

Fabrications of Natural and Artificial: A Case Study of Enhancing Users' Impressions

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Abstract. This paper focuses on users' in-depth impressions, which underlie the superficial impressions of design. We employed a concept network-based methodology for identification of in-depth impressions. To identify the in-depth impressions and concept network structures behind the users' impressions of natural and artificial, we conducted and analysed a case study. The case study has been investigated the users' responses on two prototypical exhibition works, which enhanced users' impressions of natural and artificial. The identified in-depth impressions and intensity of the concept networks provide understanding how users' impressions and creative imagination of artefacts are formed. The in-depth impressions in the cases of natural-related users' impressions are stronger and less derived from the explicit features of the works, thus more imaginative.

Keywords: impression of natural, impression of artificial, concept networks, human creativity

1 Introduction

To detect, analyze, and understand the nature of users' impressions of designed artefacts in depth is not an easy task. These impressions are essential for what the artefact represents to users. The psychological aspects—impressions, in-depth impressions, and associations drawn from the designed artefact—are current research challenges yet to be addressed. These impressions, in-depth impressions, and associations are meaningful for the designer in order to design an artefact creating or enhancing the intended impressions in the users (Krippendorff, 2006).

Users' understanding refer to the image of the product on the basis of the impression in the users' mind, that is, the users' cognitive interpretation of the designed product (Norman, 2004). The artefact is a stimulus, which creates users' superficial and in-depth impressions. The impressions, formed after an interaction with an artefact, serve to evoke deeper impressions, which differ from initial superficial impressions, because the user has learned the interaction and has cultivated a deeper impression.

Such impressions of artefacts are referred to as latent concepts or in-depth impressions (Nagai and Georgiev, 2010, Nagai et al., 2010).

We define **in-depth impressions** as associations created in the users as a result of a particular interaction with the artefact. This inner impression is related to the notion of an image schema (Lakoff and Johnson, 1999) in connection with the perception and creation of meaning. Such image schemas refer to basic impressions.

The current research on the topic investigates the role of users' in-depth impressions of the designed products (Nagai et al., 2010), or aspect of designers' in-depth impressions during the generation of the design idea (Yamamoto et al., 2009). In-depth impressions were possible to be identified and investigated in case of visual perception and impression of designed products. The importance of in-depth impressions for users was shown by identifying centred latent impressions of the explicit impressions, which accounted for users' impression of preferred products. Moreover, the in-depth impressions correspond to users' understanding and appreciation of designed products in connection with colours (Nagai et al., 2010).

In our previous research (Nagai and Georgiev, 2010), users' in-depth impressions in case of tactile interaction have been identified on the base of users' perception of naturalness and artificiality. Moreover, natural and artificial impressions were connected with complexity and depth of the created impressions. However, the relation of the in-depth impressions with originality of the impressions is an open question. We consider that basic impressions of natural and artificial can be connected with users' in-depth impressions and creative imagination. Understanding of users' creative imagination and how this imagination is formed will be beneficial for both design methodology and design thinking.

2 Aim and Method

2.1 Aim

We aim to identify the in-depth impressions and concept network structures behind the users' impressions of natural and artificial. The main assumption is that these impressions and networks provide understanding of how users' impressions and creative imagination are formed by artefacts.

In this study we build upon the original method to detect in-depth impressions of Nagai et al., (2010).

2.2 Method

In this study we apply a methodology to identify the in-depth impressions, which underlie the superficial impressions of design, using concept network analysis. We have explored the in-depth impressions based on the associations behind each of the impressions as evoked by the person that was interacting with the designed artefact. Associations are the stimulus words used to evoke the explicit impressions. In practical terms, in-depth impressions can be considered as associations initiating a higher number of connections (Figure 1). The number of connections might be assigned as weights for associations. Thus, highly weighted associations are in-depth impressions. These associations could be identified as association concepts by the means of a concept dictionary, such as the associative concept dictionary (ACD) by Ishizaki (2007). We have utilized the ACD as an appropriate tool for the association analysis of Japanese words.

