Design Creativity : Integration of Design Insight and Design Outsight

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Abstract

The objective of this paper is to capture the essence of *design creativity* by focusing on *design insight* and *design outsight.* In this paper, it is shown that *design insight* and *design outsight* consist of two viewpoints : *criteria* and *motive.* Based on the reviews and discussions on *design insight* and *design outsight,* the design process is classified into three categories : *artistic design process, creative design process* and *systematic design process.* We define a combination of the *artistic design process* and *systematic design process* as the *creative design process,* and the nature of this process as *design creativity.* Finally, it is concluded that *design creativity* involves the integration of *design insight* and *design outsight.*

1. Introduction

Currently, design researchers are displaying a high level of interest in creativity. A large number of remarkable studies have been conducted, recently and various arguments with regard to creativity in the design process have been presented, for instance, research on the meta−cognitive level of design knowledge among people or research in the context of designers' behavior [1, 2]. To understand creative design knowledge, which is complex and involves multiplicity, research approaches that adopt advanced computational modelling [3, 4, 5] and those that involve a formal representation of design concepts based on the ontology theory [6] have been utilized. Moreover, a theoretical approach to the features of design strategy has been adopted on the basis of the relationships between concept and knowledge [7] ; this approach has demonstrated a framework for innovation from the perspective of knowledge creation. Moreover, several notable investigations on design cognition have been reported using analytical approaches targeting the important factors or conditions for the high creativity of expert designers [8, 9, 10, 11]. Furthermore, research methods have been obtained for establishing the means of supporting creativity in design [12, 13]. Thus, the trend of conducting research on creativity in the design process has become increasingly prominent.

This paper attempts to capture the essence of *design creativity* from another viewpoint. We focus on the notion of *driving force* that nudges the design process. There may be two types of *driving forces* for the design process−*push type* and *pull type* (Fig.1.). The *pull type driving force* refers to the force wherein the design process is progressed (*pulled*) from outside by something like a goal, while the *push type driving force* refers to the force wherein the design process is progressed (*pushed*) from within the person, by something that is deeply rooted in the mind. In this paper, we define the former *driving force* as *design outsight* and the latter *driving force* as *design insight.*

We assume that *design insight* and *design outsight* can be viewed in terms of two viewpoints : *criteria* and *motive.*

Here, the outline of the framework of *design insight* and *design outsight* is described, while each item is explained in detail in the following sections.

The first viewpoint of *criteria* involves analyzing the nature of the design process on the basis of the principles that govern the evaluation of the design process. In order to capture the

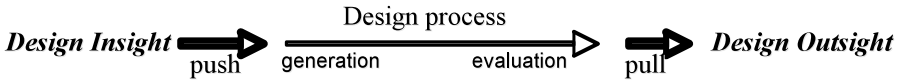

Fig.1. The notion of design insight and design outsight

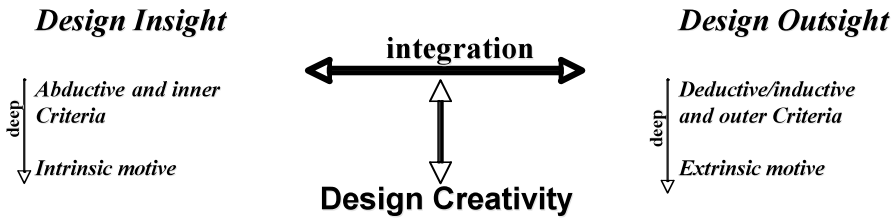

Fig.2. Framework of design insight and design outsight

essence of the *criteria,* we classify the *criteria* into three categories : *deductive, inductive and abductive.* Furthermore, from the viewpoint of systems theory, we classify the *criteria* into *inner criteria* and *outer criteria.* The *inner criteria* are related to the manner of viewing design in terms of *autopoiesis* (*self-creation* ; a term originally coined by Humberto Maturana) or *self-reference,* while *outer criteria* are related to the manner of viewing design in terms of *problem solving.* In the context of this paper, *abductive* and *inner criteria* are closely related to *design insight,* and *deductive/inductive* and *outer criteria* are closely related to *design outsight.*

The second viewpoint of *motive* involves discussing the nature of the design process on the basis of what impels it. *Motive* has been discussed by psychologists as an important factor for creativity. It has been reported that highly creative work is produced by those who have strong *intrinsic motivation* to engage in an activity [14, 15]. Therefore, whether the *motive* is *intrinsic* or *extrinsic* is a topic for discussion. Furthermore, whether an *intrinsic motive* is *coherent* or *noncoherent* is also discussed. It is suggested that an *incoherence-driven intrinsic motive* is related to *design insight* and an *extrinsic motive* is related to *design outsight.*

Further, the relationship between *criteria* and *motive* is explained as follows. *Motive* is thought to be more deeply rooted in the mind than *criteria.* Therefore, the relationship *criteria* −> *motive* has a layered structure and shows the degree of depth in the mind.

