

Towards Enhanced Affective Design: Rethinking the Notion of Design

SuKyoung Kim & Youngil Cho

Sapporo City University, Geijutsu-no-mori 1 Minami-ku Sapporo 005-0864 JAPAN

s.kim@scu.ac.jp

Abstract. Design disciplines have been contributing to shaping the life of human beings, as well as fostering culture and heritage. Design disciplines and research have been rapidly transforming, and not only objects but also services are target of design. This paper reviews design disciplines towards enhanced affective design, which attributes to intuitive knowledge. It aims at rethinking the notion of design to propose a conceptual framework for integrating user experience into objects that strengthen the form and function based design with pleasing.

1. Introduction

“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. 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 [1]”. This definition of design makes the point clear that what is design for, and current tendency of design shows what the definition represents. Design contains various social context, influences innovative humanization of technologies, and change economic with new design notions. In the first industrial revolution, new devices and machines started to replace human labour in many industries, so called “mechanization.” Water power and steam power replaced human power. At that time, design was for making “new power” which never been existed before but experienced with similar characteristics—for example, horses, which is to ride on, carrying with, moving to, were substituted by the automobile. In the second industrial revolution, also known as the technological revolution, machines were designed more efficiently, so called mass production era started. With the introduction of new technologies and machines, workers became more efficient and productive by assembly line, so called “electricity.” Many innovations in manufacturing were characterized this era. At that time, design was focused on “efficiency.” The industrial revolution was the transformation of the old methods of creating consumer goods into new ways of production through introduction of new technologies and machines. People were more efficient and productive. During third revolution era, people abandoned a traditional life in the countryside and moved to cities, which created a specialized and interdependent economic life and made an urban worker more dependent on the will of the employer than the rural worker had been. Design changed economic and life style with a new design notion, so called “mass production.” The third era of industry came about with the advent of computers and the beginnings of automation, when robots and machines began to replace human workers on those assembly lines by “automation.” Furthermore, worldwide internet, digitalization, and interactive machines emerged in people’s daily life, which creates isolated individuals. Isolated



individuals don't need to meet in-person to across-the-table meeting due to the fast and stable online network system. And the forth industrial revolution is in the progress of creating what has been called a "smart factory." Cyber physical systems monitor the physical processes of the factory and make decentralized decisions. Computers and automation will come together in an entirely new way; Robotics connected remotely to computer systems equipped with machine learning algorithms that can learn and control the robotics with very little input from human operators [2]. Society is already saturated with various high-end technological products. What is design for now and in the future society, and what will be able to be expected from the objects?

2. A New Era to Rethink the Notion of Design

Thus far, design has mainly been discussed in terms of the study of industrial design [3, 4] and engineering design [5]. However, society is already saturated with various high-end technological products, and design is continually reconfiguring itself from object-centered to human-centered. And current design does produce not only form or function based objects, but also produce involving what the users expect from the objects, so called *Kansei* information in *Kansei* science research in Japan. *Kansei* science was first proposed by Harada during the same period as the creation of *Kansei* engineering [6]. While *Kansei* engineering is a kind of technology that translates the customer's feeling into design specifications [7], *Kansei* science is a transdiscipline at the crossing of *Kansei* and cognitive sciences. *Kansei* science research initiated in the 1980s by Harada aimed at describing holistically users' cognitive processes related to preference and choice of products. *Kansei* science is built upon brain science, mostly cognitive neuroscience and psychophysiology, and relies on related philosophies [6]. The authors have been verified *Kansei* information aiming at evaluating individual experiences "properly" which contribute to very subjective and intuitive feelings to the objects with physiological and psychological approaches in valid. Design disciplines and research have been rapidly transforming, and not only objects but also services are target of design. Remained questions are two-fold: (1) how verify *Kansei* information (2) how to phase *Kansei* information in design to be effective? The paper is organized as follows: First, the authors review a new design discipline towards enhanced affective design, which attributes to *Kansei* information. Second, a model for understanding affective-cognitive information process is built aiming at rethinking the notion of design to propose a conceptual framework for integrating user experience into objects. The approach is to strengthen the form and function based design with aesthetically pleasing by verifying the link between product and the perceptual impacts on the users focused on affective values.

3. Multidisciplinary Approaches to Define Design

How design what the individual wants and needs? This question has fascinated researchers in design field, and continues to motivate them today. Design doesn't address a single issue anymore. Design has been more complex involving the notions of user, eco, universal, sustainable and so on. What is design, and how design for fit the new era society? "Dividing" can give an answer to.

