

Heart of Impressions

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Abstract

This article introduces an analysis of deep impressions of artifacts, in order to gain a fundamental understanding about the design. Some researchers have discussed deeper impressions, which do not appear on the surface of impressions explicitly expressed by users. In this study, we advance the discussion on this kind of deeper impression, which we called the “Heart of Impressions.” Concretely, we first discuss “where in people’s mind can we capture the Heart of Impressions?” Next, we discuss “How can we capture the impressions?” under our hypothesis that “Heart of Impressions exists in the center of the structure, which involves not only the surface impressions but also the latent impressions.” Then, we show a method for approaching Heart of Impressions by focusing on structure and the semantic network.

1. Introduction

Designers have to create products that fit the user’s feelings, that is, ones that make good impressions on many people. Therefore, user’s impressions on product design are sought to assist with the design of “good” products. In this article, we focus on impressions that are useful for designing “truly good” products and call them the Heart of Impressions.

1.1. Shallow Impressions and Deep Impressions

After the Semantic Differential (SD) method was proposed by Osgood et al. [1], it has been applied for various products in various areas. This method focuses on measuring a user’s impression of products quantitatively and solving the difficulty of expressing the user’s impression of a designed product by giving users some words and scales on the answer form. However, there are problems. It is necessary to decide the evaluation items beforehand. These are pairs of antonymic adjectives or nouns : for example, bright and dark, and the scales go from 1 to 5 or 7. In addition, in order to explain the collected result, the evaluation data are finally interpreted by

humans. Additionally, the SD method is persistently a method of measuring the difference in the impressions that some products made on some people and the results cannot be evaluated without the products or people that were compared. Therefore, it seems to present a surface analysis of the impression and we call the impression analyzed by this method a “shallow impression.” Although some methods are proposed based on fuzzy theory such as rough sets [2, 3] to evaluate collected impressions by using flexible integration, they are unable to capture more complete or deeper impressions.

On the other hand, we have a good example for the discussion about “deep” impressions. At the 2008 Design Symposium [4], one of the invited speakers, a product designer, Naoto Fukazawa said, “I always consider creating the products the user really wanted, although the users cannot express or tell what they want.” Furthermore, he said, “I have tried to find the ‘archetype’ which represents the fundamental relation between the product and human.”

The Greek philosopher Plato originally formulated the archetypes. Later, in psychology, Jung called the contents of the collective unconscious, which are in the bottom of unconsciousness, “archetypes,” and mentioned that an archetype is an unlearned tendency to experience things in a certain way and has no form of its own, but it acts as an “organizing principle” for the things we see or do [5]. In other words, it is the ancient, unconscious source for human beings, that is, a universal and common form of the pattern or image of the human race. This is the concept of psychological archetypes, and popular archetypes. In the present day, archetype is generally defined as an original model of a person, object, or concept from which similar instances are derived, copied, patterned, or emulated. This definition of archetype would apply to what Fukasawa said.

He also said, “we need not design only an novel product but should design a simple one.” We think an idea of simple product

is closely related with the user's deep impressions.

1. 2. Primitive Sensitivities

Cognitive semantics studies in linguistics have analyzed the generation process of languages. From the perspective of understanding conceptual abstraction, they have discussed the structured metaphors in a deep part as "image schema" [6, 7]. An image schema represents a reappraisal of metaphors that is the human embodiment of language through life. These understandings of metaphors indicated new methods of interface design by using representations based on the simple way of the metaphoric visual system (i.e. "right hand side" means the better direction). However, the image schema depends on the phenomena of physics and particularly focuses on physical situations. We consider that image schema may potentially enhance design effects, although it would be too deep to be useful for designing artifacts.

2. How can we capture the Heart of Impressions?

How can we capture the Heart of Impressions? We focus on two viewpoints. The first is the "structure of impressions" that assumes the Heart of Impressions is more than the sum of the partial impressions, and the second one is "latent impressions" that underlie the surface impressions.

2.1. Structure of Impressions

Aristotle said, "The whole is more than the sum of its parts." This has been well known in various science fields for its complexity and is called "holism" [8]. There exists "something" appearing as the whole. This phenomenon has been put forward as "emergence" by Polanyi [9], who said, after mentioning human knowledge, "We can know more than we can tell" and "the question much discussed by philosophers of how we can infer the existence of other minds from observing their external workings does not arise, for we never do observe these workings in themselves." These quotations suggest that we should dwell in a whole to understand the whole, that is, to probe the "something" in the whole. Then, to capture a user's impressions, we should attempt to dwell in a whole by using the parts of the whole as clues, without only analyzing each part.

