A CASE STUDY OF OPEN-ENDED CREATIVE PRACTICE BASED RESEARCH

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This paper concerns the nature of creativity in the case of open-ended design process. In contrary to the goal-oriented design, the open-ended design process involves formation of design image and decisions of the direction, performed by the design team members. In order to understand how the design images are formed, we conducted and observed a small-scale case study. The case study resulted in design process and exhibition of two prototypical design works, aiming at exploring users' perceptions of natural and artificial. The results of the analysis of this case study outline the particular roles of the team members in the forming of design image, and the characteristics of the open-ended design process and its creative features. The findings provide both understanding of the essence in the open-ended design process, and offer a framework to carry out future research.

Keywords: Human factors in design, Roles in design, Design creativity, Design process.

1. INTRODUCTION

This study investigates design as an open-ended process, rater that the goal-oriented one. In this open-ended process designer forms the goal (design image) which is novel design ideas [1]. This search for design image can be framed as *creative practice*. To understand how the design images are formed, it is needed to observe the processes from the participants' view [2]. In this paper, we frame this process as *creative practice based research*.

The creative practice based research is necessary to be investigated involving the participants in the design process. This paper is dedicated to an investigation of case study of a creative practice based research, where the open-ended process of forming the design image has been observed and analyzed by the participants in the process of design.

2. CREATIVE PRACTICE

The creative activities and practices in design have been in the scope of design research in recent years [3–6]. The investigations of creative activities usually are taken from outside view of the design process [7, 8].

The literature on creativity [4] and creative activities [3, 6] call attention to the multidimensional characteristics of creative process. Variety of original investigations were undertaken in order to gain knowledge and understanding about these characteristics. These investigations employ diverse methods to analyze and extract such knowledge. Due to size limitations of this paper, it is impossible to make an extensive review of the methods used to analyze the creative process.

Researchers of the creative activities from outer view pinpoint general characteristics of creative thinking and activity based on methods such as interview or protocol studies [7]. Such approaches are successful in finding general features of the creative activities, however are unable to focus on the essential issues regarding how this process works. For this reason, we need inner view to creative activity.

Moreover, previous research points out the effects of the social influences on creativity of design teams [8] and suggests future directions for research in understanding the social creative activity. This outer view to creative activity lacks design process perspective, especially from inner view. The inner view from the perspective of a participant in the design process is critical.

The inner perspective on creative activity has various requirements in order to be successful in describing the processes. The participants' reflection on creative activities is pointed out as critical for understanding of these activities [6]. Recording and reporting the moments of reflection, included the intended and unintended consequences of actions is making the creative projects accessible to researchers and other participants. However, in order to describe and interpret creative activity, a balance between rigor and action should be achieved. Moreover, the actions should be supported by additional informing and enhancement [6].

Building upon the outer and inner approaches, the research on creativity points out the importance of both, inner and outer perspectives, on design process for creative activities in designing [4]. Actually, the match between the inner push of designer and outer pull of the design goal is regarded as critical in case of such creative activities. The outer pull is connected with the problem-solving perspective to design.

However, the features of the creative activity in the case where the goal is not defined are not clear. In order to gain understanding of creative activity, we focus on the description of the processes of open-ended direction finding and formation of design image. From the viewpoint of creativity, the processes of synthesis, searching and finding [3, 5] of direction are critical for design achievements. Thus, we elaborate on the 'Geneplore model' by Finke [5] for the purpose of clarifying these processes (Figure 1). The model represents the basic processes involved in creative imagery.

For example, outstanding designers employ profound understanding of design [9]. Designer visualizes images of the goal — described as 'archetypes of the object' — even before designing. How such goals are found or formed is a very important question.

3.   AIM

The aim of the study is to explain the features of the creative practice based research, particularly to identify the individual contributions in process of formation of design image and finding direction to design image.
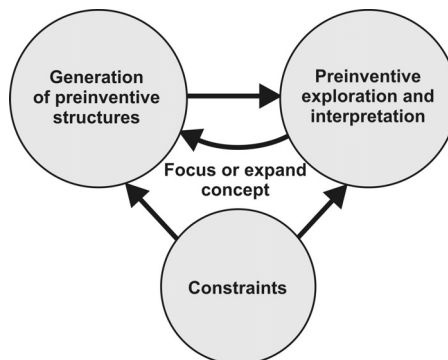

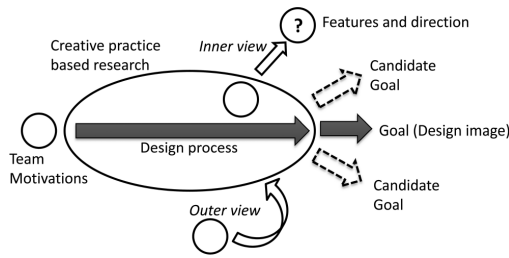**Figure 1.**   Geneplore model. Source: Finke [5].

