

Effect on Architectural Representation through Dynamic and Static Design Methods

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Abstract: *For accelerating the birth of architectures, people apply logical inductions and definitions to design processes ambiguous in the past then explore the possibilities of design methods. Evolving with times and varied perspectives, there are gradually increasing ways which could generate the difference of the natures in architectures – dynamic or static. Architecture has its own mode of dynamic or static representation in every era. Many studies have pointed out this variation derives from the advances of design media, but there still apparently lacks studies focus on the relationship between design processes and architectural representation. Thus, this research aims to juxtapose design methods with dynamic and static representation in architecture then summarize the possible correlation between these factors.*

Keywords: *Statics/Dynamics; design method; design media; architectural representation.*

Review

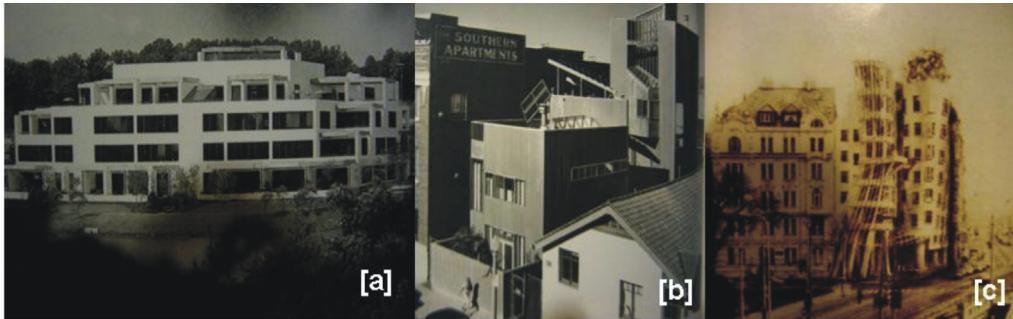
By the occurrence of Industrial Revolution in the late 18th century, architectural design has no longer been considered as a simply talented-only aesthetic activity or a master-apprentice training process which might take more than ten years to practice. It has become a systematic knowledge amenable to analysis and evaluation. Scholars believe that architects could bring forth architectures like manufacture in a rapid way through an efficient approach. Therefore, studies regarding design methods come forth one after another and try to find the precise definition of design process, which has existed for thousands of years and is still ambiguous however. One step further, these studies aim to develop new design methods people could easily get access. Studies concerning design process are continuously developing.

From design methods with static linear procedural steps (Asimow,1962; Archer, 1965; Jones, 1970), to static problem-solving cycles (Mitchell, 1977; Simon, 1967; Flemming, 1988) to nondirectional dynamic cognitive behavior (Goldschmidt,1991; Schön and Wiggins, 1992) design methods have numbered up and been categorized through characteristics from different times.

Problems

To observe the evolution of architectural expressions in the history, it's not difficult to tell that, from static expression of geometry to fluid dynamic expression, the richness of architectural design is progressively increasing. Evolving from classic principle of proportionality, by which all the architecture units must be arranged and fabricated in accordance with certain

Figure 1
The three cases



sizes and types, to the variation of Baroque elliptical curves (Zevi, 1957), in which those special spiral pillars, dual-core extent plazas and a large number of curves meet one another. Entering the digital era, various free forms keep on emerging (Liu, 1996), which simulate the motivating process of time and physical force then present a continuous and highly free transition in form. Accordingly, the architectural representations are gradually enriched and provided with dynamic character (Frampton, 1995; Giedion, 1967; Gao 2004; Liu, and Lim, 2006).

In general, from the perspective of the evolution of fabrication, one phenomenon is evident that the fabrication evolves from static to dynamic. Many researchers attribute this phenomenon of diverse forms to the progress of design media, especially the emergence of computer (Liu, 1996; Sasada, 1999; Wong, 2000; Hana and Barber, 2001). People who hold this viewpoint thought that it's the simulation function and precision characteristics of computer that substantially reduce the past restriction to design. Thus, computer is a relatively dynamic media and it could create more architectures tend to dynamic representation. Varied design methods have varied degrees of static / dynamic characters, yet few researchers investigate the correlation between design methods and forms. Therefore, this research aims to explore that if the degrees of freedom of design methods could be reflected upon the form of architecture and what kind of relation between the two really is.