How do we dwell in an impression? What is the impression? As one answer, we focus on constructing the structure based on these impression words and think that the structure can play the role of the whole impression that leads to the Heart of Impressions.

In the field of design studies, some researchers have

focused on the notion of structure. Goldschmidt introduced "linkography," which is a method that proposed using protocol analysis for examining the design productivity of designers [10]. This can show the structure of a designer's thinking very well. However, linkography is defined by what each designer has. Therefore, it cannot be used commonly in design : that is to say, designers from different backgrounds might produce a different linkograph from the same protocol. Georgiev et al. proposed a design method by focusing on the structured meanings that are constructed among multiple impression words [11]. Their method is based on the analysis of logo designs using semantics analysis [12]. They analyzed the meanings of one design example by the sum of relatedness between the impression word and an associated word. Their analysis has developed into another design evaluation method that focuses on the depth of emotional impressions [13]. Harakawa et al. [14] have clarified that there is a strong relationship between the extension of thinking space during designing and higher creativity in the design ideas created by concept synthesizing process, in which design ideas are created from two given concepts. The extension is defined based on the distance between explicit concepts in the protocol expressing the thinking space, and corresponds to a feature of the structure of the thinking space during designing.

These studies indicate the structure of impressions may be related to deep impressions.

2. 2. Latent impressions

We believe that humans cannot express all impressions explicitly. Some studies have discussed this matter, referring to the notion of "latency." Latent sensitivities are rising up in many fields of design.

As an example, there is a study that focused attention on the idea of "latent function," to construct a design methodology for artifacts suitable for an environmentally conscious society [15]. Latent function [16] means the total behaviors of the entity that can be observed for any circumstance : that is to say, although the entity has a peculiar behavior that manifests itself as correspondent to a certain circumstance (referred to as visible function), different behaviors are observed for different circumstances. The total of these behaviors is called latent function.

Also, Dong proposed a latent semantic approach to studying design team communication [12]. Latent semantic analysis [17] is a theory and method for extracting and representing the

contextual-usage meaning of words by statistical computations applied to a large corpus of text, in natural language processing, and, in particular, vectoral semantic. He showed empirically that the similarity of language use bridges the indirect relations among components of knowledge stored in each designer's mind and that latent semantic analysis can model the "psychological similarity between thoughts" based on language.

These researches indicate that latent sensitivities can be used to extract functions or relations that cannot be expressed explicitly.

As an example for emotion, in order to capture customer's latent need, a method for shape generation by showing unexpected viewpoints was proposed by Yanagisawa [18], focusing on the fact that customers have a latent sensitivity of which they are unaware.

In this paper, we call this deeper impression, which does not appear on the surface of impressions explicitly expressed by users, "Heart of Impressions." Therefore, we may be able to capture the Heart of Impressions by extracting the latent impressions that underlie the surface impressions.

3. Approach to Heart of Impressions

3.1. Hypothesis

Based on the above discussions, we set up the following hypothesis.

- The "Heart of Impressions" exists in the center of the network structure, which involves not only the surface impressions but also the latent impressions.

Fig.1. shows the images for our hypothesis. White circles are nodes corresponding to explicit impression words. Circles colored in gray or black are latent impression words. Black circles are nodes in the center of the structure of the network that express the Heart of Impressions.

In this article, "explicit impression word" implies a word

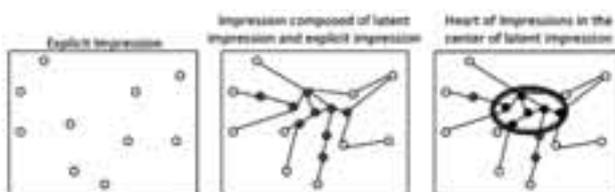


Fig.1. Image of existence of Heart of Impressions in the impression network

explicitly expressed by humans on an artifact, while "latent impression word" implies the concepts that are thought to underlie the explicit impression word.

3.2. Virtual Impression Network using Semantic Network

We propose a "virtual impression network structure" which involves the notions of "structure" and "latent impressions" by using the semantic network.