3.1. Fundamental Aspects in Design: Perceptual vs. Conceptual

Form and functions are two fundamental aspects of design, and it is expected that the two interact to impact user's evaluations of a product. Form and function based design is mainly evaluated by the baseline knowledge or previous experience [8, 9, 10]. Typical form design is conceptualized as the specific prototype in individual memory. Thus, if the form is more typical, users can easily access to memory. In other words, more typical form leads to positive product evaluation due to its perceptual fluency. Perceptual fluency reflects the ease with which users can identify the physical identity of the stimulus on subsequent encounters, and involves the processing of physical features such as shape [11]. Also, perceptual fluency is influenced by several variables such as perceptual priming, clarification, presentation duration, or repetition [12]. Most of all, perceptual fluency is known to be enhanced through prior exposures [11]. On the other hand, conceptual fluency reflects the ease with which the target comes to individual minds and pertains to the processing of meaning which is related

with semantic knowledge structures [12]. Whereas perceptual fluency is not influenced by attention or elaboration, conceptual fluency benefits from elaboration at the time of exposure [11]. In other words, perceptual fluency origins from “external feature context and subjective innate filter” whereas conceptual fluency origins from “the phase of the subjective innate filter.” More details will be discussed the following section.

3.2. Verifying Kansei Values: Combine Perceptual with Conceptual

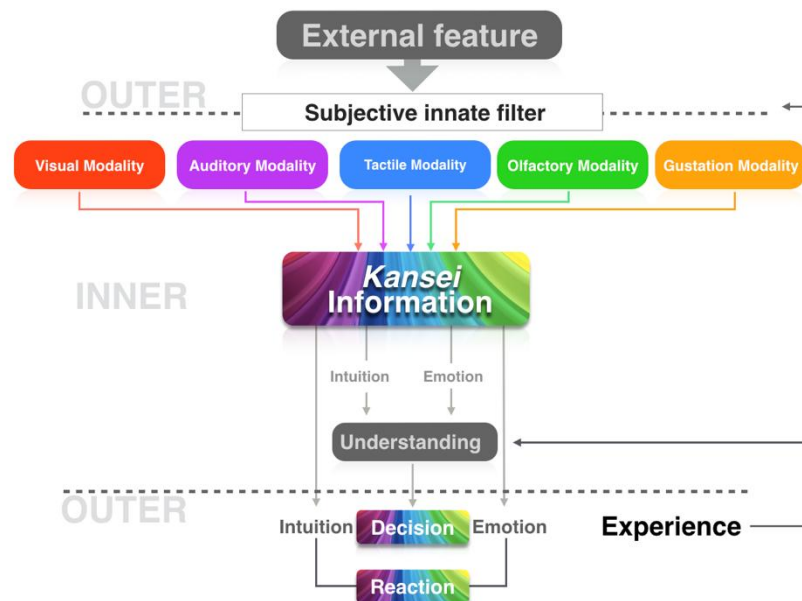


Figure 1. The relationship between *Kansei* information, reaction and decision (Kim et al., 2012; 2016)

Figure 1 represents the process of *Kansei* information and outcomes. The term of *Kansei* has been developed in Japan in order to design feelings into products, and Kim et al. [13, 14] defined *Kansei* information as Figure 1 based on the previous *Kansei* engineering and design studies. The authors postulate individual as a subjective innate filter considering the variety of subjectivity. This subjective innate filter separate individuals as “one individual.” By subjective innate filter, inner and outer separated. When human captors (eyes, ears, nose...) receive a stimulus as an external feature from outer, the sensor data integrate as *Kansei* information. *Kansei* information contains full perceptive data acquired by subjective innate filter (human sensors/modalities); the information synthesizes through in the brain; and comes out as reaction such as emotion or intuition. Decision is a result of understanding. In other words, *Kansei* information as integrated sensory data is assimilated (*Kansei* process), and is sent to understanding process. *Kansei* presents as two types of outcome: emotion or intuition as *Kansei* information per se; decision as a result of understanding. The two types of outcomes influence perceptual and conceptual fluencies as familiarity, preference, aesthetic feeling, and so on; and the two interact to impact user evaluations of a new product again through the individual experience. As mentioned above, considering the definition of *Kansei*, perceptual fluency origins from “external feature condition and subjective innate filter” whereas conceptual fluency origins from “the phase of the subjective innate filter.”

