A Study on Affective Design by Subjective-Objective Co-Approach

Youngil Cho, SuKyoung Kim

Abstract— **Designing preferred products requires knowledge and understanding about the affective values on the consumer. This paper shows a proposition of affective design by subjective-objective co-approach. In the experiment, the layout factors and its values were verified based on *Kansei*, an affective engineering methodology, which has been developed in Japan in order to design feelings into products. Through the experiment, it was investigated (1) which layout factors arouse the consumer's attention intuitively based on the previous *Kansei* studies, (2) how much the user was satisfied with the verified factors. The results show that elaborate images are the most important layout factor among five considerable factors to arouse the consumer's attention, and it impacts one's intuitive preference.**

***Key words* - *Kansei*, intuitive decision-making, preference**

I. Introduction

THE changes and complications of emerging consumer's desire has been requiring designers to understand about the affective values on the consumers. Thus, the adoption of interdisciplinary integration into design, such as scientific methods into design research, can be a useful way in order to define the consumer's needs and requirements towards new products. In this paper, the objective evaluation methods integrated into the subjective evaluation processes. And this co-approach is presented as the proposition.

The feelings and impressions of a product are important for the decision of purchasing it. Integrating such affective values in product design requires the suitable methods into consumer's decision-making processes. There is the needs to scientific proves as mentioned above. Affective values have been investigated in *Kansei* studies and used as a tool to capture and convert subjective feelings about a product into concrete design parameters. This is referred to as 'affective (or *Kansei*) engineering'. Affective engineering is a field of product design that deals with the translation of consumers' feelings for a product into design elements [1, 2]. *Kansei* engineering is an affective engineering methodology, in which tools and techniques from a wide variety of fields, such as psychology, ergonomics, information systems, sociology and marketing, are employed in order to link consumers' feelings and emotions with product properties and translate them into design elements [3, 4]. However, for *Kansei* there is no global agreement on a single definition of the term, even though *Kansei* engineering has been being used effectively as an affective engineering methodology. Therefore, in this study the term of *Kansei* will be used both as it has been understood preciously and the meaning will be refined.

Regarding the historical understanding of *Kansei*, the term *Kansei* was first used as a translation into Japanese of the word 'sensibility' by Amane Nishi, in 1857. Then it was re-applied as a translation of the German word 'Sinnlichkeit' by T. Amano in 1935. Furthermore, we can attempt to understand it through its *kanji* [5]. The two *kanji* for *Kansei* consist of components that convey the ideas of astonishment + mind and mind + life respectively. Also the kanji for *gosei* (Verstand in German, understanding in English) consist of components meaning mind + five + describing important things and mind + life [Fig 1]. It implies the concept of *Kansei* holds not only "the sensing ability = sensibility" but also "pre-process of understanding = Sinnlichkeit." Otherwise, Kim et al. defined *Kansei* as a repository [Fig 2], [6].

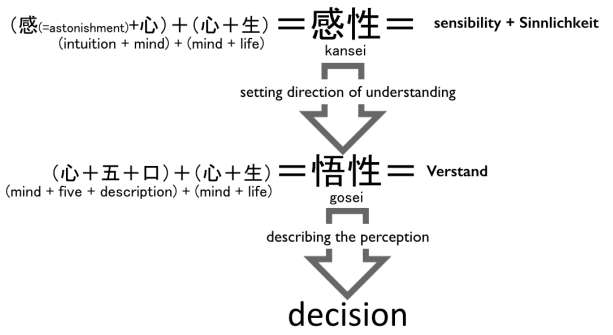

Fig 1. Meaning of components of *Kansei* and *Gosei* in Japanese, suggested by T. Yamanaka