The above discussed framework is summarized in Fig.2.

Based on these discussions, we classify the design process into three categories : *artistic design process, creative design process* and *systematic design process,* and define *design creativity* as the nature of the *creative design process* in section 4.

Finally, it will be stressed that *design creativity* involves the integration of *design insight* and *design outsight.*

2. Criteria : The first viewpoint for design insight and design outsight

First, we describe the *criteria* in terms of categories : *deductive, inductive* and *abductive.*

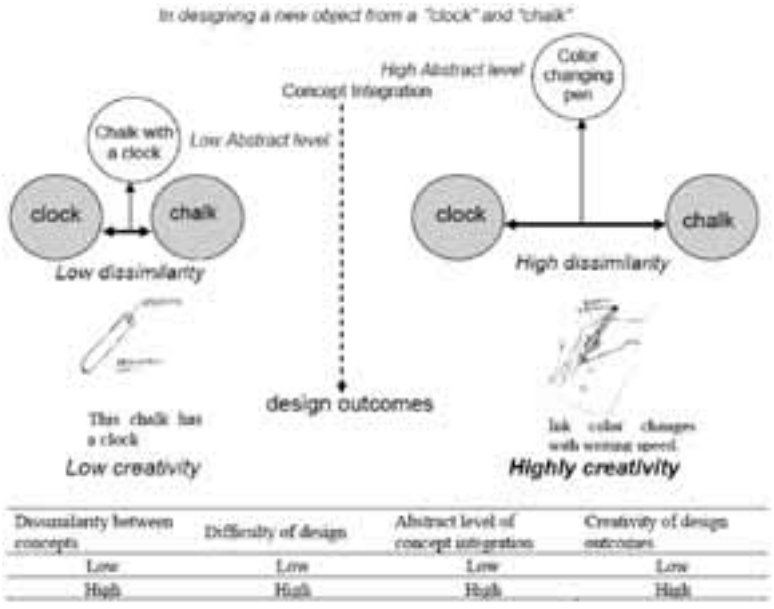

Fig.3. Relationship between dissimilarity and creativity

Deductive criteria are determined according to certain deductive knowledge. As an example, let us consider the process of synthesizing two concepts. This process is the simplest and most essential process in formulating a new concept from the existing ones. With regard to the deductive knowledge on the concept−synthesizing process, we can show the knowledge that concerns the distance between the two concepts to be synthesized. That is, if the two concepts are very dissimilar, a highly creative design product may be obtained by synthesizing them [16]. Here, the term 'concept' is used to represent not only the image but also the object (natural and artifactual) being held in the mind. This knowledge was derived as follows. In the concept synthesizing process, a more creative new product can be produced when the notions, features and situations are combined at a more abstract level ; this abstraction is caused by the dissimilarity between the two concepts (Fig.3.).

Inductive criteria are derived from experience. The following is an example : when a person designs a creative design product, he/she may have conducted the same or a similar design process in different situations.

On the other hand, *abductive criteria* focus on foreseeing the nature of the design process. During the design process, we often determine something that can be evaluated only after the design process has proceeded for a while [17]. Let us consider the example of the invention of the art knife—the first snap-off blade cutter (Fig.4.). The inspiration for this incredible idea came from the synthesis of two concepts—chocolate segments that can be broken off and sharp edges of broken glass [16]. Although this invention is rather attractive, the problem of focusing on the chocolate remains unsolved. In other words, why is the chocolate focused on? Generally, chocolate is not associated with a knife. As shown in this example, it is extremely difficult to select the concepts to be synthesized before designing because the concepts that are required to produce a new creative concept can be evaluated only after they have been synthesized and the creative concept has been judged.

