On the Implicit Intention in the Incubation and Pre-Inventive Structure of Creative Design Thinking.

The creative thinking process of design is a preoccupation of times to come. This type of thinking process inevitably has ‘trial and error’ processes because no one can control the future before it comes true. The incubation seems to be not included in those ‘trial and error’ processes, but the authors of this paper think that the incubation is included in creative thinking process and it has latent intention to get a goal. Depending on the difference of each person’s experience and physically inherited DNA, one has unique subjective mental world. Some part of the subjective mental process goes latently under the conscious level.

During the incubation, one can unconsciously widen his/her searching space in latent exploration of new purpose-mean relation and make him/her sensitive to find the new purpose-means relation in things or events those have been thought to be not concern with present design purpose.

While Finke asserted that the ‘pre-inventive structure’ phase should separate from the ‘pre-inventive exploration and interpretation’ phase, the authors of this paper assert that the incubation process includes both ‘pre-inventive structure’ and ‘pre-inventive exploration’, but not includes the ‘interpretation’ phase. The interpretation is followed by latent exploration as an understanding process. Between the exploration and interpretation, there is the process of finding new purpose-means relation. In this process, the implicit intention is transferred to the objective form. The authors try to explain it referring to the viewpoint of the Karl Marx’s theory of value in exchanging commodities.

Based on this thought the authors assert that purpose-means relation is represented as the relation of the subjectivity and objectivity, and if one has a common ground with another person, one can look into the subjective world of another person with the physical and objective results of his thinking.

The finding process of purpose-means relation can be represented by \( m=r(p) \) where:

- \( m \): a physical set of things (objective),
- \( r \): purpose-means relation (objective and subjective),
- \( p \): design purpose (subjective).

When the designer can find a purpose-means relation in ‘\( m \)’ as a means to meet his/her design purpose, ‘\( m \)’ can have a new meaning that represents his/her intention. In other words, ‘\( m \)’ can have an equivalent abstract value to \( r(p) \), when it is recognized as a mean to meet the purpose. Usually, the creative thinking process goes under an intention whether it may be explicit or implicit. This process can be represented as \( p'>m=r(p) \) where:

- \( p' \) represents implicit intention.
- The sign ‘\( > \)’ represents trial and error process. After designer found the purpose-means relation in ‘\( m \)’, \( p' \) is transferred to \( p \) (explicit intention).

The designer needs to free from those of existing purpose-means relations to open free creative eyes. The incubation is the most effective strategy to do it.

The authors propose ‘trace experience method’ in the empirical research into design thinking to have a common ground for inter-subjective inference.
On the implicit intention in the incubation and pre-inventive structure of creative design thinking

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1. Introduction

In recent research on the creative design thinking, it is pointed out that creative design idea often comes from unexpected thinking process. Finke et al. [1] asserted that there is, at first, pre-inventive structure of thinking while designer generates a visual image, and after he/she get an image as the result of the pre-inventive structure he/she explore and interpret them into creative idea. Lawson [2] presented five-stepped model of creative thinking process. In this model, they pointed out that after making effort to analyze design problem, designer often came to relaxed time and seemed to forget the problem, and after that unexpectedly illuminated a good solution. This phase is called ‘incubation’.

The authors of this paper focused on this stage of creative design thinking. They consider that both of the pre-inventive structure and the incubation stage should include implicit intentions of designer. They try to understand that what are the implicit intentions, and also try to make clear the difference of those in case of generating the ‘pre-inventive structure’ and in case of the ‘interpretation’ from the viewpoint of semantic generation.

2. The nature of design thinking

The design thinking process is a problem solving process. However, it has quite different feature from that of mathematics. In the mathematics, the process is usually converged into fixed solution, but in the design thinking, it is converged into non-fixed solutions. In other words, the design thinking process is open-ended process. Because it allows very wide ranged solutions.

In general, design thinking process ends with a new artifact by which one can fulfill one’s need, otherwise problem solving of mathematics ends with a solutions by which one can understand the logical reasoning. The purpose of
design thinking is not to understand something but to create a new artifact that can fulfill a need. This means that the design thinking process is a preoccupation of times to come. The new artifact will be created but now it is not yet here. The new artifact can be varied depended on the designer’s thinking at present time. This type of thinking process inevitably has ‘trial and error’ processes because no one can control the future before it comes true. The ‘trial and error’ process has a spirally cyclic structure in frequent repetitions of making tentative solutions and evaluations to them [3], and finish at the time when the designer can decide he/she get satisfactory result (and it may be not final solution).

The incubation seems to be not included in those ‘trial and error’ processes and seems to exist out of the thinking process. But is it really so? The authors of this paper think that the incubation is included in creative thinking process and it has latent intention to get a goal.