Methodology and steps

Case study

By looking through previous design work by architect Frank O. Gehry and the literal data recorded along the way, we investigate whether there is a connection between the changes of design method to architecture style and if design methods lead to different tendencies in choice of design media.

Take three cases which built in different periods for example, there are [a] Rouse Company Headquarters (1974), [b] Spiller House (1980) and [c] Nationale-Nederlanden Office Building (1996).

In the first place, analysing the literal data recorded along the design process of the Rouse Company Headquarters (Giovannini, 1986). It is really clear that Gehry positively participated in the interior design, including mechanical and lighting systems. He also pointed out that in order to make the best space quality of the office and computer rooms, he had to devise a new tile fabrication system. A new carpet tile system which is invented for particular purpose took the place of asphalt tile and linoleum. The entire design concept is based on the interior systems and reflects to the building exterior. The architectural representation is as upright and foursquare as its interior, stacking up to create a very horizontal box. It is a design process which divides all the design problem into several small problems. The nature of architectural representation is composed by the way he solved each problems, therefore, it is a problem-solving design method.

In the literal data recorded of Spiller House (1980), Gehry said that the case referred to another unbuilt Familian House. They have the same manner about utilizing the obvious framing which roughly penetrates each building's elevation. Besides this, in the aspect of site plan, it referred to another case called De Menil House. They both placed two objects in a tight site for making a situation that one object against the other. Although there is no record about whether Gehry did data collection and site observation or not, it is clear that he studied his past cases for design thinking. Whole design process is a result which stimulated by the previous cases study.

Before the step of design sketching, Gehry must spend much of time on studying his cases, and then he catch some information to start his new design. It is easy to notice that architectural representation and objects placing are similar to what he had done

before. When the design finished, he had to focus on some carpentry detail to confirm that the architecture could be build. All the sequence of design processes is coincide with Jones' design method, so it is a procedural-steps design method.

The design process of Nationale-Nederlanden Office Building (1996) is relatively indeterminate. At first, Gehry sketched some vague lines for his concept development. Suddenly, he designed two towers which show strongly style comparison just like female and male. Gehry called the two different style towers "Ginger and Fred". After changing those images into study models, Gehry inputted the data of those models' form into virtual environment. The reason why he did that is because digital environment can help him estimate the possibility of material and detail without making it in full scale. It not only saves time and money but also stimulates his mind.

Table 1
Small size-pavilion

	Age	Case	Architect	Scores
[1]	Greece & Rome	Temple of Athena Nike	Kallikrates	11/50
[2]	Renaissance	Tempietto of San Pietro	Donato Bramante	17/50
[3]	Baroque	Bernini's baldacchino	Giovanni Lorenzo Bernini	33/50
[4]	Modernism	Glass House	Philip Johnson	19/50
[5]	Digital	Bubble	Bernard Franken	39/50

Table2
Middle size-building

	Age	Case	Architect	Scores
[6]	Greece & Rome	Pantheon	Marcus Vipsanius Agrippa	20/50
[7]	Renaissance	Florence, Cathedral	Filippo Brunelleschi	21/50
[8]	Baroque	San Carlo alle Quattro Fontane	Francesco Borromini	33/50
[9]	Modernism	villa savoye	Le Corbusier	24/50
[10]	Digital	mercedes-benz miseum	Ben Ven Berkel	40/50

Table 3
Large size-plaza

	Age	Case	Architect	Scores
[11]	Greece & Rome	Acropolis of Athens	Kallikrates	23/50
[12]	Renaissance	Palazzo Senatorio	Michelangelo	24/50
[13]	Baroque	ST. Peter's Colonnade	Giovanni Lorenzo Bernini	26/50
[14]	Modernism	Salk Institute	Louis Kahn	21/50
[15]	Digital	Phaeno science center	Zaha Hadid	42/50

If he find somewhere unsatisfied, he could go back to design step immediately and remodify his previous design. From concept step, design step to detail step, the design process jumped without limitations. There is no certain sequence also a problem of going backwards. Until he found out the right form, the design process has stopped. Whole processes emphasize the importance of designer's percipience; it is a cognitive-behavior design method.