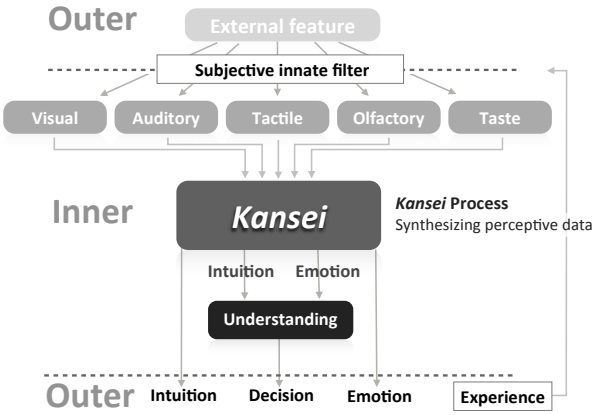

Fig 2. The definition of what is *Kansei* and how the individual modify one's subjective innate filter, suggested by Kim et al.

Manuscript received Jan. 8, 2014 (GMT). This work was supported by Hiroshima Kokusai Gakuin University in Japan.

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ISBN: 978-988-19253-3-6
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

By this definition, *Kansei* postulates an individual has a subjective innate filter to take into consideration the variety of subjectivity [Fig 2]. By subjective innate filter, inner and outer are separated. When human captors (eyes, ears, nose…) receive a stimulus as an external feature from outer, the sensor data is stored in *Kansei* (repository). *Kansei* (repository) contains full data acquired by subjective innate filter (human sensors); the information synthesizes through in the brain *Kansei* process); and comes out as reaction such as emotion or intuition (*Kansei* information). Decision is a result of 'understanding.' In other words, data in *Kansei* (as repository) is assimilated (*Kansei* process), and is sent to understanding process (as *Kansei* information). *Kansei* presents as two types of outcome: emotion or intuition as *Kansei* information per se; decision as a result of understanding which based on knowledge. And this definition and process of *Kansei* was used as a model for this study.

The aim of this paper is to investigate which affective values can capture the subjective feelings and impact on the consumer's decision-making. In order to achieve this, intuitive evaluation values of the consumer were used. Their statistical significances were determined in the previous research [6]. The current study shows a similarity to service development progress. According to Johnson et al. [7], new service development comprises four major phases: design, analysis, development, and full launch. Although the new service development process cycle might represent a progression of planning, analysis, and activity execution independently, the process, i.e., planning, analysis, and activity execution, is in inter-relation [8]. The design stage involves formulation of new services objectives, strategies, idea generation, screening, and concept development and testing. In other words, all stages are inter-related. Hence, one of the essential components in the service design is to involve understanding and planning the interaction of a variety of physical, electronic, and human elements [9]. Another is to consider and respond to customer expectations in designing each element of the service [10]. In other words, both service and design should be considered the inter-relation of progress in all stages.

From a variety of design fields, layout design was chosen to be used as stimuli in this study. Because, this study has been supporting whom, such as the elderly and a hospital patient, do not prefer reading materials. The purpose of the present study is twofold. First, it investigates which layout factors capture the individual's attention in three affective evaluation values: preference, aesthetic, and pleasure. Second, it shows how designers could approach layout design to evolve its framework for more effective and affective works.

II. Method

To investigate individual's intuitive and emotional responses, three significant intuitive evaluation values were used in the experiment: preference, aesthetic, and pleasure [11]. By the previous study conducted by Kim et al. well-designed uninominal layouts (uninominal layouts were defined as an information unit, which has its all its information together in one place as the same as the previous study by Kim et al.) evaluated preferred, balanced, and pleasant. Furthermore, combinations of a non-preferred design part and a non-preferred design part were evaluated as non-preferred (unbalanced, unpleasant); combinations of a non-preferred design part and a preferred design part were evaluated as more preferred (balanced, pleasant) and; combinations of a preferred design part and a preferred design part were evaluated as most preferred (balanced, pleasant). The results show that there is the linear relation between the intuitive evaluation values and the uninominal layouts. In other words, a well-designed uninominal layout can be evaluated preferred, balanced, and pleasant for the individual. By the previous study findings, it can be hypothesized that a well-designed uninominal layout can be evaluated as preferred, balanced, and pleasure. With the hypothesis, the experiment was conducted to investigate which layout factor captures the individual's attention.

