering time to be chosen as the priority.

![Figure 3: The procedure in the experiment.](image)

![Figure 4: The process of the experiment.](image)
3.3.2 Screening for aesthetic reference

In this study, an aesthetic reference was prepared per subject. Since aesthetic perception is deemed different from ordinary perception in daily life [22-24], the current study prepared an aesthetic reference for fixing a parameter of a subject’s aesthetic feeling to compare other evaluation values, such as pleasure, arousal, familiarity, preference, decision-making in purchasing a product, and knowledge. Considering the previous studies on the relationship between balance and preference, structural features of image were known to influence preferences: (1) the location of an object of greatest salience in an image influences individuals’ preferences (2) balance of elements within an image can have profound influence on aesthetic preferences [25]. Furthermore, since balance is a central feature that contributes to the organizational structure of aesthetic visual images, and individuals are sensitive to balance “at a glance” within 100ms of presentations [26, 27], the author prepared a reference photo for aesthetic. Subjects evaluated aesthetics of each photograph on a scale from 0 to 10 (Visual Analogue Scale) with eleven photos each of uninominal information stimuli (car-front-face image) and binominal information stimuli (combination of front & side image) (Figure 6). Since the aim of an aesthetic reference was to fix a scale of a subject’s aesthetic feeling to compare other evaluation values. The evaluation criteria of aesthetic, is well balanced (Figure 6).

3.4 Stimuli reconciliation

Seventy-two car-front images (F) and thirty-six car-front-side images (F&S) were prepared through item screening. The screened images were reunified by the logics as follows to investigate whether Subjective Preference was related to product evaluation.

3.4.1 Uninominal Reality Sets

The headlights were separated from three most preferred and three least preferred car front photos. Six bodies and headlights were prepared, and headlights were combined with bodies into new stimuli (Figure 7-8).

3.4.2 Binominal Reality Sets

The logic of Binominal stimuli was the same as Uninominal Reality Sets. The sides were separated from selected three most preferred and three least preferred car front face and side pair photos. Six fronts and sides were prepared, and fronts were combined with sides into new stimuli (Figure 9-10).

3.5 Product evaluation

In product evaluation, subjects evaluated seven values considering Kansei responses: intuition, decision, and emotion. (1) In intuition: preference and aesthetic were applied to the product evaluation values (2) in decision: decision making in purchasing a product, familiarity, and knowledge were applied to the product evaluation values (3) in emotion: pleasure and arousal were applied as the product evaluation values (Figure 11).

Thirty-six car-front images were used as stimuli in Uninominal Reality Sets. Thirty-six car-front-side images were used as stimuli in Binominal Reality Sets. As mentioned above, aesthetic was evaluated by comparison with a reference per subject. The subjects were given general instructions including the way of evaluation in the experiment, and participated in the product evaluation (Figure 12).
4. ANALYSIS & RESULT

A two-way (2×2) mixed-design analysis of variance (ANOVA) was performed on the evaluating difference scores for each stimuli: Subjective Preference in car body × Subjective Preference in car headlights; Subjective Preference in car front face × Subjective Preference in car side. In order to accommodate individual differences in evaluating, a mean evaluating score for each subject was used as dependent variable (Figure 13).

(1) Results in Uninominal Reality Sets

There was no significant interaction effect in Uninominal Reality Sets (Table 1). While Aesthetic, Pleasure, Arousal, Familiarity, and Decision-making in purchasing a product shows significances, Preference does not show any significance. It was written as “n.s”, which is the abbreviation of “non-significance”. It aimed to note that if preference, as a product evaluation value, shows a significant difference after the reconciliation of Subjective Preference. Preference as an evaluation value, addressed different from other values (such as Aesthetic, Pleasure, Arousal, and so on) due to this reason.

The graph in Figure 14 shows that aesthetic and pleasure were evaluated as affirmative when the stimuli consisted of a car body that coming from subjective preferred image. Moreover, it shows the values showed a significant main effect in Uninominal Reality Sets. LL and LD were similar tendency in the product evaluation affirmatively whereas DL and DD were showed similar tendency in the product evaluation negatively. Least Sq Mean differences in Tukey HSD (the right of Figure 14) shows the results with levels. For instance, LL in A and DD in B shows that LL and DD are in statically different level. DD and DL were in the same level: non-preferred (preference) and non-balanced (aesthetic), whereas LD and LL were in the same level: preferred (preference) and balanced (aesthetic).

Some product evaluation values showed significant interaction effects in Binominal Reality Sets. Furthermore,
preference value showed main effects both car front and body (Table 2). It was written as “s”, which is the abbreviation of “significance”. It aimed to note that if preference, as a product evaluation value, shows a significant difference after the reconciliation of Subjective Preference.