To observe the three cases, architectural representations change from orthogonal, oblique form to curved shape. The freedom of design is obviously increasing and gradually performs dynamic. The design method is equally changing dynamic. So in the first stage, we can conclude a comment that the natures of design methods do affect Frank O. Gehry's design representation.

Recognition experiment

In this stage, ten volunteers without design or architecture background will take part. Architectural representation from different eras will be categorized according to dynamic and static natures, and the results will be put to comparison in how the nature

of design methods of each era. The more dynamic representation gets more scores, and the full scale is five. Besides grading, volunteers also have to write down the reason why they give the score to make sure its accuracy. After finishing all the tests, calculating each case's scores and analyzing the result. The fifteen cases classify by sizes with scores are the following list.

According to the scores record, we can conclude that the natures of Digital and Baroque ages are dynamic, and the other three ages which don't get upward twenty-five scores are static. The sequence of architectural representation from static to dynamic is Greece and Rome, Renaissance, Modernism, Baroque, and Digital age. The result coincides with the property of each era's design method. Besides, the small size is easy to recognize its nature, but the large one isn't. The reason that makes the phenomenon is about the discrimination of objects. In the small cases, Volunteers can easily focus on some objects which could clearly define like pillar, beam, and board and simply compare the difference between each case. Take [1] and [3] (Figure 2) for example, although most of volunteers point out

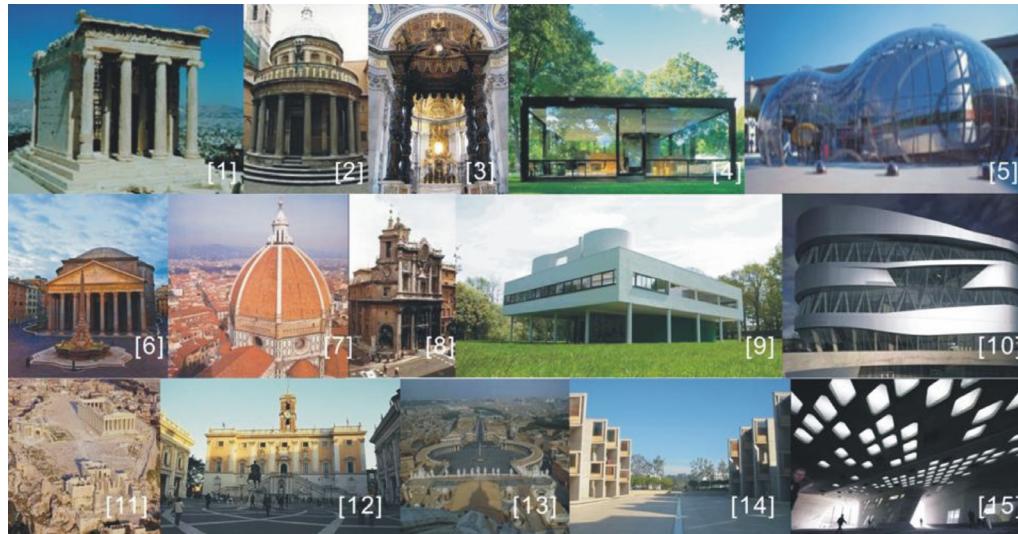


Figure 2
The fifteen cases

the composition of [1] and [3] are almost the same, they still define that [3] is more dynamic than [1]. It is because the column in [3] looks like been twisted and represents strongly dynamic power. In the other hand, compared with the composition of [1] and [3], [5] is totally different which makes itself more outstanding. It is hard for volunteers to recognize some conventional objects from [5], so they turned to describe ambiguous fluid feeling of the skin and that is the reason why it gets much scores.

In the large cases, since each case has much void space, volunteers easily lose their attention on particular objects that makes the comparison deprive of their base. Many comments has different standard which sometimes focus on objects and occasionally discuss with void. Under this situation, scores distributed over each age averagely. It is hard to say which one is dynamic or static confidently.

Rapid design

In this stage, ten volunteers with architectural training will take part in rapid design. With the restrictions of choosing static or dynamic design methods and the freedom of choice in design media, they will be observed in experiment to find connections between design methods and the nature of design media.