In this research, we introduced a semantic network method approach for the depth images created by users from impressions as a result of design (Nagai et al., 2010). The utility of this method was proven in an investigation of the colours of design examples (colour coordination) in a hospital environment (Nagai et al., 2010). In the current research, we have extended the novel semantic network method for the extraction of in-depth impressions and for the evaluation of exhibition works. Our approach uses concept networks to describe the associations of human impressions and allows us to find the core hidden in-depth impressions.

The actual identification of in-depth impressions is done by the construction of concept networks based on the collected explicitly created impressions (Figure 2).

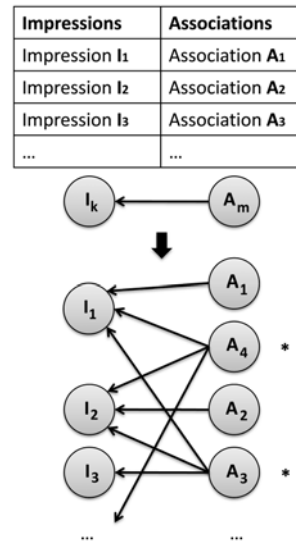


Fig 1. Identification of highly weighted associations as in-depth impressions

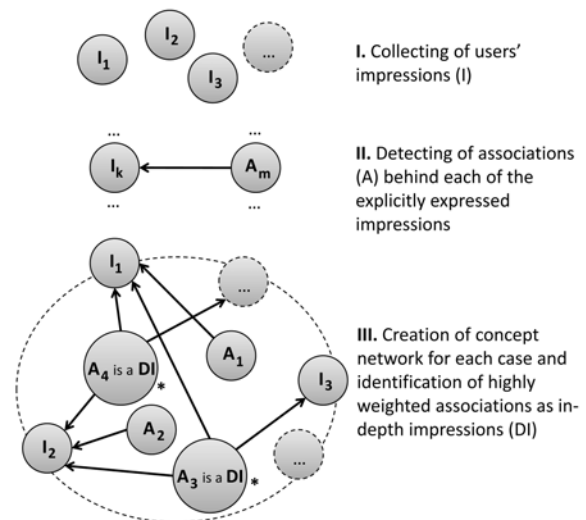


Fig 2. Steps of the method for in-depth impression identification

Concept networks depict human memory as an associative system wherein a single idea can lead to many other ideas. As computational structures, these networks can be used to model conceptual associations (Boden, 2004).

The method was adapted from our previous study (Nagai et al., 2010) and where it is described as follows. The participants' impressions (I) are collected in a written questionnaire form. The next step focuses on detection of the associations (A) behind each of the explicitly expressed impressions of the participants

based on associative concept dictionary. Finally, concept networks are created for each individual case. Using these concept networks we identified the highly weighted associations as the in-depth impressions (DI).

3 Case Study

In this section we discuss a case study conducted to investigate the users' responses and identify the in-depth impressions and concept network structures behind the users' impressions of natural and artificial.

3.1 Approach

In this paper we adopted the case of exhibition of two prototypical design works—Folder Garden and Natural Fabrication. The works were created to enhance users' impressions of natural and artificial.

The first work, Folder Garden, explored the users' impressions of technology in the context of symbolic representation of nature (Figure 3, a). The technological materials were placed in constructs of hybrid-media constructs of 'folders' (the shape of folder was a computer interface-derived image) were realized as rapid-prototyping (3 dimensional printing). The representation of nature was in the form of a Japanese stone garden. Folder Garden was realized as a small scaled Japanese garden with number of differently sized of folders instead of stones. The Folder Garden explored the users' visual and tactile interactions of technological materials (smart textiles, placed in these folders).

The second work, Natural Fabrication, explored the users' impressions of natural phenomena (videos of nature) in connection with technological semantic associations (words). It was realized as contradicting semantic association (videotaped flags on which semantic association word was printed on) placed next to the video of natural phenomena. For this part of the exhibition, digital-video projections of the two parts—semantic association and natural phenomena—were used (Figure 3, b). For example, semantic association of "synthetic" was printed on flag, videotaped and placed together with video of waterfall (natural phenomena), or semantic association of "particle" was printed on flag, videotaped and placed together with video of cherry blossoms, etc..