Further, *abductive criteria* are expected to be the most closely related to *design insight,* since abductive criteria are difficult to recognize explicitly and are thought to be deeply rooted in the mind of the designer, while *deductive criteria* and *inductive criteria* are more explicitly available, being governed by factors in the external environment of the designer.

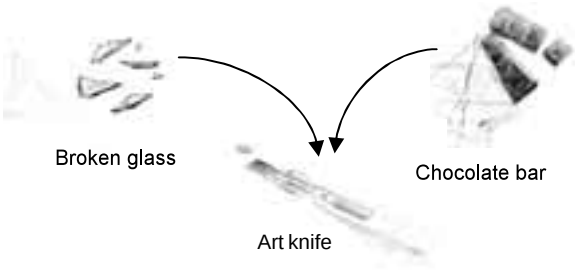

Fig.4. Design idea for an art knife by combining two concepts−glass and chocolate

On the other hand, from the viewpoint of systems theory, *criteria* can be divided into *inner criteria* and *outer criteria. Inner criteria* refer to the viewing of design in terms of *autopoiesis* or *self-reference,* while *outer criteria* refers to the viewing of design in terms of *problem solving.* Whether the *criteria* are *inner* or *outer* depends on whether or not the *criteria* are dependent on the design process itself. That is, if the *criteria* change during the design process only according to the design process and the design product, then the process is regarded as one that involves *inner criteria.* On the other hand, if the *criteria* can either remain unchanged or change according to the *outer* information, the process is regarded as one that involves *outer criteria.*

In general, the creative work of artists can be expressed as *autopoiesis* because the interaction between an artist and his/her works is continuously regenerated. Winograd and Flores (1986) called this process 'instructive interaction' [18]. From the viewpoint of personal creativity, knowing or learning a process by changing views through experience is also addressed as the continuous recognition process [19, 20]. During learning, the boundary conditions can be recognized as becoming increasingly wider based on inner views ; this was reported as an 'interactive redesign process' [21]. In general, creativity is also considered to be related to *self-reference* or *self-recognition* [22, 23]. Such an individual creative/learning process and organization can be explained as a structure-determined system [18]. Since Winograd addressed design as an issue related to an 'interaction process of understanding and creation' from wider social views, the function of information/communication design can be considered as the creation of a new experience [24]. It is necessary that these processes be experienced, which can be achieved only through inner views. Therefore, the *inner criteria* have been considered to be integral to *design insight* ; however, the objectification of the *inner criteria* is considered to be difficult.

Tab.1. Classification of the types of design processes

	Criteria (1)	Criteria (2)	Motive
Class 1 : Artistic design process	Abductive	Inner	Intrinsic
Class 2 : Creative design process	Abductive & Deductive/Inductive	Inner & Outer	Intrinsic
Class 3 : Systematic design process	Deductive/Inductive	Outer	Extrinsic

In contrast, the *problem solving process* is also used to represent the design process. There is one famous reference for the design process in engineering, which was originally represented as a model by Asimow (1962) [25]. Subsequently, interest in design methodology was activated in the 1960 s. This perspective is similar to the viewpoint of a *problem solving* process, in that they are both goal-oriented. In both the design processes, the objective views are suited to represent productive processes. Since Jones (1984) illustrated the design process as a three-step model (analysis-synthesis-evaluation) [26], it (design process) has been considered to have a sequential circulation structure [27, 28].

3. Motive : The second viewpoint for design insight and design outsight

In order to capture the very essence of *design insight* and *design outsight,* it is necessary to focus on the *motive* that is more deeply rooted than the *criteria. Motive* has been discussed by psychologists as an important factor for creativity. It has been reported that highly creative work is produced by those who have strong *intrinsic* motivation to engage in an activity [14, 15]. Whether a *motive* is *intrinsic* or *extrinsic* is a topic of discussion. An *extrinsic motive* is a stimulus from the outside (i.e. from an external source, e.g., a reward), which leads to humans channeling all their activities toward a particular goal. An *intrinsic motive* is an *inner motive* (i.e. from an internal source) that is responsible for human (personal) behavior, spanning from the bionic level, for example, 'hunger', to a higher cognitive level, for example, an artist's 'flow' (a state of concentration or complete absorption with the activity at hand and the situation) [29]. The function of *intrinsic* and *extrinsic* motivation involves a reciprocal action in individuals. The *intrinsic motive* is thought to play an important role in *design insight.*