The network construction processes are shown below.

Step 1 : Extracting paths between two explicit impression words in the semantic network. Here, a path is a set of links joining directly between a word and the next word. The words that are found along each path are regarded as latent impression words.

Step 2 : Collecting words appearing in the extracted paths, that is, explicit impression words and latent impression words.

Step 3 : Drawing the network having the collected words as nodes and the links comprising the extracted paths as edges.

Semantic networks have a word meaning as a node. Therefore, we searched out the shortest path between meanings of explicit impression words and extracted the latent impression words in the path between the explicit impression words. Fig.2. shows an image of searching out a path in a semantic network. Circles are nodes in the semantic network. White ones are nodes for explicit impression words. Gray ones are latent impression words appearing on the path between the nodes of the explicit impression words. Arrows are the links comprising the path. The middle figure in Fig.1. shows an image of a virtual impression network having these kinds of nodes.

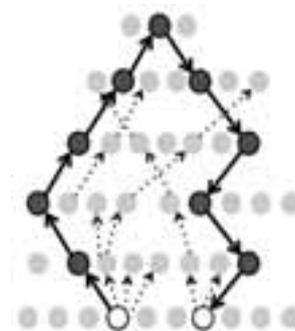


Fig.2. Image of searching out a path between impression words.

3.3. Network Centrality

As one approach to the Heart of Impressions, we focused on the centrality of the network structure and extracted the center

of the constructed network as the approximate Heart of Impressions. It would seem to play a role of the Heart of Impressions.

Network centrality is an indication of what kind of node and link are important in the network. Three centralities, "degree," "closeness," and "betweenness," are well known [19]. As a first step, we used degree centrality that is the simplest centrality. Degree centrality is a centrality measure for the number of links that a node has in its network. We extracted words having high centrality as the candidates for the Heart of Impressions. The words in its approximation are expected to be close to the user's deep impression evaluation such as function, shape, and color.

Also, we think these words will be closer to the nature of the artifacts than the concept expressed by explicit impression words in the different dimension because most of them are latent impression words, that is, virtual (implicit) nodes extracted by using the semantic network. Moreover, extracting them would correspond to fundamentally observing artifacts, similar to what Fukazawa said. Fig.3. shows an image of the relationship between the explicit impression and the Heart of Impressions.

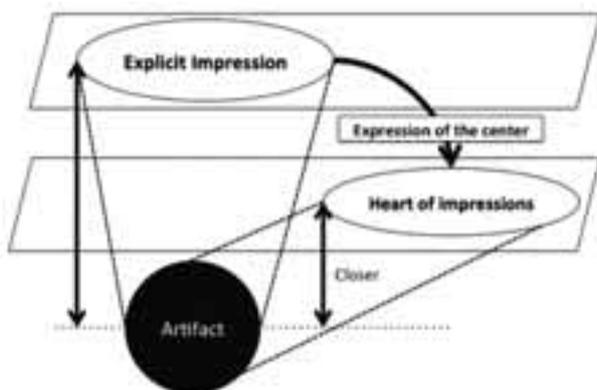


Fig.3. Image of positional relationship between explicit impression and Heart of Impressions.

4. Experiment

In this research, in order to verify our hypothesis, an experiment was conducted.

The subjects were asked to perform two kinds of tasks. One was to describe the impression by using some words, looking at a picture of each product. Another was to indicate the boundary of like and dislike for the products. All subjects were Japanese. Ten adult graduate students participated in this experiment and six cups were used for the experiment.

4.1. Method

The method of the experiment is shown below.

Description of impression (2 minutes for each cup) :

The subject was shown a picture of each cup and asked to describe the impression using some words in Japanese, where noun, adjective, and verb were required to be set out in a separate column with at least one word for each category.

Indication of boundary :

The subject was asked to rank the six cups according to preference and draw a boundary of like and dislike.

4.2. Results

Here, we show the results for one subject. The number of explicit impression words described by this participant for a cup like that shown in Fig.4. is 20. The impression words are as follows :

cup, weak, hold, winter, carry, sea, usage, difficult, small, saucer, spoon, cold, break, coffee, black tea, cake, weight, cleaning, fall, blue.



Fig.4. Drawing of a certain cup that was shown to the participants.