During the one-day exhibition of the works, users' (visitors of the exhibitions) free-style written impressions from 20 subjects were collected. Additionally, we collected these users' evaluation on

non-graded scale of 'natural-artificial' independently for the both works.

We did not consider the connection words in our analysis. The rest of the words—nouns, verbs and adjectives—from the written impressions were considered as evoked in the users and employed in the further analysis (see the methodology section).

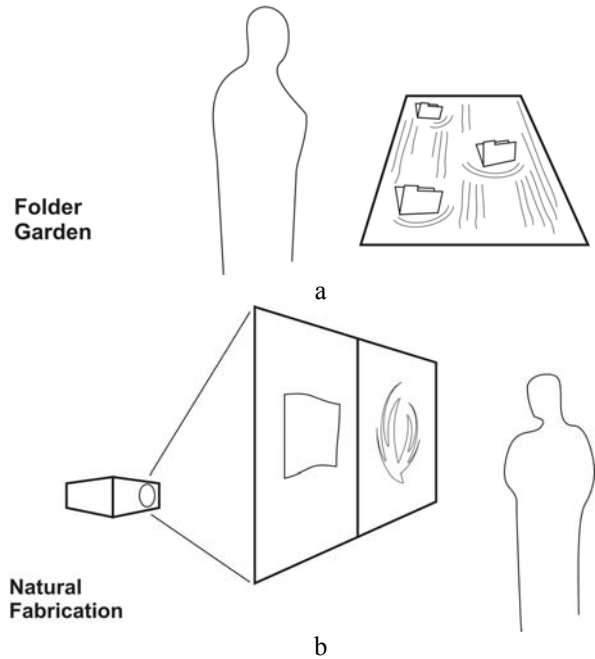


Fig 3. Users' interaction with Folder Garden (a) and Natural Fabrication (b)

3.2 Results

We divided the answers in four groups on the base of received evaluations on non-graded scale of 'natural-artificial'. The users' written impressions of Folder Garden that were more artificial-related, according to indication on the scale of 'natural-artificial', were grouped in (A); while those of natural-related were in (B). For Natural Fabrication the groups were (C) and (D), respectively (Table 1).

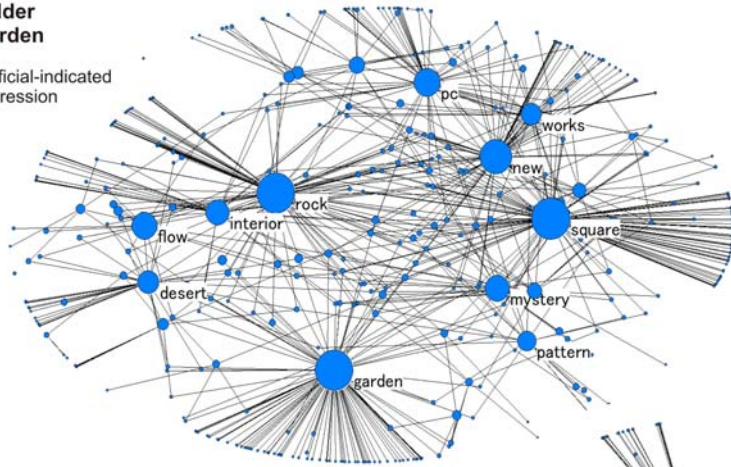
Table 1. Number of answers in each group and number of words

Proto-typical work	Artificial-indicated impression cases / Number of words	Natural-indicated impression cases / Number of words
Folder Garden	(A) 14 cases / 46 words	(B) 6 cases / 20 words
Natural Fabrication	(C) 10 cases / 34 words	(D) 10 cases / 33 words