Whether an *intrinsic motive* is *coherent* or *noncoherent* can be another topic in the discussion on *intrinsic motive.*

Conceptual *coherence* has been explained by using connectionist models such as impression formation of people (IMP), and it is classified into two types : *coherence driven* and *incoherence driven,* by Thagard [30]. Based on the assumption that every concept possesses a network of associated concepts, abstract relations and constraints, an attempt can be made toward determining the relationships among the associated concepts, which then form the knowledge of the world (as in the case of IMP). Then, the problem of 'how people select the appropriate relations in framing conceptual combinations' can be expressed using a *coherence* -based computational model. It can be said that the selection of the relation of the connection itself is a *driving force* behind the formation of networks, that is, the *coherence-driven* process.

However, '*incoherence-driven* conceptual combination' is distinguished from '*coherence-driven* conceptual combination', from the perspective of creativity. As pointed out by Thagard, creative thoughts such as *abductive inferences* occur when a solution to a mundane problem cannot be obtained ; they leap beyond the *coherence-driven* process and necessitate constraint-satisfying reconciliation. Thagard suggested that the high potential of *incoherence-driven* creativity is 'beyond' the *coherence-driven* process.

4. Discussion on the essence of design creativity

Based on the above discussions, we characterize *design insight* as that which *pushes* the design process, particularly by *abductive* and *inner criteria* and *intrinsic motive.* On the other hand, we characterize *design outsight* as that which *pulls* the design process, particularly by *deductive/inductive* and *outer criteria* and *extrinsic motive.*

Furthermore, we classify the design process into the following three categories (Tab.1).

The *artistic design process* refers to the viewing of design as an art, and it focuses on representing the artist's inner feelings. The *artistic design process* is impelled by the *push type driving force* and closely related to *design insight.*

The *systematic design process* is a type of *problem solving* process in which a problem is solved by the *pull type driving force* , which stems from the external environment of the

designer. The *systematic design process* is closely related to *design outsight.*

The *creative design process* is a combination of the *artistic design process* and *systematic design process.* Design is a social activity ; it is not only related to the user but is also associated with culture or society. Moreover, it is important to represent the designer's inner feelings. Therefore, an ideal design process is one that not only involves representing the designer's inner feelings but also fulfilling the user's request or satisfying the demands of society. We define this design process as the *creative design process* and the nature of this process as *design creativity.* Its important function is that it should change the viewpoint of the *outer* and *inner criteria* and the viewpoint of the *abductive* and *deductive criteria* while internalizing the *extrinsic motive* into an *intrinsic motive.* Generally, creativity in design is considered to be evaluated by originality (novelty) and practicality (utility) [31]. Regarding the creativity in design, based on the above discussion in this paper, we would like to stress that the 'novelty' dose not involve the notion of 'strangeness' ; rather, it should be one that resonates with that which comes from the integration of *design insight* and *design outsight.* From this viewpoint, we define the *design creativity* as the integration of *design insight* and *design outsight.* We believe that this integration is difficult, and a key element of *design creativity* lies in this difficulty.

We show an example of the integration of *design insight* and *design outsight*. 'You-an' is a Japanese harmonious space (Fig.5.) [32]. This space is set up with light and water. Within the space, organic electroluminescent lights provide an 'organic glow' which has a flickering rhythm similar to that of a firefly from the natural world. This organic glow provides the impression of the earth's breathing. The idea of this space was adopted from a traditional tea ceremony room for entertaining guests. The designers of this space recalled memories of 'time' they spent in fields and activated their *inner feeling* from their *design insight.* Moreover, their design outsight was an aim to produce a healthy space with a gentle encompassing atmosphere for people. Lastly, the space You-an changed people's perception of the lights from one that is physical to one that is spiritual and evokes the impression of the nature.

5. Conclusion

In this paper, we focused on *design insight* and *design outsight,* and attempted to systematize them. As a result, we were able to illustrate that *design insight* and *design outsight* consist of two viewpoints : *criteria* and *motive.*

Based on these discussions, we could classify the design process into three categories : *artistic design process, creative design process* and *systematic design process.* We defined a combination of the *artistic design process* and *systematic design process* as the *creative design process,* and the nature of this process as *design creativity.* Finally, it is concluded that *design creativity* involves the integration of *design insight* and *design outsight.*

Fig. 5. Organic electroluminescence space You-an

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