The graph is mean rating of standard deviations of preference (Figure 15). The graph shows that preference was evaluated as negatively when the stimuli consisted of a factor which came from non-preferred image whether it car front or side. Least Sq Mean differences in Tukey HSD (the left of Figure 15) shows the results with levels. For instance, LL in A and LD, DL, DD in B shows that LL levered in statically different from the others.

Table 2: Results in Binominal Reality Sets.

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Side</th>
<th>Front×Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic</td>
<td>P = .5276</td>
<td>P = .2776</td>
<td>P = .0607</td>
</tr>
<tr>
<td>Pleasure</td>
<td>P = .7587</td>
<td>P = .1431</td>
<td>P = .0394</td>
</tr>
<tr>
<td>Arousal</td>
<td>P = .8156</td>
<td>P = .7265</td>
<td>P = .0470</td>
</tr>
<tr>
<td>Familiarity</td>
<td>P = .9785</td>
<td>P = .5002</td>
<td>P = .0654</td>
</tr>
<tr>
<td>Decision-making in purchasing a product</td>
<td>P = .3115</td>
<td>P = .5391</td>
<td>P = .0466</td>
</tr>
<tr>
<td>Knowledge</td>
<td>P = .7750</td>
<td>P = .7750</td>
<td>P = .9109</td>
</tr>
<tr>
<td>Preference</td>
<td>s</td>
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5. FINDING & CONSIDERATION

This study shows the findings as follows.

There was no significant interaction effect in Uninominal Reality Sets. From the finding, it assumes that Subjective Preference of both factors is related to product evaluation independently (Table 1).

Subjective Preference of car body is related to aesthetic and pleasure. From the finding, it assumes that Subjective Preference of car body effects to aesthetic and pleasure independently (Table 1).

Subjective Preference is not related to preference. From the finding, it assumes that Subjective Preference was not reflected enough in reunified processing (Table 1).

Subjective Preference are related to preference not only car body but also side. Moreover, Subjective Preference of factors showed significant interaction effect in preference in Binominal Reality Sets. From the finding in Binominal Reality Sets, it assumes that Subjective Preference is related to preference, and Subjective Preference of the factors affects to product evaluation dependently. Moreover, if permitted significant interaction effect in aesthetic and familiarity, Subjective Preference is related to product evaluation, except knowledge in Binominal Reality Sets. The factors are related to product evaluation dependently, except knowledge. Knowledge is not related to Subjective Preference (Table 2). Comprehensively, Subjective Preference is related to aesthetic and pleasure, but not related to preference in Uninominal Reality Sets. In other hand, Subjective Preference is related to preference in Binominal Reality Sets, but in Uninominal Reality Sets. Difference between Subjective Preference and product evaluation is (1) one week interval (2) stimuli reunification. However, additional analysis about if the factors’ homogeneity in stimuli affects product evaluation did not show any significance. Hence, considerable reason (1) is excluded from the cause. Since Subjective Preference in Binominal Reality Sets is related to preference, (2) is excluded from the cause. Remained considerable reason is the screening method. In item screening, stimuli were evaluated one by one (Figure 5). There was a possibility that all stimuli were not evaluated in the same parameter thereby was not reflecting Subjective Preference enough. It will be addressed in the further study.

6. CONCLUSION

In summary, while partial factors of reconciliated images influence product evaluation according to the sum of Subjective Preference in Uninominal Reality Sets, partial factors of reconciliated images do not influence product evaluation according to the sum of Subjective Preference.
in Binominal Reality Sets. In Binominal Reality Sets, partial factors influence product evaluation independently. As the results, while partial factors influence product evaluation in Uninominal Reality Sets as the author hypothesized, partial factors do not influence product evaluation according to the sum of Subjective Preference in Binominal Reality Sets.

The number of alternatives, the number of attributes, the number of variability of information on attributes and the similarity of alternatives all increase cognitive workload in a decision process [28]. It reveals the possibility that uninominal stimuli may understand as ‘one whole’ image whereas binominal stimuli may understand as ‘two whole’ image. These findings provide experimental evidence for the efficacy of whole view impression in each Reality Sets whether uninominal or binominal. Most preference studies have examined the relationship between preference and evaluation factors using product visual images, but using controlled contents images such as Subjective Preference and Reality Sets. It is a notable point. Since Subjective Preference is flexible to easy-modifying factor in choice, to understand Subjective Preference matrix is important to make individuals interested in a product.

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REFERENCES

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