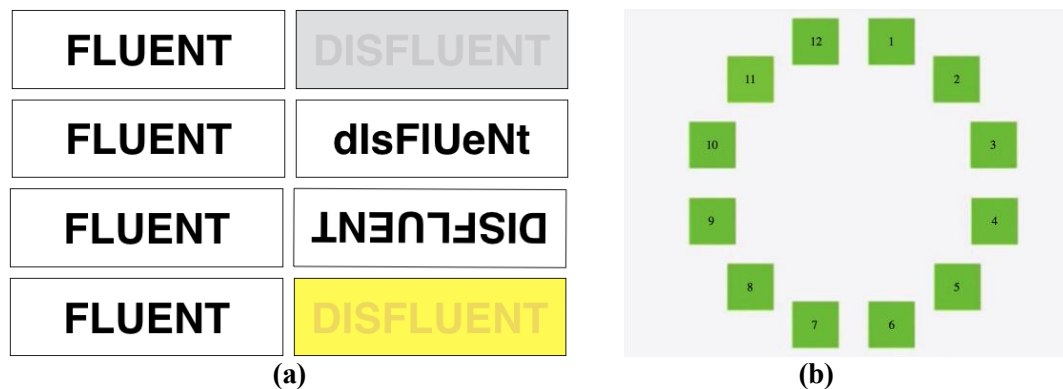


Figure 2. Examples of perceptual fluency

Figure 2(a) presents examples of which influences perceptual fluency. While the left “fluent” are easy to read, the right ones aren’t. The first letters are printed in a blurry font, and third letters featuring an upside down. These are very orthodox examples of the effects of perceptual information. Figure 2(b) presents also the example of which influences perceptual fluency. Only one green sector is different from others. The answer is no.11. If you are one of the Himba of northern Namibia, you can categorize colors and very quickly point out the standout color [15]. This example give a clear answer why some “external features” don’t show the same results as others.

3.3. Integrating Affective Values to Design: Balance between Perceptual and Conceptual

In everyday lives, people are constantly making decisions from small to big, such as choosing what to wear on, and which presidential candidate to vote. Regardless of the importance of the choice, people engage in different strategies to make these decisions, by either following their feelings, intuition, or by weighting all the pros and cons. While the first processing is related to “fast thinking” which consider to be intuitive and effortless; the second processing is related to “slow thinking” which consider to be deliberative and effortful [16]. Affective values in design are influenced by the two both. Affective values have been investigated in *Kansei* researches and used as a tool to capture and convert subjective feelings about a product into concrete design parameters. Without knowing about which design gives people pleasure and satisfaction, they seek pleasant and emotional satisfaction in quality of life. Considering perceptual and conceptual information, design is a process to verify individual subjective feelings, pleasure, and satisfaction in perceptual and conceptual levels. Design researches in human-centered, universal/inclusive, UI, UX, and so on, have been focused to give individuals subjective pleasing and satisfaction. *Kansei* researches, whether science or engineering-oriented, have been focused on verifying individual subjective feelings, and having the foresight to transform design disciplines. In this paper, the authors clarify the relationship between “individual” and “object”, focused on its factors to propose a new affective-cognitive approach to design.

4. The Notion for Enhanced Affective Design: *Kansei*-Oriented Affective Design

Aesthetic aspects are a potential source of pleasure for the users [17]. Aesthetic response tends to involve a number of factors. Out of those several factors, typicality has been widely researched to examine the relationship between typicality and affect. Many studies in marketing and consumer fields have demonstrated that form typicality influences product evaluation via affect. Recent previous literature shows that a typical form is usually more appealing such that there is a positive relationship between typicality and affect [18, 19]. More typical product design is more affectively pleasing [20, 21]. The right answer to the question is three-fold: what typicality represents out of the “external feature”; what typicality represents out of the “subjective innate filter”; how those typical outcomes, which comes from the external feature and from subjective innate filter, are made to meet in design.