Figure 2. Methodological framework of research.

To address this aim we conducted a case study. Moreover, from this case study we intend to find a model about the features of the process of creative practice in designing, based on participants view. The model should contribute to the understanding of creative design where the goal is not given and should clarify how the designer or design team forms the design image.

4. METHODOLOGY

The methodology adopted in this research emphases on the inner (participants') view to the design process (Figure 2). To understand the process of creative activity and practice it is needed to observe the processes from the participants' view [2].

This observation necessarily involves awareness of inner perspective to the design process; also a considerable amount of reflection of own activities and a thorough examination of how formation design goals come about.

It has been shown that self-investigation is particularly difficult [2]. However, an external observation of the design process can fail to grasp designers' thoughts since these are stimulated by intrinsic motivation and formed dynamically. It is difficult to observe the creative process from an inner perspective when designers are deeply engaged in their work. The reason behind this is that the designers who are absorbed in their work are assumed to have entered the 'flow' state. The means of understanding the creative thinking process are different from other activities. For an observer who is not familiar with how the creative process of design works, it is impossible to focus on the essential issues regarding how this process works. Therefore, we must consider who is most able to access such a perspective [2].

The methodology involves reflections both an inner perspective and an outer perspective. Reflections are a popular technique for accessing self-consciousness, which was first proposed by Schön [10]. He found that people who had achieved a high level of creativity often reflected objectively on their own creative processes. We consider this technique here because it has been confirmed as a useful method for examining our understanding of the design process.

Thus, in this research, the inner views are analyzed on the basis on design researcher participating as a design team member, and who takes ethnography-like approach to the design process. The researcher tries to maintain a degree of objective detachment to the occurring processes. The design researcher's inner view is complemented by the other participants' (again, inner to the process) views. The consciousness and reflection on the occurring direction finding processes are aided by systematic collection of all design documents (notes, sketches, etc.) and videos of the discussions between team members.

5. CASE STUDY PROJECT

In this section, we will discuss the object of design in the project, the questions and purpose of the case study project, as they were formulated in its course. Further on, the realization in exhibition and its outcomes in the terms of this paper's aim will be discussed.

5.1. Participants, object and purpose

To address the aims, short-time project called Natural Fabrications was realized with three participants in April 2010 in Japan Advanced Institute of Science and Technology. This small multi-disciplinary design team consisted of leading designer with multimedia background, expert in design computing and design researcher.

The project took off as an open-ended process with open goals, as described in Introduction and Methodology sections. In the open-ended process, the design team formed design images and formulated goals based on evolving design ideas [1].

As a first step of direction finding, on early stage of the project, the project questions were formulated as: (1) How to challenge and trigger emotional responses in users of design prototypical works, and (2) What is the relationship of the users' responses to technologically facilitated products.

The formulation of the project's purpose was as follows: "New designs can be created based on design-for-response approach. Exploring the symbolic representations and genealogical roots leading to users' responses is the first step in this approach. "

Thus the focused of the case project was put on stimulation of a users' "conversation" around the nature and technology of the artifact. The natural and technological aspects were considered as initiating the users' responses to the product. Thus, the aim of the project was exploring users' responses on prototypical design works.

Understanding the users' responses to designed products is an emerging research challenge. The responses can be triggered with different means and in different situations. Thus, the Natural Fabrications project focused on design works that are open-ended in forms and that utilize new and traditional technologies to initiate users' responses. The investigation is carried out through production and analysis of a set of prototypical design works. At its end, the Natural Fabrications project resulted in one-day exhibition of the two prototypical design works (installations), which are described in the following sections.

We should point out that the word "natural" is often associated with manifestations requiring hardly any or no human intervention. In this paper, this word is used differently — in the sense of results of this manifestation being enhanced by the design work.

5.2. The outcome

The two prototypical works of Natural Fabrications project are the result of the carried out creative practice based research. As an outcome of the design process, in the Natural Fabrications Project, the described design works borrowed visual traits — folders — from computer technology and the Graphical User Interface (GUI) in the formation of design works. The projects utilized hybrid media combinations, such as digital-video projections, combined with sculptural forms, audio and print-based 2 dimensional elements. Hybrid-media constructs of "folders" (a computer-derived image) are realized as rapid-prototyping (3 dimensional printing) is an important set of techniques used in the creation (Figure 3).