A. Subjects

Fifteen subjects participated in the experiment. The age range of the subjects is from twenty to forty. No subjects had taken part in any kind of a similar experiment.

B. Stimuli

Forty-eight stimuli were used in the experiment considering five factors; (1) contents axis (vertical, horizontal) (2) contents positioning (default, modified) (3) font (default, modified) (4) figure (default, modified) (5) information type (three various contents layout). The five factors and the two (or three) levels were used in all combinations to prepare the forty-eight stimuli [Fig 3].

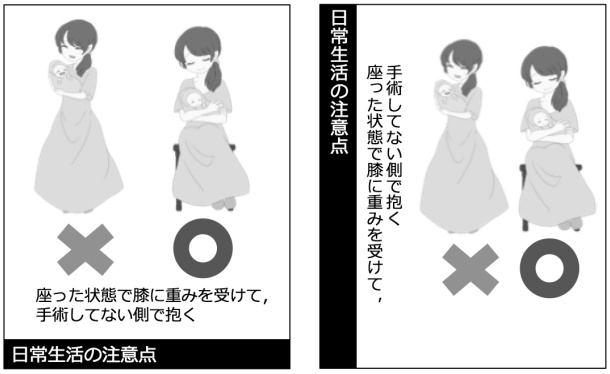

Fig 3. A sample of the stimuli

C. Procedure

- The subjects were given instructions firstly.
- The subjects were given three statements using three evaluation values (i.e., preference, aesthetic, and pleasure) with nine-pointed Likert Scales [Fig 4].

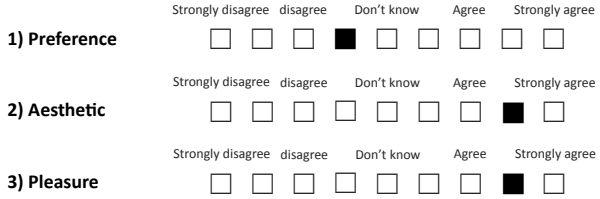

Fig 4. The Likert Scales used in the experiment

ISBN: 978-988-19253-3-6
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

- In each evaluation explained as follows: I like this layout design (Preference); The connection of design attributes of this layout design is good (Aesthetic); I feel happiness while I look at this layout design (Pleasure).

III. Analysis and Results

A one-way ANOVA was used in the analysis. The independent values were five factors of its layout; (1) contents axis (2) contents positioning (3) font (4) figure (5) information type, and dependent values were the three evaluation values; preference, aesthetic, and pleasure. From the results, two factors showed statistical significances in figure and information type. It shows statistical significances between the figure factors (default, modified) and the three evaluation values (less than .0001* in preference and pleasure, .0002* in aesthetic) [Fig 5-7].

It shows that modified figures preferred than default in all stimuli conditions whether it simple or complicated layout [Fig 5].

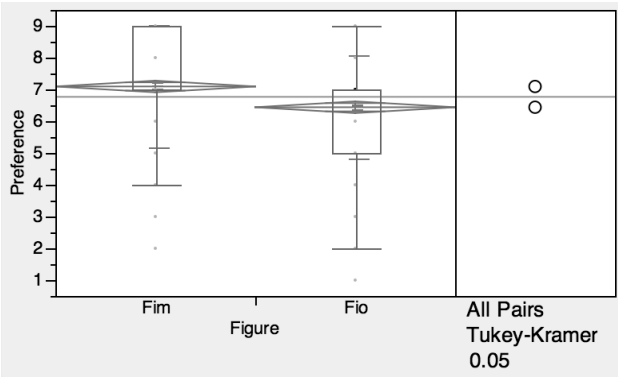

Fig 5. "Fim" shows the results of modified figures. "Fio" shows the results of default figures.

It shows that modified figures evaluated as aesthetic than default in all stimuli conditions whether it simple or complicated layout [Fig 6].

