



## experiential knowledge, method & methodology

International Conference 2009 of the  
DRS Special Interest Group on Experiential Knowledge

## Conference Proceedings



# **EKSIG 2009: experiential knowledge, method & methodology**

Proceedings of the International Conference  
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# EKSIG 2009: experiential knowledge, method & methodology

## *Editorial*

*Kristina Niedderer & Linden Reilly*

This CD contains the papers accepted through the double blind review process to be given at the EKSIG2009: Experiential Knowledge, Method and Methodology held on 19th June 2009. The papers presented by the keynote speakers will be available on the conference website.

The conference was organised to provide a forum for debate about methods of research and other forms of practice in design, art, and related subject areas. Over the past two decades, new impetus has been given to debate about design research in the UK subsequent to the formal transformation of polytechnics and some schools of art and design into universities in the 1990's (Durling, Friedman, and Gutherson, 2002), which meant that design has increasingly been conceived and framed in academic terms. Before then, most research relating to art and design had to be conducted in a recognised research discipline such as history, philosophy, education, or engineering (Niedderer 2009). This transformation of the context of much design education has

brought two disparate sets of practices and beliefs into close proximity: on the one hand practices and cultures of research, characterised by debate about questions, methods and what counts as knowledge, and by requirements of communicable as well as generalisable and transferable

results. On the other hand practices of creating, designing, inventing, and making, in which the experiences of the body are traditionally conceived as playing an important role. (Niedderer and Reilly 2007)

Negotiation between these two disparate sets of practices has generated new models of research to accommodate the particularities of design and related subject areas.

Several recent studies have been concerned with the development and use of art and design methods within and for art and design research. Publications by Cross (1984, 2001, 2003) have been seminal the field, and a number of PhD studies have set precedents for research in art and design by using the creative potential of drawing or designing to generate insights and/or new solutions (Whiteley 2000; Rust and Whiteley 1998, Wood 2004, Pedgley 2007, Niedderer 2007).

There is increasing interest in the development of methods and approaches that are designed for art and design research and that are developed to utilise and integrate experiential knowledge. This year's conference is held in recognition and support of these developments, and to provide a forum that might stimulate research and debate in this area.



### **Conference Theme & Call**

The aim of *EKSIG 2009* has been to provide a forum for debate about methodology and methods for the inclusion and communication of knowledge in research and practice in the creative disciplines. The need to be more explicit about research methods, frameworks, and methodologies has arisen from the increasing use of creative and professional practices as part of the practice of research in recent years. While research guidelines and regulations have been either generic enough, or were adjusted, to accommodate the use of some creative and professional practices under certain conditions, the debate about the nature, aims, validity, evaluation, and necessity of such research has continued.

While all research has a method, and disciplines are characteristically driven by debates about the best methods for achieving their aims, that which constitutes a research method in design and related disciplines is still a matter of debate. The debates about research methods in design in many ways echo questions addressed in the design methods movement of the 1960s and 1970s, such as: 'What are design methods?' Now framed in terms of design research, questions address the conditions under which design methods might be used as research methods as well as the nature of discipline specific methodologies.

The developing understanding in this debate is that the inclusion of practice in the research process or as a research outcome helps to integrate and/or communicate those kinds or parts of knowledge that cannot easily be made explicit, such as the tacit part of experiential and procedural knowledge, commonly known as tacit knowledge. With this conference, we wish to explore the different

ways in which tacit knowledge can be integrated and communicated within the framework of research.

Questions of interest are, for example:

- What are design methods and what are design research methods?
- How is knowledge/knowing created within the process of research?
- What frameworks are there to guide discipline specific methodologies?
- How can we integrate & utilise tacit knowledge in the process of research?
- Why is the use of tacit knowledge important in research?
- What contribution can the use of practice make to the inclusion of tacit knowledge in research?
- What contribution can the use of design practice make to the development of design research?
- What methods are there for the communication of tacit knowledge within research?
- Can we talk about the communication of tacit knowledge, or should we talk about a transfer?
- What means and methods do we have to transfer tacit knowledge?



## **Responses**

The conference call received a great international response with submissions from over 20 countries including Australia, Austria, Belgium, Brazil, Canada, Columbia, Denmark, Finland, France, Germany, India, Ireland, Norway, Portugal, Russia, Saudi Arabia, Spain, Sweden, Swiss, Taiwan, The Netherlands, Turkey, UK, USA. Submissions were interdisciplinary and from a variety of disciplines and discipline areas including fine art, applied art, architecture, product design, graphic & communication design, film, knowledge management, education, philosophy, and social sciences.

For the conference, contributions were selected in a two-stage process comprising abstract and full paper selection, through a double blind review process by an international review panel. From the contributions, five strands emerged, of which two could be seen as theoretical reflections, and three as contributions to debate about methods pertaining to applied research.

