Reflection on Graduation Thesis

Liu, Ruiying
4481062

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My research project Metaphorical and Analogical (M-A) Thinking in Urban Design and Planning (urbanism) emerges out of many interacting frames: complexity theories of cities, design thinking theories, my own education and practical experience, etc. But first and foremost, it is about learning urban design and planning.

In Q1 I was confronted with the problem of gathering and synthesising information into a holistic representation; in Q2 the challenge was to sharpen that representation into a decision-making basis; in Q3, the two previous problems was compounded by multiple scale navigation. The ultimate question for this journey of education has become: how are they related and why are they so difficult? In other words, after my own unconvincing success in passing all three tests (in this master program and my previous practical experience), I want know the true face of what designers always struggle with.

There remain two options for my graduation project: First, to choose a site-specific topic and again struggle through the three tests, proving once and for all I have mastered the three lessons. I would become a specialist in a high-relevance topic with first-hand experience. Second, to find out the various ways to cope with the problems from proven cases and experts, and conclude them into something that can be borrowed and checked by anyone else. I would not become a specialist in a hot topic by graduation, but I would have learnt what I needed to become one for the rest of my career.

Both options are appealing, but the second one takes some unique circumstances to happen, which happen to be present in this faculty: the experts I need as my subjects, their first-hand account of the cases, and interested mentors willing to guide me on it. This is an opportunity that I have decided to take.

Finally, the first difficulty of learning about design is to find an entry point. Design thinking is addressed in many works as a whole. Design theorists seem to contradict the distinguished designerly approach of propositional thinking to understand ill-defined problems (Cross, 2006b; Lawson, 1980) because they dwell on abstract, general theory construction. So, in my own manner of propositional thinking, I take up metaphorical and analogical thinking as a testing ground—to probe the unarticulated “problem” behind all efforts to theorise about design (specifically, urbanism).

THE RESEARCH IN ESSENCE

This research started as an exploration. It took many iterations to define the relevant scope, observe and articulate the patterns. The patterns reveal to me what questions can be posed and answered by
the data I have collected. And after that, I still needed to sharpen both questions and answers against the larger context, based on other experts’ opinions. Finally, I need to go beyond theories and attempt some proposals about more concrete things, such as practice and education. By doing this, the theories I am testing and consolidating my theories, and also providing others a perspective to evaluate my work. Here I summarise the essential aspects of this project: research questions, approach, the underlying perspectives/assumptions, and the results.

The research questions:

Why is M-A thinking practised in urbanism?
How does it meet the various needs in urbanism?
Basis: M-A as a design strategy is disputed, because it seems to have no systematic principles and highly idiosyncratic. But the fact remains it is widely practised. Neglecting it makes it an unevaluable rogue element in design/planning process. It can aid design practice and theory, or can be counter-productive (Casakin & Goldschmidt, 1999; Chettiparamb, 2006). People also think in M-As unconsciously. To evaluate its use and make it more effective, the reason for its use, and its roles must be clarified.

What characteristics do the M-As of different roles have?
Why do they have these different characteristics?
Basis: The previous two questions identifies categories, but they are empty if the framework does not have directions on how to identify cases. Various M-As have different levels of clarity, and more rational thinkers tend to judge the more ambiguous ones harshly. But there are reasons for their differences. The more ambiguous ones may have more subtle in sights, and more potential to inspire imagination. To find out why, the characteristics need to be summarised, and their corresponding cognitive patterns that make sense for the situation should to be identified.

How can the study of M-A thinking address both scientific framework and the phenomena in urbanism equally without imposing partial theoretical structures from one on the other?
Basis: All experiments are based on assumption of certain theories. Only then can one specify the parameters and variables. Although science has many theories on M-A thinking, as a designer myself I know they are far from covering everything we encounter in urbanism. But the discourse in urbanism on this subject does not have a theoretical structure to guide a systematic study. To overcome this dilemma, this research starts from providing an overview, and constructing a framework of the phenomena.

What application prospects do the results have?
Basis: This research started as an exploration to understand phenomena. I did not know what the findings would be, even less what they can be used for. Only when the findings develop an outline can I begin to tailor it down to applicative situations. And the ideas on what situations they could apply to also have a feedback influence on the structure of how the findings are presented. To apply in education/practice the research needs to focus on the thinkers’ perspective. To have any implication for technology it needs to identify the transferrable mechanisms. And both requires making explicit patterns underlying phenomena.

The approach consists of the following components:
Applying knowledge from cognitive science

As Cross (2006b, pp. 100-103) points out, design research draws on three sources: people, process and products. To derive consistent understanding from all these three, reference to cognitive science is inevitable. Otherwise, M-A can also be addressed in more idiosyncratic, eclectic or experiment-based manners (Casakin & Goldschmidt, 1999; Fez-Barrington, 2011; Gerber & Patterson, 2014; Ungers, 1982).

Empirical research

Scientific studies of M-A thinking in design disciplines mostly take up experiment-based and protocol analysis approaches (Casakin, 2010; Casakin & Goldschmidt, 1999; Christensen & Schunn, 2007; Hey et al., 2008). These approaches tend to de-contextualise design activities, and create isolated categories of knowledge. They are limited to explain complex real-world phenomena. Therefore this research gathers cases and opinions in a broader scope to support a knowledge framework integrated in urbanism itself.