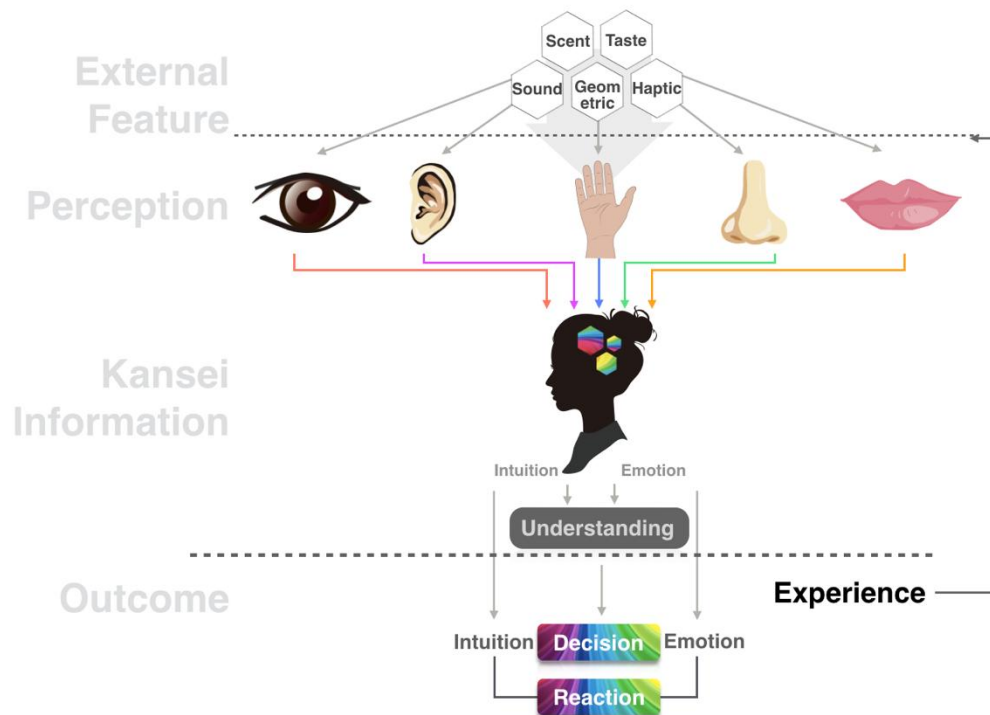


Figure 3. The relationship between perceptive data, *Kansei* information, and outcomes considering the factors of external feature (Kim&Cho, 2017)

Figure 3 shows the flow of *Kansei* information and its outcomes which evolved by the author, 2017. The most different concept from the previous definition is on “division.” In the evolved-definition, not only information through “subjective innate filter,” but also information of “external feature” is to be divided into factors such as scent, taste, sound, geometric, and haptic. The previous definition of *Kansei* information, perceptive information through the subjective innate filter were divided into visual, auditory, tactile, olfactory, gustation information [Figure 1]. The definition is focused on the method to verify most proper design factors, which comes from intuition, emotion, and understanding of the individual. In order to clarify more affective scent or sound, etc., and to please the users is important in the notion of design to foresight individuals’ subjective satisfaction beyond the design so far. The most impressive scent, sound, and so on, is not only the best part of the experiences of the individual, but it is what the individual remembers most as the specific prototype of the design. The smell of a strawberry triggers sweet, savoy, salty and so on. The smell of a strawberry is the “fact” that provides objective information independent of an individual, whereas, the subjective feelings from the strawberry smell is dependent on the individual experience or expectation. The last definition of *Kansei* information by the authors is beneficial to affective design with the trans-discipline at the crossing of *Kansei* and cognitive science researches due to its holistic research methods. Affective design aims at human-centered, user-experience, whereas pleasure-giving design, aims at neither customized design nor personalized design.

Affective design will have to bring more values to both users/customers and designers than efforts to use/costs so that it will be a viable approach. For users, they can be provided with products with less lead time, high quality, and better preference match. For producers, they can be benefited by providing *Kansei*-oriented affective design products at a higher price with satisfied users, valid data about individual user’s latent needs, and so on. It is not easy to explain what people really want and need in words. In the paper, it was reviewed what design disciplines towards enhanced affective design aiming at rethinking the notion of design to propose a conceptual framework for integrating user experience into objects that strengthen the form and function based design with aesthetically pleasing. Design disciplines have been contributing to shaping the life of human beings, as well as fostering culture and

heritage. The notion of *Kansei*-oriented affective design is valid for both designers and users, because of that design disciplines and research have been rapidly transforming, and not only objects but also services are target of design. Transdisciplinary approach which was used in *Kansei* science research, is effective and sustainable in pleasing design.

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