3. What is the incubation?

Finke asserted that creative thinking process is composed by two different phases: ‘generation of pre-inventive structures’ and ‘pre-inventive exploration / interpretation’. He represented them in his ‘Geneplore model’. He said that the pre-inventive structures have various emergent properties that are exploited for creative purposes in the exploratory phase, and the resulting creative cognition can be focused or expanded according to task requirements or individual needs by modifying the pre-inventive structures and repeating the cycle. He also said that constraints on the final product could be imposed at any time during the generative or exploratory phase.

In the Finke’s ‘Geneplore model’, it seems that the incubation is included in the phase of generating pre-inventive structure. Finke and Smith said that progress on a problem could be blocked by fixation on ideas that are not getting one closer to a solution and an inability to free oneself from that fixation. And also said that ceasing to think about the problem provides an opportunity for the dissipation of such fixation and, consequently, greater accessibility to knowledge that is likely to lead to a solution. The authors of this paper also think that the incubation is crucial phase of creative thinking to avoid unconscious fixation. During the incubation, one seems to cease thinking but he/she doesn’t stop
thinking and it goes on latently and more freely.

Every person has his/her mental world that has been made by enormous memory and knowledge accumulated through long times from his/her birth to now. Depending on the difference of each person’s experience and physically inherited nature (given as DNA), one has unique subjective mental world. Whole human mental processes (including thinking process) are in this world. The subjective world usually includes tacit knowledge as Michael Polanyi pointed out [4]. Moreover, it can be thought that some part of the subjective mental process goes latently under the conscious level. This means that the human mental process has basically two layers at least. Generally saying, the conscious part of the mental process is constrained by the existing concept. But according to well-known researches on the dream by S. Freud, the unconscious part of the mental process is free from the existing concept. This may be a reason that the incubation can be effective to free from the existing concept.

The authors of this paper assert that human inference process is basically formed as purpose-means relation, because it has been formed through long human history of artifacts production that inevitably includes purpose-oriented mind. So that, in most of the pre-inventive exploring phase of design thinking, one explores purpose-means relation between design purpose and a way to be able to meet it. This exploration sometimes progresses in latent purpose oriented mind that seems to be ceasing conscious thinking. When one flashes and gets new idea, he/she finds new interpretation in purpose-mean relation that gives break through into the existing relations. During the incubation, one can unconsciously widen his/her searching space in latent exploration of new purpose-mean relation and make him/her sensitive to find the new purpose-means relation in things or events those have been thought to be not concern with present design purpose. So that, designer can suddenly aware and finds an unexpected purpose-means relation in his/her sketches. We often see and experience in the sketching and thinking process an unexpected new idea suddenly come from looking the drawn sketches. Goldschmidt [5], Suwa [6] also refer to this phenomenon in their researches on the design thinking. As Oxman pointed out in her research into the visual re-cognition in design emergence [7], visual prototype may act as guide for finding new meanings in drawn sketches.
But, when designer create a new idea, he/she often breaks the visual prototype in his/her mind. This means that before interpretation comes, the latent exploring space of purpose-means relation has been unconsciously widened.

While Finke asserted that the ‘pre-inventive structure’ phase should separate from the ‘pre-inventive exploration and interpretation’ phase, the authors of this paper assert that the incubation process includes both ‘pre-inventive structure’ and ‘pre-inventive exploration’, but not includes the ‘interpretation’ phase. The interpretation comes after exploration. The interpretation is followed by latent exploration as understanding process (Fig.1).

4. Relation of the subjectivity and the objectivity

When we talk about implicit intention, it needs to make clear the relation of subjectivity and objectivity in human mental world. Because the designer’s intention as purpose-oriented mind exists in the subjective world, and the result of design thinking comes out to physically objective world. But it seems difficult to make clear the relation of subjectivity and objectivity by commonplace logics, so the authors try to explain it referring to the viewpoint of the Karl Marx’s theory of value in exchanging commodities [8]. Marx said that when one ‘A’ has a thing ‘a’ that he does not need, he wants to exchange it with other things that he needs. Then, if he meet with another person ‘B’ who has another thing ‘b’ that can meet A’s need, and also ‘B’ finds his need in the A’s thing ‘a’, they can reach agreement on the exchange of the things. It can be represented as ‘a=b’ at only this agreement. This means that ‘A’ finds a value in ‘b’ and ‘B’ finds a value in ‘a’, and at only this relation ‘a’ and ‘b’ can have the same value (can be connected by ‘=’). In other words, the exchangeable value between ‘a’ and ‘b’ can be

![Figure 1: Interpretation comes after incubation](image-url)
established only when ‘A’ found usable value in ‘b’ and ‘B’ found usable value in ‘a’. This Marx’s theory of value implies that the usable value is formed in the subjective and specific world and the exchangeable value is formed in the *inter-subjective* and abstract world when the things can be seen as equivalent value between different subjective and specific worlds. The abstract value that can be seen in physically embodied form like the money is established on the inter-subjective values.