Figure 4. Concept networks of in-depth impressions

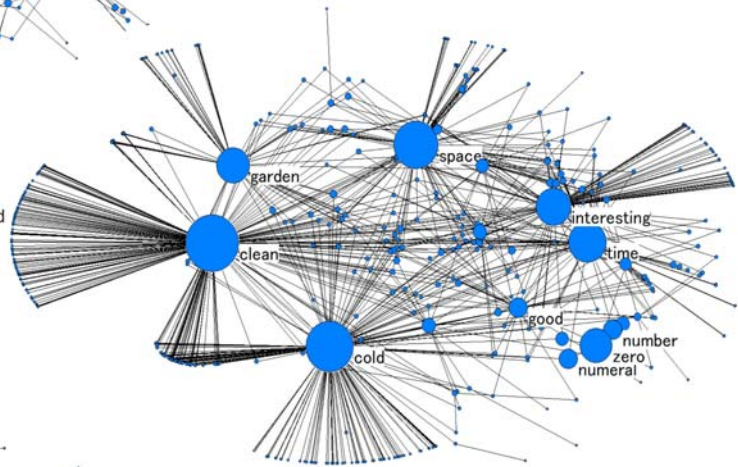
**Folder
Garden**

Artificial-indicated
impression



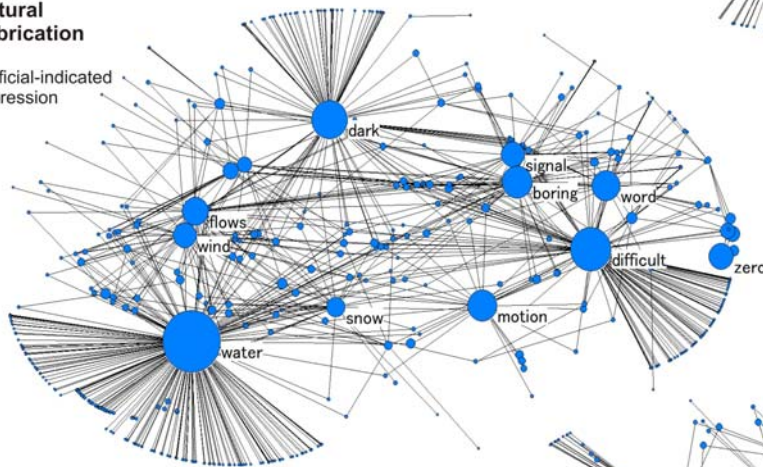
**Folder
Garden**

Natural-indicated
impression



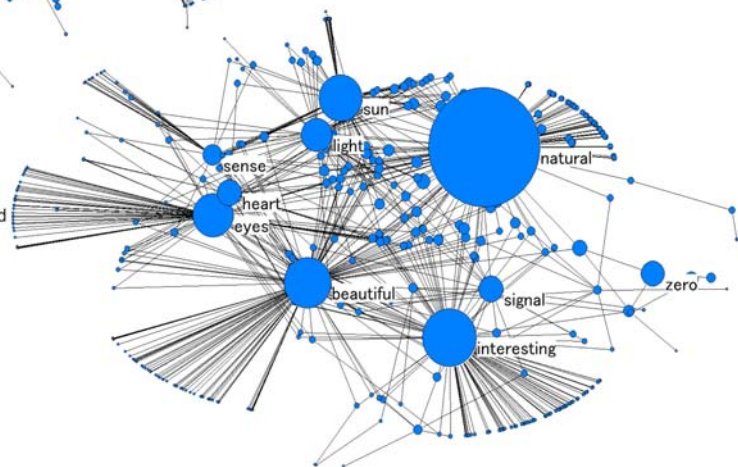
**Natural
Fabrication**

Artificial-indicated
impression



**Natural
Fabrication**

Natural-indicated
impression



The users' written impressions were analyzed by means of aforementioned methodology for identification of in-depth impressions.

The associations (A) behind each of the explicitly expressed impressions of the participants based on associative concept dictionary (Ishizaki, 2007). The concept networks are created and visualized for each of the four cases. For this step we used the graph visualization tool Pajek (Pajek, 1.24; Batagelj & Mrvar, 2003). The visualizations are shown in Figure 4. Using these concept networks we identified the in-depth impressions (associations with weights higher than 0.05). For each group A–D, they are shown in Table 2.

