

UNIVERSITY OF TECHNOLOGY SYDNEY

**Inside the Creative Leap:
Understanding Metaphorical Thinking in Design**

By
Suat Hoon Pee

Submitted in fulfilment of the requirements for the degree of
Doctor of Philosophy
Faculty of Design, Architecture and Building
University of Technology Sydney, 2018

CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Pee Suat Hoon declare that this thesis is submitted in fulfilment of the requirements for the award of the degree of Doctor of Philosophy, in the Faculty of Design, Architecture and Building at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

Signature of Student:

Production Note:

Signature removed prior to publication.

Suat Hoon Pee

Date: 13 Nov 2018

To God be the glory!

*The Lord is my strength and my shield; in him my heart trusts,
and I am helped; my heart exults and with my song I give thanks to him. Psalm 28:7*

*“but they who wait for the Lord shall renew their strength;
they shall mount up with wings like eagles; they shall run and not be weary;
they shall walk and not faint.”*

Isaiah 40:31

*“...He gives wisdom to the wise and knowledge
to those who have understanding...” Daniel 2:21*

Abstract

In order to understand design and design thinking, it is necessary to understand what lies at the *core of what designers do* in their creative practice. Literature reveals that the creative leap is recognised as an important aspect of design thinking (Archer 1965; Cross 2006), the kernel of design (Roozenburg 1993), and even the *real crux of the act of designing* (Archer 1965). This study is motivated by the need to gain insight into the creative leap, and to provide at least a partial answer to the question of where originality in design comes from.

Many researchers talk about the leap as the heart of abductive thinking (Taylor, Torugsa & Arundel 2017). Therefore, an improved understanding of abductive thinking could illuminate the steps underlying the creative leap. In design thinking, the creation of frames is powered by abductive thinking (Dorst 2011). As metaphors are used as frames in design practice, a focus on the use of metaphors in framing could shed valuable light on how the creative leap is carried out in design thinking. However, metaphor creation is a topic that is not well researched, according to Cila (2013). Therefore, it needs to be strengthened with empirical research.

The guiding question that directs this project is: “What are the creative processes present in metaphor creation?” The research questions developed in this study are:

Research Question 1: “*Which types of creation processes of metaphors that help produce frames can be identified?*” and

Research Question 2: “*How can the logical representations of these respective creation processes identified in RQ1 be described?*”

From literature investigation, it is found that there are various types of metaphors in existence and they are likely to be created in different ways. Since a *general* understanding of the creation process will not reveal how different metaphors are created, a *typology* approach is needed.

Three studies are conducted in this research project to answer the research questions. The findings reveal two types of creation processes: *Explicit Thinking Type (ET)* and *Perceptual Intuition Type (PI)*. In the creation of ET metaphors, designers use propositional symbols and logical inferences such as categorisation. For creating PI metaphors, designers make use of the gestalts of the design situations to trigger the metaphorical sources.

Findings from the single case analysis reveal that PI metaphors are often intuitively created. In order to gain an improved understanding of this process, the knowledge of image schema is applied in the analysis to illuminate how PI metaphors and the mysterious leap are conducted. This close description of the use of *image schemas* contributes significant insights into how originality is achieved in creative practice.

Acknowledgements

I would like to express my deep appreciation to my principal supervisor, Professor Kees Dorst, for his kind mentorship, encouragement and patience in the development of this research. I am deeply grateful for his suggestions and guidance to conduct the research using the understanding of metaphors. I would not be able to take on the project if not for his keen interest in problem framing.

My grateful thanks also go to Dr Mieke van der Bijl-Brouwer who painstakingly ploughs through my drafts. Her meticulous supervision and keen eye for details demonstrate to me how the human brain can think in incredibly structured and rigorous ways. I have tried to apply that to organise the complex ideas and thoughts in this thesis.

I wish to also thank the three examiners; Professor Linden J Ball, Professor Vesna Popovic and Associate Professor Hernan Casakin for their valuable comments and insights. Their suggestions have helped to make this into a better piece of work.