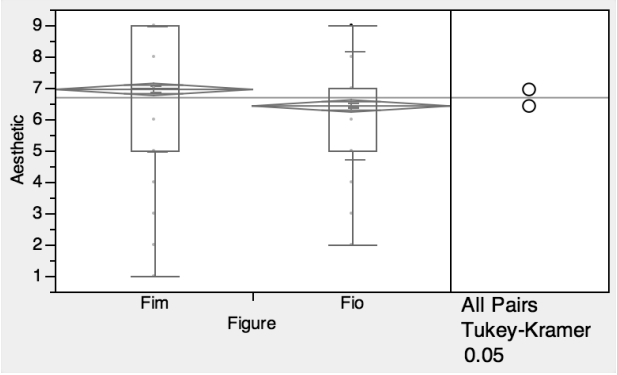

Fig 6. "Fim" shows the results of modified figures. "Fio" shows the results of default figures.

It shows that modified figures evaluated as aesthetic than default in all stimuli conditions whether it simple or complicated layout [Fig 7].

Also, the information type shows statistical significances in aesthetic and pleasure values, but does not show in preference [Fig 8, 9], [Table 1]. Aesthetic (p value = .0464*) evaluation values show statistical significances in the information type factor. It shows that T3 was evaluated more aesthetical and preferred information than T1 and 2 [Fig 8]. It means that information types affect differently in aesthetic and pleasure by its complecity.

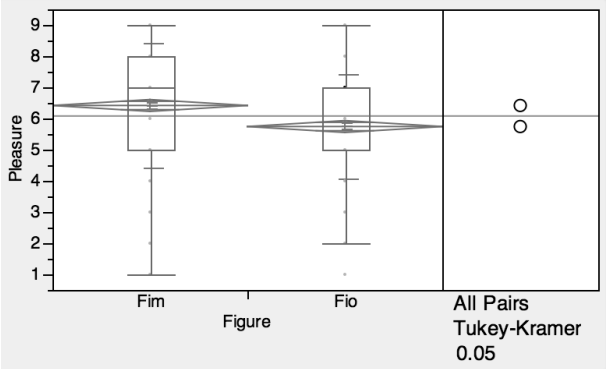

Fig 7. "Fim" shows the results of modified figures. "Fio" shows the results of default figures.

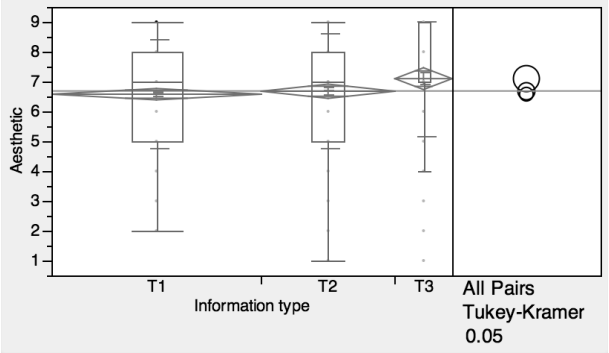

Fig 8. "T1" shows the results of the information type 1. "T2" and "T3" shows the same pattern.

Pleasure (p value = .0141*) evaluation values show statistical significances in the information type factor. It shows that T3 was evaluated more aesthetical and preferred information than T1 and 2 [Fig 9]. It means that information types affect differently in aesthetic and pleasure by its complecity.

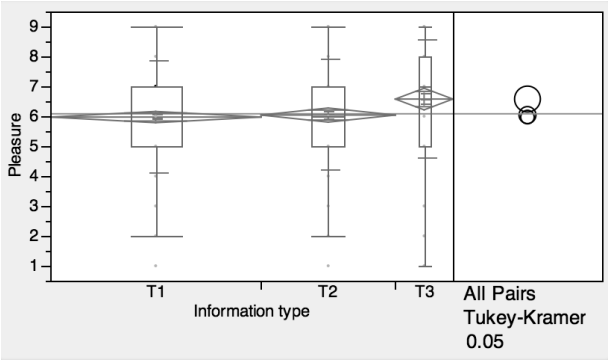

Fig 9. "T1" shows the results of the information type 1. "T2" and "T3" shows the same pattern.