Table 2. In-depth impressions

Impression of Prototypical work	In-depth impressions (Weights in the concept network)
(A) Artificial-indicated impression of Folder Garden	square (0.260), garden (0.256), rock (0.254), new (0.176), pc (0.119), flow (0.110), mystery (0.107), interior (0.101), desert (0.086), works (0.077), pattern (0.063)
(B) Natural-indicated impression of Folder Garden	clean (0.497), cold (0.393), space (0.348), time (0.255), interesting (0.212), garden (0.191), zero (0.177), numeral (0.062), number (0.062), good (0.056)
(C) Artificial-indicated impression of Natural Fabrication	water (0.579), difficult (0.290), dark (0.232), boring (0.164), motion (0.153), word (0.138), flows (0.121), zero (0.107), signal (0.101), wind (0.101), snow (0.064)
(D) Natural-indicated impression of Natural Fabrication	natural (2.142), interesting (0.516), beautiful (0.385), sun (0.337), eyes (0.283), light (0.166), signal (0.103), heart (0.102), zero (0.100), sense (0.071)

3.3 Identification of creative in-depth impressions

We considered the identified in-depth impressions with regard to their originality. For criterion of originality (concerned with the quality of being new and original and not derived from something else) is connected with creativity (Finke, 1996).

We investigated the impressions which were different from the words explicit to the samples (e.g., 'square', 'garden', 'rock', 'interior', 'desert' and 'works' for the first case of Folder Garden). These words were derived from the exhibited work. We excluded these explicit words and few unspecific

words (e.g., 'interesting') (see Table 2). We considered the rest of the words as **creative in-depth impressions**.

The result of this analysis is given below. The case of Folder Garden was as follows:

- Artificial-indicated impression was characterized with creative impressions of 'new', 'pc', 'flow', 'mystery', and 'pattern'
- Natural-indicated impression was characterized with creative impressions of 'clean', 'cold', 'space', 'time', 'zero', 'numeral', and 'number'

The case of Natural Fabrication was as follows:

- Artificial-indicated impression was characterized with creative impressions of 'difficult', 'flows', 'zero', 'signal', and 'snow'
- Natural-indicated impression was characterized with creative impressions of 'beautiful', 'sun', 'eyes', 'signal', 'heart', 'zero', and 'sense'

4 Discussion

Based on this case, an observation can be done: that the natural-indicated impression is connected with creative imagination, judging both the quality and quantity of in-depth impressions. The in-depth impressions in the natural-indicated cases are stronger (see Figure 4 and Table 2 for the weights of the in-depth impressions). Moreover, in such cases they are less derived from the explicit features of the design works, thus probably more creative.

The case of natural-indicated in-depth impressions of Natural Fabrication stands out. The in-depth impressions are stronger here (based on the calculated weights) and the creative in-depth impressions of 'sun', 'eyes', 'heart', and 'sense' are new and original. The in-depth impressions and intensity of the concept networks provide understanding of how users' impressions and creative imagination of artefacts are formed. Such strong in-depth impressions and intense networks could be aimed by the designer during design of a product.

The results of this case study are in conjunction with our previous studies regarding the connection of users' tactile interaction with naturalness and habituation with design materials (Nagai & Georgiev, 2010). However, the findings of the current study provide additional understanding in connection with creativity of the users' in-depth impressions. The natural indicated impressions of the users are evoked by more original and stronger inner cores.

As a preliminary one, this study needs further validation and addition of more experiments. The limitation of the presented case is in the scale of the presented investigation. Further investigations are required in order to gain deeper understanding of creative imagination of both users and designers.

5 Conclusion

We can conclude that in this case study creative in-depth impressions are more often associated by the users' of the design works in case of natural-indicated impressions. More original and stronger in-depth impressions can be seen in the cases of natural-indicated impressions. The presented approach to disclose the character of users' impressions is widely applicable.

The particular findings of this research provide clues how creative imagination may be enhanced in the process of designing and how to design imagination-stimulating artefacts. The implications of the findings may be extended to the bio-inspired design and bio-inspired creativity, as well as interaction design.

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