Design thinking and Design Process

Introduction
We usually criticize and evaluate the end-products in design area including architecture. So in architectural history and criticism area most articles are about not design process but end-products, in that, buildings. But these articles are focused on not the end-products but design process itself, and research results about design process and thinking are reviewed. At first I reviewed these 3 articles briefly, and compare these articles and present my opinions. I think that research of design process is important to design computing area. Because we have to understand design thinking and design process for researching in design computing area.

How Designers Think
- Bryan Lawson

Key words; Approach methods to design problem / Technologies in design process/ Design as skill
This article is focused on not end-products but design process unlike Beaux Art Education. So the author, Bryan Lawson gave an attention to why the design processes are different in other areas, for example engineering and designing dress. He said that it is not because design problem is different but because approach method to design problem is different. In other words various design process can be appeared, because designers approach to design problems in different ways.
In design process an understanding of technologies which is necessary in designer’s specific field is definitely good to designers, but it is not sufficient condition. Because besides technical knowledge designers need aesthetic experience unlike the aesthetic appreciation in art, in that, they have to understand user’s experiences. Such being the case, design activities are the well-organized mental process with making various information based on art, society and technology to a coherent set, and show the designer’s thoughts. And design process is a skill to have to learn like sports or musical instruments. The method of good design is to design with thinking least about his techniques like a practiced golfers and well trained flautists. But it is necessary to practice some skill in beginning stage.

Design in Mind
- Bryan Lawson

Key words: design process/ research design thinking/ design process as “sequence of cognitive operations”; assimilation-analysis-synthesis-evaluation-communication / understanding of user’s feeling / technology
Like the above article, this article put the more emphasize on design process than on end-product, too. To understand design process, the author said that we have to use all methods we can do; analyzing the task and propose logical structures and processes, observing designers at work, conducting lab experiments on designers, and asking designers to tell us what they do.
The author regard design process as “sequence of cognitive operations”; assimilation-analysis-synthesis-evaluation-communication. This design sequence is repeated with feedback loop to generate solution.
In design process an understanding of user’s feeling is necessary to designers, and technologies can have some affect on design process.

Research in Design Thinking
- edited by Nigel Cross, Kees Dorst, Norbert Roozenburg
Key words: Design process/ research design thinking/ 3 patterns of in design process; Problem Formulation-Solution Generation-Cognitive Strategies/ major solution concept/ ill-defined problem/ solution-focused cognitive strategy

Design process, in that, how people do design, is the major part in design research. The purpose of this article is reviewing research methods and research results about design thinking.

There are 6 ways to research design thinking; interview with designers, observations and case studies, protocol studies, controlled tests, simulations trials, and reflections and theorizing.

<table>
<thead>
<tr>
<th>Empirical Research Method</th>
<th>Theoretical Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>interview with designers</td>
<td>reflections and theorizing</td>
</tr>
<tr>
<td>observations and case studies</td>
<td></td>
</tr>
<tr>
<td>protocol studies</td>
<td></td>
</tr>
<tr>
<td>controlled tests</td>
<td></td>
</tr>
<tr>
<td>simulations trials</td>
<td></td>
</tr>
</tbody>
</table>

*Table1. Research Methods*

Through this research methods researchers got the result that there are 3 patterns in design process; Problem Formulations, Solution Generation, and Cognitive Strategies. At first in design process, the nature of design problem can be got through analyzing a set of proposed solutions (alternative solution conjectures), because the relation of between problem and solution is “conversational” (Schon) like ill-defined problem. Next, designers narrow the solution space by adding some constraints called as “missing ingredient” In this process uniquely design task goal continues to be changed and constraints continues to be redefined. But designers hold “major solution concept” as long as possible. In that, changing goal and constraints continuously is for the purpose of avoiding the difficulty of starting with new concept. Finally designers think design problem is ill-defined, and they use solution-focused cognitive strategy unlike problem-solving strategy in science.

### Comparison and My Reflections

* Design Process

We cannot deny design has artistic or aesthetic characters, but we have to keep in mind the fact that design is not art, in design process we have to consider user’s feelings, and practical aspects. In these 3 articles a series of design process is considered as the relation of “design problem – solution” The reason that there are various design processes is because there are various approach methods to design problems.

The second article “Design in Mind” and the third article, “ Research Design Thinking” have different expressions about design process in that in the former article it is “sequence of cognitive operations”: assimilation-analysis-synthesis-evaluation-communication, and in the latter one it is Problem Formulations - Solution Generation with cognitive strategies.

But I think they are similar opinions in part, although they use other words or expressions.
Because in all 2 papers the relations of design problem and solution which is appeared in design process are “conversational”, and design process is the repetitive process of finding new solution with feedback or evaluation activities of designers (the former) or with narrowing solution space changing design goals and adding new constraints-missing ingredients. But in the last paper the important thing is paying an attention on the fact that designers try to find solution with changing task goal and design constraints continuously with holding “major solution concept” as long as possible. This is to avoid the difficulty of starting with new concepts in design process.

In my opinion there are things in common with two different arguments: one is design process is interactive and iterative process, the other is a kind of analysis procedure is necessary. In other words, whatever you define design process as “design problem-solution” or “sequence of cognitive operation”, designers have to analyze and evaluate their design, and design process is interactive and iterative until they could find the final design.