The authors think that, as seen in the Marx’s theory, human subjective intention become objective when it interacts with another subjective intention. From the viewpoint of purpose-means relation in design thinking, it can be said that ‘A’ found his means in ‘b’ to fulfill his purpose (need) and ‘B’ found his means in ‘a’ to fulfill his purpose (need), then their purposes were represented in abstract form as ‘a=b’, where the different means (things) can be seen as equivalent and have exchangeable values in each. This inter-subjective relation makes it objective.

Based on this thought, the authors assert that purpose-means relation is represented as the relation of human subjective and objective world, and if one has a common ground with another person, one can look into the subjective world of another person with the physical and objective results of his thinking.

5. Nature of trial and error

The creative thinking process can be said as finding process of new purpose-means relation through the trial and error process. According to the thought above mentioned, the finding process of purpose-means relation can be represented by

\[ m = r(p) \]

where:
- \( m \): a physical set of things (objective)
- \( r \): purpose-means relation (objective and subjective)
- \( p \): design purpose (subjective)

When the designer can find a purpose-means relation in ‘m’ as a means to meet his/her design purpose, ‘m’ can have a new meaning that represents his/her intention. In other words, ‘m’ can have an equivalent abstract value to \( r(p) \), when
it is recognized as a mean to meet the purpose. Usually, the creative thinking process goes under an intention whether it may be explicit or implicit. This process can be represented as

\[ p' \downarrow m = \tau(p) \]

where: \( p' \) represents implicit intention (or unconscious purpose-oriented mind). After designer found the purpose-means relation in ‘m’, \( p' \) is transferred to \( p \) (explicit intention or purpose). The sign ‘\( \downarrow \)’ represents trial and error process.

In the trial and error process, designer makes effort to find ‘m’ as an objective side of purpose-means relation. But usually it is constrained by unconscious fixation because conscious mind is always formed on the existing embodied world, which is composed of the results of existing purpose-means relations.

The designer needs to free from those of existing purpose-means relations to open free creative eyes. The incubation is the most effective strategy to do it. The authors presented a schematic diagram of creative thinking process from the viewpoint of purpose-means relation (Fig. 2).

In this model, loop of ‘trial and error’ process is inevitable part of the creative thinking, because it makes designer to decide move to incubation strategy and
as the result, it acts as creativity brewer.

6. A proposed research method

The authors assert that the method of traditional protocol analysis does not make sufficient understanding this kind of thinking process because it treats thinking process by only outside of the subject’s thinking. Usually, when the subject of experiment is a designer, the experimenter is always a specialist of cognitive science who has not any experience of design works. It needs the viewpoint that can infer real time thinking process inside of designer’s mind. As one of the methods based on this thought, the authors adopted ‘trace experience method’ to know the designer’s subjective intention. Without saying each designer has each unique experience from his/her birth to present time. So that, the inside event of designer’s mind is the problem of ‘subjective world’. From the viewpoint of ‘traditional’ scientific method, the problem concerns with human subjectivity cannot be treated as a science. The author, however, assert that even if one cannot perfectly trace the other person’s experience in all of his/her life, there must be some kind of common understanding ground among the personal experiences, and it may give clues which make possible to understand the one’s internal intention.

The authors propose that to do the trace experience method in the empirical research into design thinking, the experimenter should have an experience of design work, or, before the experiment, experimenter should try the same design task that will be assigned to the subject. The authors did some empirical researches with this method [9] [10], and they got a thought that the design thinking process could be seen as a semantic generation process. Without saying the thought of cognitive semantics gives us good clues in those researches.

7. Conclusion

Finally, the authors summarize their assertions.

1. The design thinking process progresses as a purpose oriented mind, even if it seems cease thinking in incubation phase.
2. The design thinking process can be seen as an exploration of new
purpose-means relation in external world (including designer's idea sketches).

3. The interpretation phase comes after getting new purpose-means relation as externalized form.

4. The incubation is unconscious part of exploring new purpose-means relation.

5. The purpose-means relation is represented as the relation of subjectivity and objectivity of human thinking.

6. To get clues of designer’s inside thinking process, ‘trace experience method’ is proposed based on the thought of common ground in the relation of subjectivity and objectivity.

References
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