Strand 1: Methodologies & Experiential Knowledge

Strand 2: Communicating Experiential Knowledge

Strand 3: Social Practice

Strand 4: Design

Strand 5: Craft

Strand 1 examines the development and methods used in design research, and especially PhD research. Joyce S R Yee identifies and analyses “the methodological innovation that is occurring in the field, in order to inform future provision of research training for Design PhDs”. Mark Evans considers the conditions for the rigorous application of methods “within an appropriate and pre-

defined methodology” while Peter Storkerson offers Brunswik’s lens model “as a way to operationalize a theoretical framework to systematically study experiential knowledge and knowing.”

Strand 2 is concerned with the role of creative practice and visual approaches for the communication of experiential knowledge. Lynn Butler-Kisber and Tiiu Poldma investigate “how collage making and concept mapping are useful visual approaches that can inform qualitative research.” Grant Ellmers, Ian Brown, and Sue Bennett, research “how reflection supports articulation of design knowledge by the tertiary graphic design student.” Finally, Kaye Shumack “describes ways in which the designer, understood as agency, may conduct productive and creative internal conversations through a journal writing practice”.

Strands 1 and 2 are preceded by the keynote of Prof John Onians BA, PhD, FSA who is Emeritus Professor in the School of World Art Studies at the University of East Anglia. His reflections on the central role of experience in the process of creative ideation neatly frame both strands explaining some of the underlying mechanisms of artistic and design practice and knowledge. He says:

Artists and designers have long been aware that many of their best ideas are not the product of conscious reflection but surface spontaneously as they work. Today neuroscience helps us to understand some of the sources of this phenomenon. This talk will offer a view of the neural mechanisms involved and present various examples of their operation taken from different periods and different fields of art and design. (Abstract)

The afternoon is preceded by Prof Angie Titchen who is Clinical Chair at the Knowledge Centre for Evidence-Based Practice, Fontys University of Applied Science (NL), Visiting Professor at the University of Ulster, Northern Ireland, Adjunct Professor, Charles Stuart University, Sydney, Australia and Associate Fellow of the School of Health and Social Studies at the University of Warwick. Her work is concerned with the role and relationship of tacit knowledge and research for the benefit of professional practice. She says:

In this keynote, I would like to share something of my current work about professional artistry which appears to be core to professional practice, whatever the discipline or field. This artistry sits within new philosophical, theoretical and methodological frameworks for transformational practice development and research that I am developing with my colleague, Brendan McCormack. Professional artistry seems to be central to expertise, whether it is expertise in practice, research, development or education. Critical companionship, as a facilitation strategy within our new methodological framework, appears successful in enabling embodied, tacit knowledge to be revealed through the body, creative imagination and critical reflection. Moreover, the critical companion facilitates artistic and cognitive critique of the dimensions and processes of professional artistry, used in a particular context, to help uncover for the practitioner/researcher/ developer/educator how they blend

this embodied, experiential knowledge with other kinds of knowledge and use this blended knowledge in their practice.

Titchen's research sets the scene for strands three, four, and five, which are concerned with practice-led research in the areas of social practice, craft and design. Within strand 3, Sally McLaughlin is concerned with how the practices of praxeological enquiry, that is study of human action or conduct, can apply to the use of design in research. Mel Gray and Leanne Schubert report on a research project conducted jointly by social workers and artists, which discusses "the importance of practice wisdom in creative social work practice" and pursues the question "Is art an effective medium for achieving attitudinal change in the community?"

Strand 4 features two contributions from design. Anne Louise Bang introduces an exploratory approach that enables end-users to contribute with their real life experience, and in which "the textile designer with her repertoire of (experiential, implicit and tacit) textile design knowledge should facilitate the articulation process." Marianella Chamorro-Koc and Vesna Popovic are concerned with the ways individual designer's inform the usability design process. Finally, Strand 5 offers two contributions from the crafts. Karen Wuytens and Bert Willems investigate strategies for the increasingly complex design process in jewellery design. Flemming Tvede Hansen explores from the perspective of a ceramicist how experimental design practice in a research context can be "a fruitful way to produce knowledge that supports the interplay between designer, material and technique in design practice."

### ***In Summary***

The conference had the aim to share different views and developments on methods and methodologies concerning the inclusion and communication of experiential knowledge in art and design research. The excellent response to the call for papers has brought together theoretical perspectives and case studies as well as emerging models and practices regarding research methods and methodologies in art and design.

The response has shown the strong interest and development concerning these issues. It demonstrates a consolidation in the understanding of methodologies that use creative practice as part of research and combine it with a variety of mixed methods approaches as well as an increasing awareness of and confidence in the use of methods for the integration and communication of experiential and tacit knowledge in research.

These are important developments for the field because they demonstrate that after nearly two decades of research in the creative disciplines, discipline specific approaches and methods have started to gain momentum, signalling maturing practice and increasing confidence as well as quality and equity with other fields.

### ***The EKSIG conference 2009***

*EKSIG 2009: Experiential Knowledge, Method and Methodology*, International Conference 2009 of the DRS Special Interest Group on Experiential Knowledge (EKSIG) is hosted by London Metropolitan University, Visual Arts Practice Group of the Sir John Cass Department of Art, Media and Design.