Special appreciation to the University of Technology DAB for the use of UTS Design Innovation Research Centre (DIRC) as the platform to conduct this research. Thanks to all the academics and practitioners at DIRC and its Designing Out Crime (DOC) Research Centre. Deep thanks to Douglas, Rodger, Rohan, Lindsay, Kim, 2 Lucys, Tasman, Amira, Sarah and many others in the Centre. They have shown how designers think and have shed valuable light on the design process.

I acknowledge with sincere thanks and deep appreciation to Margaret Chia-Watt for her editing services. Her kind and prompt editorial support has helped ameliorate my stress during the writing process.

Also, not forgetting my family and friends; Ai Choo and Jennifer who are always there to provide emotional support and unceasing stream of prayers.

Contents

1	Introduction	1
1.1	Importance of design thinking	2
1.2	What is design thinking?	2
1.3	The creative leap in design thinking.....	4
1.4	Understanding metaphor creation in design	6
1.5	Research objective	12
1.6	Research Method	14
1.7	Structure of thesis	16
1.8	Conclusion	18
2	Typology Development of Metaphor	20
2.1	General understanding of typology	20
2.2	Steps to develop dimensions	24
2.3	Development of attribute values for the five dimensions.....	32
	Dimension 1: Basis of connection	
	Dimension 2: Representation forms	
	Dimension 3: Connecting elements	
	Dimension 4: Origins of sources	
	Dimension 5: Cognitive utilities provided by source	
2.4	Discussion	47
2.5	Summary.....	50
3	Research Methodology.....	52
3.1	Research Methodology	52
3.2	Case Study Research Design.....	59
3.3	Conclusion	73
4	Individual Case Studies: Analysis and Discussion	75
4.1	Review of analysing dimensions and related attribute values	76

4.2	Summaries of single case studies.....	79
4.3	Observations and lessons learned.....	103
4.4	Conclusion	115
5	Cross Case Analysis	117
5.1	Overview of case studies and identified attributes	117
5.2	Clustering case studies	118
5.3	Metaphors created by Explicit Thinking.....	121
5.4	Metaphors created by Perceptual Intuition (PI)	133
5.5	Creation process of different levels of Perceptual Intuition type metaphors	136
5.6	Discussion: Logical representation of Perceptual Intuition metaphor creation process.....	151
5.7	Exception case: SOCIAL HOUSING AS SCAFFOLDED EDUCATION	158
5.8	Discussion	161
5.9	Conclusions of cross case analysis.....	166
6	Conclusions, implications and future research	168
6.1	Overview of research aims	168
6.2	Significance of work.....	169
6.3	Contribution and advancement of knowledge	170
6.4	Implications for design practice	178
6.5	Implications for design education	180
6.6	Reflection on research approach	182
6.7	Recommendations for future research.....	183
6.8	Concluding comments.....	187
7	References	188
8	Glossary.....	199

9	Appendices.....	205
9A.	Research data of metaphor creation	205
9B.	Image Schema Workshop.....	209

List of Tables

Table 2.1 Innovation Strategy	22
Table 2.2 Metaphors obtained from literature review.....	27
Table 2.3 Clustering of existing metaphor types	30
Table 2.4 Development of dimensions	31
Table 2.5 Attribute values for Dimension 1: Basis of metaphor connection.....	33
Table 2.6 Dimension 1: Basis of connection	35
Table 2.7 Dimension 2 Forms of Representation.....	38
Table 2.8 Dimension 3: Connecting Elements	40
Table 2.9 Dimension 4: Origins of sources.....	42
Table 2.10 Dimension 5: Functions provided by source	44
Table 2.11 Typology of metaphor LIFE IS A JOURNEY.....	46
Table 3.1 Evaluation of research methodology for research project	57
Table 3.2 Data Sources, Data Collection Methods and Types of Data	64
Table 3.3 Empirical cases	65
Table 3.4 Retrospective cases obtained from secondary data.....	67
Table 3.5 Cases obtained from literature	68
Table 3.6 Analysing dimensions and related attribute values.....	72
Table 4.1 Analysing dimensions and related attribute values.....	78
Table 4.2 Ten single case studies	79
Table 4.3 Experiential gestalt of attending musical festival	90
Table 4.4 Difference in the connecting elements and functions provided by sources	110
Table 4.5 Different metaphor creation processes despite similar design approach....	114
Table 5.1 Attribute values of 5 dimensions	118
Table 5.2 Mapping for SUPPORT OF VICTIMS OF CRIME AS AMBULANCE SERVICE	127
Table 5.3 Mapping for WATERLOO SOCIAL HOUSING AS REBIRTH	129
Table 5.4 List of Perceptual Intuition Metaphors created in case studies	135
Table 5.5 Mapping between musical space (Source) and physical space (Target)	140
Table 5.6 Activation of image schemas by problem statements.....	147
Table 5.7 Eight variations of CONTAINER image schema	148