Framework construction

Research question 5 points to a knowledge framework that connects different perspectives and practices. The framework construction therefore takes a “catholic approach” (Moudon, 1992), and aims to account for the various phenomena encountered in the empirical stage with a coherent logic; in other words, a meta-structure informed by cognitive science, complexity theory of cities, and designers/planners’ perspective.

Proposal making

Propositional thinking is a designerly quality, which I have tried to honour in this research project by venturing outside my comfort zone and make some statements. Research question 6 suggests the results be used to inform practice and education. To do that I need to connect the theory construction back to concrete phenomena and prescribe principles for decisions. This is also an opportunity to address the contending views that gave rise to question 1 & 2, by clarifying my own view on evaluating criteria, practical principles and so on.

Underlying my research questions and approach is a series of perspectives/assumptions (see also report Part III). Regarding the content:

Design thinking research should inform real-world design process (including research practice) besides explaining design behaviours. It can do so starting from connecting to the specific objects and tasks of the design activity instead of hiding behind the generalising term “ill-defined problem”.

The claim that design is solution-focused and science is problem-focused (Cross, 2006b; Lawson, 1980; Marples, 1960) must be re-examined in current context. Urbanism can no longer afford to operate on the ad hoc level of individual projects due to the need of sustainability. “The problem” must be studied. This calls for a systematic approach on a meta-project level in order to build up structured knowledge of the discipline.

The study of human intelligence can aid its own propagation—education—and guide the development of technology. A humanised technology can advance human intelligence. Therefore this research does not aim only to argue for recognition of human intelligence, but to extract the transferrable patterns. As such they can be appropriated by both design educators and scientists.
Regarding the approach:

Urbanism has a different context compared to traditional design disciplines. It can offer unique insights into design thinking that would undoubtedly be lost, if studied only with the experiment-based and protocol analysis approaches as applied in other design disciplines. Therefore a phenomena-oriented approach is needed.

Scientific terminology can offer the coherent frames to be used for systematic investigation in urbanism. They incorporate the timely progress to inform design research. The research is also careful not to import scientific theories literally; instead, it aims to adapt, instantiate and clarify them for further verification within urbanism.

The results:

1. Identified views & trends in research, instances in the processes of urbanism, and the gap between them.
2. Empirical research: gathered opinions and cases that indicates why M-A is practised in urbanism, how it helps the design/planning process and how different qualities are evaluated.
3. A framework to structure and explain the M-A phenomena in urbanism, and furthermore, using the dynamics observed, to indicates how to work with M-As.
4. Identified three types of cognitive patterns underlying M-As of different roles through three in-depth case analyses.
5. A system for practitioners to reflect on the practice of M-A.
6. A proposal on how to use the findings in design education.
7. By-products: distinguishing the qualities of design and planning; identified how studies of this kind can have implications for technological development in urbanism.

CHALLENGES

This research is aimed to initiate a wider and deeper understanding of metaphor and analogy in urbanism, by clarifying the cognitive processes and patterns beneath their diverse phenomena in the disciplinary context. To do this requires a leap connecting the cognitive theories to the phenomena in urbanism, which is only possible by re-interpreting both sides’ contents. Therein lies the challenge: cognitive scientists and designers see M-A thinking from different scales.

Such a problem of scale has also bothered science community since its early days. Some scientists study the molecular composition of a substance, say, water, while others focus on its physical properties. To understand it and innovate its application, both scales must be examined. For example, from molecules it is difficult to predict the phenomena of freezing and melting. But from the macro-scale, it is impossible to explain why ice has an increased volume than its liquid state. Without a unifying framework, researchers on different scales find it difficult to understand each other. “Alchemists” stay on the macro-scale, while micro-scale scientists threaten to come up with theories ill-suited to the complex reality (like the spatial science movement in the ’60s).
Similarly, it has been difficult to structure the paper/report of this research in an order that both scientists and designers are used to, constrained by the linear flow of text. Designers could find it difficult to assign relevance to the cognitive mechanisms and favour the discussion of the pattern underlying the phenomena. Cognitive scientists could see the discussion of phenomena before proper definition as flawed reasoning, because normally definition should be introduced before the scope and phenomena. But for the subject of M-A thinking, the definition also needs re-interpretation so that it can properly address the phenomena. Only when definition and phenomena are compatible, can scientific theories be applied to reveal the patterns beneath the phenomena. Between the scientists’ scale and the designers’ scale, this research is to demonstrate the relevance of one to the other. To somehow complete this circular event, the results must be presented to the reader not as a tree, but as a multi-dimensional structure. The “story” in this book starts with gathering and structuring phenomena, not because that is where the inquiry really started, but because starting with phenomena facilitates the perspective to go beyond existing theoretical frames. This is in line with the abductive theory of scientific method (Haig, 2014), which moves from phenomenon detection, to theory construction (further divided into generation, development, appraisal).