5. Analysis

5.1. Preprocess

WordNet 3.0 [20] was used as a semantic network to construct the virtual impression network structure. WordNet is a huge lexical database in English. However, there are only links between words belonging to the same POS (part of speech ; for example, noun-noun). Accordingly, we performed two preprocesses. First, we translated into English, while confirming that the meanings were consistent with the Japanese. Next, we replaced all verbs and adjectives by corresponding nouns. After this process, according to the network construction method explained in section 3.2, the virtual impression network was constructed.

5.2. Extraction of nodes with high centrality

As the approximate Heart of Impressions, we extracted the nodes with high centrality by using the network visualization

and analysis tool Pajek [21]. Fig.5. shows the virtual impression network of a certain participant, that is, her impression of a cup design.



Fig. 5. Virtual impression network for a cup by a certain participant

In this analysis, nodes having more than 3 links were extracted as the approximate Heart of Impressions (hereinafter, called “central nouns”). The words were as following :

abstract entity, activity, change, nutrient, physical entity, property, substance, tableware, ware.

It can be recognized that there are not only high abstractive words but also relatively low abstractive words such as “tableware” and “change,” which are expected to be the approximate Heart of Impressions.

5.3. Comparison

In order to verify the possibility that the extracted words were the Heart of Impressions, we classified the explicit impression words and the central nouns of a cup obtained from each subject by using Multi Dimensional Scaling (MDS). Fig.6. shows the distribution based on the explicit impression words and Fig.7. shows that based on the central nouns. As a result, it is found that a boundary between subjects (whether they like the cup or not) can be recognized in Fig.7., while that cannot be recognized in Fig.6. This shows the central nouns may indicate the Heart of Impressions.

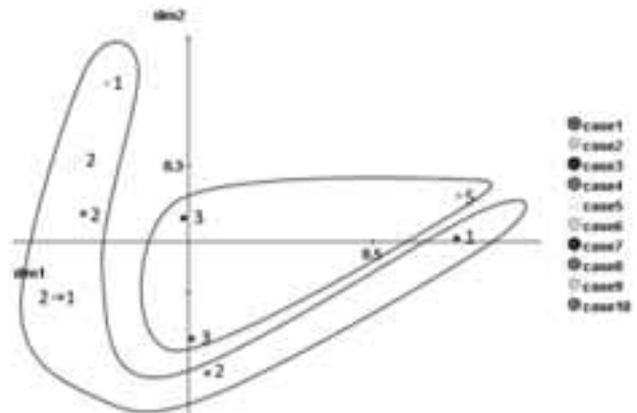


Fig.6. The distribution of participants based on impression words.

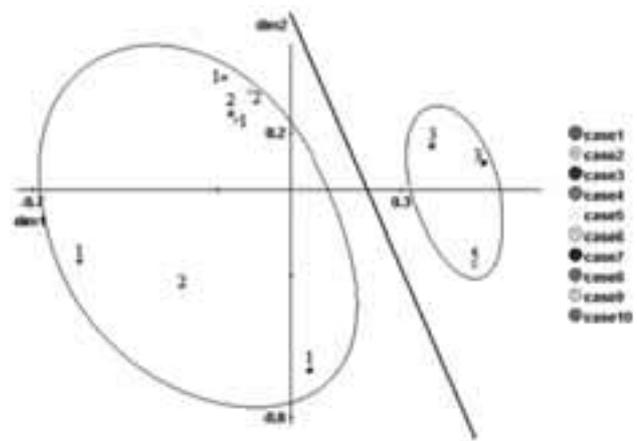


Fig.7. The distribution of participants based on central nouns.

6. Conclusion

We discussed the deeper impression of an artifact by calling this impression the Heart of Impressions. Concretely, we discussed two issues ; “where in people’s mind can we capture impression?” and “how can we capture the impression?” Regarding the first issue, we reviewed the studies on the SD method and image schema and pointed out the importance of deep impression in order to design a truly good product. Regarding the second issue, we focused on two viewpoints : structure of impressions and latent impressions. Based on the above discussions, we proposed a hypothesis that a “Heart of Impressions” exists in the center of the network structure that involves latent impressions as well as explicit impressions.

We developed a method for extracting the Heart of Impressions by using the semantic network. We performed an experiment and showed the possibility for this method to be an approach to finding the Heart of Impressions.

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