The first design method which designers have to follow is problem-solving design method. The exam will give some conditions that designers need to consider like to keep out wind and rain, lighting system, user number in ten, and placards. At the first time, design activity will continue ten minutes. The second design method which designers have to practice is procedural-steps design method. Take Jones' design processes for example, designers must follow data collection, concept development, and detail design; three steps to create their bus stations. Because it is a rapid design, volunteers couldn't leave and spend much time on data collection. The experiment will provide some basic design data and ten diverse cases for designers to consult. All they have to do is finding the useful information from the database

and choosing a suitable case to study. At the second time, design activity will continue fifteen minutes. The five more minutes is for designers to find the data which could stimulate their design thinking. The third design method that designers have to practice is cognitive-behavior design method. The experiment won't set any conditions and provide nothing to consult. Volunteers can independently follow their own cognition to create a bus station and design activity will continue ten minutes. After finishing the three bus stations, volunteers have to sort each design representation through dynamic or static nature for observation.

Through analysis, four phenomena are found. First: All the volunteers define that the nature of first design is the most static. They use the same objects and compose them with little difference. Even every designer create their own bus station, the representations are similar to each other. It is hard to find out some big distinction between them. Second: The second design is easily affected by the nature of the chosen case study. Except some designers which have very strong personal style, general volunteers who chosen dynamic cases have the tendency to create dynamic projects. In the other hand, designers who chosen static cases for case study have the tendency to make static projects. The nature of the chosen case intensely affects the design representation of procedural-steps design method. Third: The third designs show the division into two opposing extremes. Although there is no limitation in third experiment, some of the designers still subconsciously took the conditions of first exam. In other words, they still follow the problem-solving design method to design. Somehow the third exam doesn't mention any limitations, so they don't need to exactly satisfy all the conditions which come from first exam. The kind of design process presents more dynamic nature than problem-solving design process, but compared with cognitive-behavior design process, it is still close static. The other designers create projects depend on their cognition. The design processes of those volunteers are jumping without any regulation

and perform strongly dynamic nature. By using that design process, they create the most dynamic one of the three projects. Forth: The nature of design media doesn't limit the phenomena happened. Even if designers choose static media, projects which followed the dynamic design method still performed dynamic nature. In the other hand, projects which followed the static design method performed static nature.

Results and significance

Through analyzing history data, contemporary architect, professional and unprofessional volunteers, the conclusion can be made. The nature of different design method truly affects the representation of architecture. Using problem-solving design method has the tendency to make static architectural representation. In proportion to that phenomenon, using cognitive-behavior design method has the tendency to make static architectural representation. Besides, procedural-steps design method will make two extremely possible results which present dynamic or static nature. It is affected by the nature of chosen case. The nature of design method as well as the nature of design media influences architectural representation. Even the influence of design method is more powerful than design media. The reason why the conclusion be made is because the freedom of digital media have to under a premise that designer is familiar with digital tools. For those who don't get familiar with digital media, even if the digital tools give them much possibility to image, they still use it by their used way. This means they will take those digital tools like normal pencils or papers, and won't change anything of their design thinking. In the other hand, the influences made by different design methods are about designer's design thinking. Even if the nature of media is static, designers can still practice their dynamic thinking through spending more time and energy. According to all of the above, it is clear that the nature of design method is more powerful than it of design media.

With these conclusions, the research hopes to

make clear definition on how design methods influence static and dynamic representations, and offer future designers a clear reference when designing space for particular purpose or representation. By using the suitable method, the design process will be easy and efficient. Make the biggest benefit for designers and users.

Limitation and future study

The conclusion about the relationship between design method and architectural representation is not absolutely right. It is because some designers have very strong personal style which means their design thinking is fixed. No matter how their design media or method changes, designers will subconsciously take their familiar design processes to finish the project. The phenomena which caused by designer's personal reason can't be controlled. It is the first limitation of the research. Besides that, the standard of dynamic or static natures is an abstract comparison. Somehow volunteers could discriminate the difference and record it, but it is based on their personal feeling. Even two volunteers give the same scores to one case, it is still hard to say that they have the same feeling about the case. It is the other limitation in the research. Future researchers could refer to tectonics scope and study the influences between the different sizes more deeply, finding out what could happen of diverse design method in different situation. Furthermore, researchers may define other new design methods, providing future designers a convenient way to practice their rich imaginations.

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