VALUE

As an investigation into human intelligence in design, this research is relevant for education, practice, and technology development. For education, learning about M-A can help students critically interpret existing M-As; and from good M-As they can gain insight into the subjects in urbanism. For practitioners, knowing the mechanisms of M-A and analytical techniques to help improve the effect of using of it, and even intentionally make creative M-As. For technology developers, it delineates important patterns of human cognition, and can help in creating better interfaced technology/tools of design. (See also report Chapter 7.)

From the perspective of design phenomenology, it reveals how human agents relate to the built environment and how they apply their mental and social instruments to shape it. This would inform design/planning processes, such as research synthesis, product communication and so on.

From the perspective of design epistemology, it enriches the approach and source of design research. It uses scientific terminology to investigate urbanism phenomena and to structure its knowledge, without “scientising” it—as was dubbed the design science movement in the ’60s. It adds another approach to the experiment–protocol analysis repertoire.

Finally, this research has tried to connect different perspectives and processes, to reveal conventional categories and to update those categories. This can be evaluated by returning to the beginning of this project: research of M-A thinking is a way to probe “the problem”—the constraints that together express the context of urbanism as one discipline (see also report Chapter 6). This map of basic constraints contains:

The nature of human cognition and psychology. Because cities is built by humans and for humans, both the design activity and the design decisions cannot escape how humans perceive, process, express and implement ideas on their environment.
The nature of cities. Because cities are large-scale, collectively modified artefacts that evolve with their own long cycles, engaged in interaction with other slow-evolving entities (social collectives, as revealed in this research).

The social process of urban design and planning. This is reflected in the multi-disciplinary approach, project phasing, multiple actors, cross-scale execution, open-endedness, etc. It emerges as a mechanism for the large spatial and temporal scales of urban design tasks. This means communication and information processing are to be formal areas of research instead of only practical issues in urbanism.

The set of abilities that characterise design thinking. As claimed by many studies, these abilities are distinguished from those that dominate science and liberal arts: they tackle ill-defined problems, are solution-focused, engages innovative abductive thinking, and manipulate non-verbal modelling media with their own system of “codes” (Cross, 2006b; Lawson, 1980; Rittel & Webber, 1973; Roozenburg, 1993).

Knowledge of forms, or the system of “codes” that translate abstract needs into physical artefacts (Cross, 2006b; Hillier & Leaman, 1976). The design knowledge system is, at its core, knowledge of forms (Tzonis, 1992a). But this knowledge is seldom made explicit and is only called upon in action.

In urbanism, researches are done in different directions to probe and apply each constraint, creating various frames of theories. This research captures the widespread M-A thinking like a kind of visualising reagent, and the context in which the various frames are all bound, is beginning to reveal itself.

THE FINAL PRODUCTS

The final product of this research was originally planned to be a journal paper. For many scientific researches such a product would suffice. But a paper has a limited breadth in discussing a subject that implicate so much context. The scientific terminology is new to designers/planners working on this subject in our discipline; the phenomena-oriented approach is also new to scientists who are familiar with this subject. This work seems to be in a most awkward position, struggling to find a justified footing for its line of reasoning. The paper therefore suffered many restructuring; every time it is like telling the same story in a different way. With so many repetitions, the story teller came very close to lose the essence of the story. But this process also turns out to have strengthened the contents, so that at some point, I came to realise the paper content was not the source of the debate anymore. It is already the best I can make, and what else I must achieve has to be done in another way.

So I set out to find a format that would allow me to address all the implications my theories come with. All the while I was motivated by the words Frits said to me: imagine if I want to thank the staff members that helped me with my research, by presenting them with the results of my work, how would I materialise it?

I would want it to be readable, digestible, flavoured and colourful. And there are many different topics that they care about, that can be (partially) answered with my research. So to assemble all these qualities together, it takes a book.
To find the answer is (another) challenge; and so is executing it. A book takes planning of its rhythm: the way the content is distributed among its chapters is not only about a line of reasoning but also the pace of reasoning. One can also call it a sense of proportion (and literally so). Various distractions are employed to keep the reader concentrated: short articles, summaries, informal highlights and so on.

**Evaluating This Research**

Most graduation projects of physical design are never constructed. So they can only be evaluated by experts based on: the coherence of their reasoning and final visualisation; the experts’ knowledge of forms (the implicit “codes” of design). This research cannot be “built” either. Its evaluation will similarly depend on 1) its coherence and groundings, and 2) the extent to which it conforms to experts’ shared knowledge of urbanism. The final product, now a book, consisting of explorations in both theory, phenomena and practical issues, can be subjected to both types of evaluation.

The scientific terminology in this research is not used to produce calculable scientific data as its core argument. If this were the case, then there would be good reason to question whether this research belong to the design discipline. However, the scientific terminology is used to structure the research approach and findings. The final results are grounded in design phenomena, and related to the knowledge that belong to the expertise of this discipline. For example, to demonstrate the implications and potential of the theories I develop, I have constructed several subplots: proposals on how practitioners can work with M-As, and how M-A thinking can be applied in education; summarising what we can learn about design and planning; discussing the technological potential of such researches. Therefore this research is not only evaluable by the discipline of urbanism, but also should be evaluated as such.

**References**