In upper part of Figure 3 the moments of creation of Folder Garden part — layout in a small space for Japanese garden and differently scaled rapid prototypes of "folders". In the lower part of Figure 3 the moments of creation of Natural fabrication part are shown — finding contradicting semantic association to the video of natural phenomena and videotaping of printed on flags semantic associations.

The first work of the Natural Fabrications Project, named Folder Garden explored the users' tactile interactions of technological materials (smart textiles) in the context of symbolic representation of nature. The representation of nature was in form of Japanese rock garden. The technological materials were placed in a constructs of hybrid-media constructs of 'folders' (a computer-derived image) are realized as rapid-prototyping, all in the traditional Japanese garden (Figure 4).

The second work, Natural Fabrication, gave the name of the whole project. It explored the users' responses of the technological materials in connection with visual perception of natural phenomena and in connection with semantic associations. For these explorations, digital-video projections of natural phenomena and semantic association were used (Figure 4). For example, semantic association

Figure 3. Creation of design works Folder Garden (up) and Natural Fabrication (down) as a part of Natural Fabrications Project.

of "synthetic" was printed on flag, videotaped and placed together with video of waterfall (natural phenomena).

During the exhibitions of the works, users' (visitors of the exhibitions) responses were analyzed. Twenty-six of the visitors answered a questionnaire. Their responses were enhanced and stimulated by the exhibited works. Strong impressions of natural or artificial were indicated by the visitors.

5.3. The model of creative practice based research

The process of creative explorations in this case study showed diverse goal proposals and reconsiderations of these goals. Design process had features of iterative nature and sequence of expansion of creative ideas.

Figure 5 shows the model created as result of creative practice based research of the Natural Fabrications Project. The preliminary model outlines this practice as having main features of exploration, reconsideration and iteration.

In the step of early direction finding (Figure 5), the project questions were defined along with the purpose of the project. Further, in this step, these questions resulted in diverse goals proposals, exploration and significant amount of reconsiderations. These diverse goals (however, compared at the beginning in more details) were discussed between the design team members and led to more focused
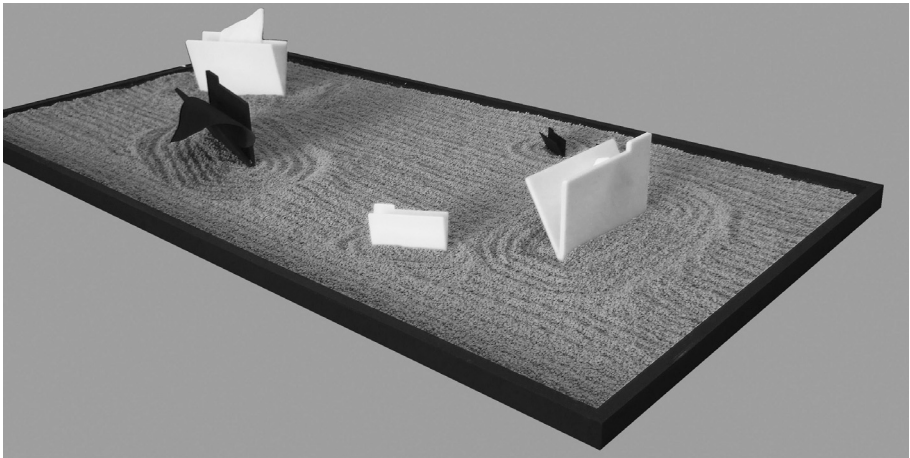
Figure 4. The prototypical design works created at the end of the project.
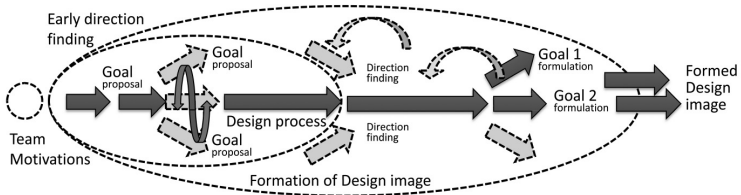

Figure 5. The model of creative practice based research based on formation of design image and direction finding.

design image at the end of this early direction finding. The actual two goals (design images) were formulated in the result of iterative goal generation, which resulted in the finally formed design image.

5.4. Identified roles in the design team

In order to identify the roles of the participants in the direction finding and formulation of design image, the design researcher took ethnography-like approach to the design process in this case study. The researcher maintained as much as possible degree of objectivity while participating in the occurring

Table 1. The main roles of three participants in the different stages of the formation of design image.