Table 5.8 Topological and superposition of individual image schemas to form overall gestalt structure	150
Table 5.9 Underlying gestalt structures that contribute to the Perceptual Intuition metaphor creation processes	154
Table 5.10 Correlation of AUTONOMY AND CONTROL with SCAFFOLDED EDUCATION	160
Table 6.1 Ways in which image schemas contribute to the creation of PI metaphors	176

List of Figures

Figure 1.1 KINGS CROSS AS A MUSICAL FESTIVAL metaphor	7
Figure 1.2 Overview of research project investigation.....	18
Figure 2.1 Types of innovation strategies. <i>Source</i> : Eiriz, Faria & Barbosa (2013)	22
Figure 2.2 A BATTLE IS A GAME OF CHESS metaphor.....	25
Figure 2.3 Gestalt representation form	36
Figure 2.4 Propositional Symbolic representation form <i>Source</i> : Handke (1995)	37
Figure 2.5 Gestalt image of Dalmatian dog <i>Source</i> : Gregory (1971)	49
Figure 3.1 Case study research design.....	60
Figure 3.2 Captured data from empirical studies	69
Figure 3.3 Data processing and analysis	70
Figure 3.4 Overview of research design and three research studies.....	74
Figure 4.1 Overview of project.....	75
Figure 4.2 Multiple jumps in the creation of Dr. Jekyll & Mr. Hyde metaphor	93
Figure 4.3 CONTAINER image schema	105
Figure 4.4 PATH image schema.....	106
Figure 5.1 Types of metaphor creation processes.....	119
Figure 5.2 Structural similarity between birds and fishes	122
Figure 5.3 Explicit Thinking feature metaphor: SUPPORT FOR VICTIMS OF CRIME AS AMBULANCE SERVICE	125
Figure 5.4 Explicit Thinking Structure type metaphor: WATERLOO SOCIAL HOUSING AS REBIRTH.....	128
Figure 5.5 Explicit Thinking metaphor creation process.....	131
Figure 5.6 Jekyll, Hyde and the morphing process	137
Figure 5.7 Step in a melody.....	139
Figure 5.8 Ascending contour present in melody	139
Figure 5.9 Inter-movement between musical notes. <i>Source</i> : Goss (2013)	141
Figure 5.10 Design solution with proposed relationship between the pathways and homes. <i>Source</i> : Casakin (2006b).	142
Figure 5.11 Design solution illustrating the spatial relationships between the pathways and homes. <i>Source</i> : Casakin (2006b).	142

Figure 5.12 INTO and OUT OF	149
Figure 5.13 Logical representation of Perceptual Intuition metaphor creation process (see phase). <i>Source</i> of photos on the right column: Creative Commons	156
Figure 5.14 Schematic logical representation of the <i>see</i> phase of PI metaphor creation process	157
Figure 5.15 Conceptual structure of AUTONOMY and CONTROL themes	159
Figure 5.16 Creative leap	165
Figure 6.1 Two types of metaphor creation processes.....	173
Figure 6.2 Image Schema Workshop	177