IV. Conclusions

In the previous study on the relationship between information types (uninominal vs. binominal), the product evaluation values (preference, aesthetic, pleasure) showed significant differences. Those results showed a correlation between subjective preference in design factors and reconciliated product images: combinations of non-preferred and non-preferred were evaluated as non-preferred in

ISBN: 978-988-19253-3-6
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

product evaluation. Combinations of non-preferred and preferred were evaluated as more preferred than non-and non- combinations. Combinations of preferred and preferred were evaluated as most preferred. Looking at the results of the present study, the figure differences were significantly related to evaluation values. Furthermore, information complexity affects aesthetic and pleasure values, but not preference. The reason will be found in *Kansei* definitions.

TABLE I
The results which did not show statistical significances.

Evaluation value	Layout factor	P value
Preference	Contents axis	.2412
	Contents positioning	.3339
	Font	.2944
	Information type	.0530
Aesthetic	Contents axis	.3872
	Contents positioning	.2084
	Font	.3455
Pleasure	Contents axis	.8273
	Contents positioning	.4874
	Font	.3309

Considering the definition of *Kansei* by T. Tamanaka (2011), *Kansei* is intuitive understanding process prior to the Verstand, and *Kansei* involve both 'sensibility' and 'pre-process of understanding.' The most important thing in Kansei definition is this: all sensory data that are received through human sensors (i.e., visual, auditory, tactile, olfactory, and gustatory data) 'must' pass through the 'subjective innate filter.' This 'subjective innate filter' [Fig. 1] can explain the most confusing point that *Kansei* varies by individual.

By considering these *Kansei* definitions, the value of preference is the most confirmed value in design evaluation. It showed the statistical significance even in information complexity. This result shows the intuitivity of preference. According to the motivation of choices, the subjectivity of preference affects decision rather than rational actors in reality. Unfortunately, there is no global agreement on a single definition of what preference is. The expression of preference by means of choice and decision-making is the essence of intelligent, purposeful behavior [12]. Preference is stored in memory and drawn on when individuals make decisions [13]. Experiences with objects structuralize a preference, which in turn affect decision. This cycle is repeated throughout an individual's whole life, and is modified by experiences. A preference is a comparative evaluation of a set of objects. If an individual prefers A to B, A should be the better choice than B for the individual. By the choice, the individual expects to receive greater benefits, not only material benefits but also mental ones. Understanding what the individual expects from the product and how individual reacts to external stimuli contributes to the investigation of preference. However, people do not behave according to the dictates of utility theory that people are rational in the sense of having preferences that are complete and transitive and in the sense that they choose what they want.

Furthermore, figure is the most important layout design factor due to its statistical significance through all evaluation values, i.e. preference, aesthetic, pleasure. This result shows the importance of external forms. 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 [14, 15].

This means that attractive figures arouse consumers' attention and this attention influences their evaluation the preference, aesthetic, and pleasure values.

In this age of globalization and information technology, corporate strategies are more and more challenged to bring production in line with complex demands, which requires a substantial shift from the production of goods to the provision of knowledge-intensive systemic solutions [16]. Hence, companies find it extremely difficult to predict consumers' needs and requirements [17]. While mass marketing arguably has been successful in the past, it is now a less viable strategy to satisfy consumers by a single offer [18]. This approach to new service design taking into consideration informational assimilation could be a showcase how design factors work in its complexity.

Design is a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in whole life cycles. Therefore, design is the central factor of innovative humanization of technologies and the crucial factor of cultural and economic exchange. Design seeks to discover and assess structural, organizational, functional, expressive, and economic relationships [19], and *Kansei* engineering is one of the methodologies. The findings of this study and the consequences of its subjective-objective co-approach are worthy contributions to the understanding of affective engineering and design factors.

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ISBN: 978-988-19253-3-6
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)