Stage	Leading designer	Design computing exp.	Design researcher
Early direction finding	Interest pointer	Systematizer/ Explainer	Negotiator
Generation/formation of design image	Challenger/Idea generator	Rationalizer/Idea sharer	Reason finder
Formulation of design image	Planner	Problem solver	Appraiser

processes, and trying to bring explicit the underlying causes, reasons and motivations of the other participants.

As a result of this approach, Table 1 outlines the identified roles of the participants in the main stages of design image formation. These main roles related to the individuals' strategies and intentions towards direction finding. For example, on early direction finding stage, the leading designer employs "Interest pointer" role towards the design image, while the design computing expert employs role of "Systematizer" and "Explainer", and the design researcher uses "Negotiator" role towards the design image.

6. DISCUSSIONS

The findings provide both understanding of the practice in the open-ended design process, and offer a framework to carry on future research on open-ended design process. The results of the analysis of this case study outline the particular roles of the team members in the forming of design image and the characteristics of the open-ended design process. The roles of "Interest pointer", "Systematizer" and "Negotiator" were found in the stage of direction finding, while roles like "Challenger", "Rationalizer" and "Appraiser" were taken in next stages of the design process.

The research on creative production points out directions of systematic research on creative collaboration in multi-disciplinary design teams [3]. However, in this research, we focused on the knowledge we can gain from the process of creative activity rather than the knowledge, which can be gained from the product of this activity. To the knowledge which is refined from the process [3, 6], we added the perspective of open-ended search-for-goal design process. Thus, the results of this research contribute to the knowledge about the formation of design image in design process, particularly the participants' role in that process.

One question can be made here: is the case of open-ended practice based research and developed design based on the interrelationships of social, cultural and technical aspects. It is also argued, that different elements of culture learned and acquired socially are highly integrated and act as packages of meaning and meaningful forms [11]. For example, Hofstede [12] believes that this integration is largely unconscious and that no mental activities of humans can be culture free. Although that it seems that it is questionable how design researcher can maintain a degree of objective detachment to the occurring processes, we believe that a participating researcher can intentionally keep certain degree of detachments in form of systematic periodic reflections of own activities. This partially addresses the cultural issue. Moreover, such periodic reflections are useful tool for analysis of creativity. For example, it has been already observed that the people who had achieved a high level of creativity often rely on objective reflection on their own creative processes, as argued by Schön [12].

The discussed case study project — Natural Fabrications — started as open-ended one and design team formed the design images, leading to creative ideas. In result of the applied methodology — observation from inner perspective — the process of creative direction finding in this case study showed diverse goal proposals and reconsiderations of directions.

The preliminary model we presented outlines this creative practice based research as having main features of exploration, reconsideration and iteration, in which the direction to the finally decided goal (formed design image) was found on early phases. This preliminary model of features of the creative practice based research shows the importance of early creative exploration of design images.

The findings about the role taking shed light on the creative activity and practice in the perspective of open-ended design. We should note that most of these roles are taken rather not intetionally. In the

perspective of the 'Geneplore model' [5] (Figure 1), the different participants took these major roles in different phases of Finke's model. For example, the leading designer had major role in the Generation phase and Preinventive phase, while the computer scientist and design researcher took major roles in Constraints and Preinventive phases. Thus, the roles are connected with the nature and implicit features of creative activity in designing.

Moreover, these roles can be used for building a research framework for creative activities, which is based on inner view of participating design researcher. For such researcher, taking a particular role in open-ended creative activity will allow minimal interruption of designers' creative thinking process.

7. CONCLUSIONS

Design research is focusing attention on the achievement of design goals. However, the actual expression and formation of new and creative design images is not specifically discussed. This research concerned the nature of creative activities in the case of open-ended design process. The open-ended design process involves direction finding and formation of design image, performed by the design team members, which is different from the goal-oriented design.

To understand how the design images are formed, we conducted and observed a small-scale case study. Additionally, we considered the perspective of the inside of the process as methodology for investigation. To analyze the creative activity from the inner view, we challenged to put together practitioner designer, design technologist and design researcher in a team that employed open-ended design process. The case study called Natural Fabrications resulted in design and exhibition of two prototypical design works, with the goal of exploring users' perceptions of natural and artificial.

The influences on the content and direction of direction finding are connected with the roles, which participants play in the process. We showed a preliminary model of features of the creative practice based research based on open-ended search for design goal. The results of the analysis of this case study outline the particular strategies in direction finding of the participants. The formation of design image and the features of the open-ended creative activity in designing seem to be related to the participants' roles. These roles seem to be important for process of creative activity and offer a framework for future research on such activities. Through accumulation of cases in the future, we aim to provide a practical methodology for research on creative design.

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