EKSIG is part of a program of Special Interest Groups set up by the Design Research Society (DRS) to facilitate international exchange and advance in relevant areas of design. EKSIG is concerned with the understanding and management of knowledge in research and professional practice in design and design related disciplines in order to clarify fundamental principles and practices of using practice within research, both with regard to research regulations and requirements, and research methodology.

The EKSIG conferences are part of a regular programme of the EKSIG group. They serve to bring together researchers and practitioners from different disciplines and to promote understanding and best practice concerning the integration of different forms of knowledge within design research and practice. EKSIG promotes a multidisciplinary approach to engender multi-vocal debates and cross-fertilisation between the creative disciplines and other practice-led disciplines, including contributions from the design disciplines (design, engineering, craft, media etc), philosophy, education, health and knowledge management that are concerned with methods and methodology in research and in creative and professional practice; with the nature, role, and management of knowledge within research; and with the role and use of creative practice (both as process and outcome) as a means by which to develop and manage experiential/tacit knowledge within research.

The Visual Arts Practice Research Group of the Sir John Cass Department of Art, Media and Design London Metropolitan University has long been engaged in debate about the nature of research pertaining to visual arts practices. From earlier concerns with the epistemological basis of competing models of research and visual arts practices, the group has recently turned its

attention to the development of methods for the recovery of tacit knowledge; and the question of whether a clear research aim is a necessary, but not sufficient, condition for research in the arts.

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# **EKSIG 2009: experiential knowledge, method & methodology**

## **Keynote Speakers**

❖ Prof John Onians

❖ Prof Angie Titchen



## EKSIG 2009: Keynote Speakers

### Professor John Onians

University of East Anglia, UK

John Onians is Emeritus Professor in the School of World Art Studies at the University of East Anglia, and he has held research fellowships in France, Germany, New Zealand and the United States. He was founding editor of the journal *Art history* (1978) and edited the first *Atlas of world art* (2004). His most recent book is *Neuroarthistory. From Aristotle and Pliny to Baxandall and Zeki* (2007). His interest in the brain was first sparked by the work of his teacher, Ernst Gombrich, and is now leading him to apply a neural approach to the art, first of Europe and then of the world.

### Abstract

*'Sources of creativity in the ultimate design studio, the brain'*

Artists and designers have long been aware that many of their best ideas are not the product of conscious reflection but surface spontaneously as they work. Today neuroscience helps us to understand some of the sources of this phenomenon. This talk will offer a view of the neural mechanisms involved and present various examples of their operation taken from different periods and different fields of art and design.



## **EKSIG 2009: Keynote Speakers**

### **Professor Angie Titchen**

**Fontys University of Applied Science, NL**

Angie Titchen is Clinical Chair at the Knowledge Centre for Evidence-Based Practice, Fontys University of Applied Science (NL), Visiting Professor at the University of Ulster, Northern Ireland, Adjunct Professor, Charles Sturt University, Sydney, Australia and Associate Fellow of the School of Health and Social Studies at the University of Warwick. Angie is passionate about practice development and doing research critically and creatively. Her practice development work is rooted in clinical experience as a physiotherapist. She holds a PhD from Oxford University and she has published widely in the field of health care especially on the nature of person-centred practice and professional knowledge and its acquisition; the facilitation of experiential learning, work-based learning, expertise, professional artistry and; critical and creative qualitative research. Currently, Angie leads on programmes of support for practice development, evidence-based practice and facilitation.

### **Abstract**

In this keynote, I would like to share something of my current work about professional artistry which appears to be core to professional practice, whatever the discipline or field. This artistry sits within new philosophical, theoretical and methodological frameworks for transformational practice development and research that I am developing with my colleague, Brendan McCormack. Professional artistry seems to be central to expertise, whether it is expertise in practice, research, development or education. Critical companionship, as a facilitation strategy within our new methodological framework, appears successful in enabling embodied, tacit knowledge to be revealed through the body, creative imagination and critical reflection. Moreover, the critical companion facilitates artistic and cognitive critique of the dimensions and processes of professional artistry, used in a particular context, to help uncover for the practitioner/researcher/developer/educator how they blend this embodied, experiential knowledge with other kinds of knowledge and use this blended knowledge in their practice.





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## EKSIG 2009: Organisation

EKSIG 2009 is organised by members of the DRS **Special Interest Group on Experiential Knowledge**, and supported by the **Design Research Society**. The conference is hosted by London Metropolitan University, **Visual Art Practice Research Group** of the Sir John Cass Department of Art, Media and Design. The conference is further supported by the **DART** AHRC-funded collaborative doctoral training scheme, which is coordinated by Middlesex University, and by the **Journal of Research Practice**.

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# Facilitated Articulation of Implicit Knowledge in Textile Design

Anne Louise Bang, Kolding School of Design, Denmark.



## Abstract

This is a report from an ongoing research project and as such it is work in progress. The paper proposes an exploratory approach in order to enable end-users to contribute with their experiences of emotional values of fabrics in use. It is suggested that the textile designer with her repertoire of (experiential, implicit and tacit) textile design knowledge should facilitate the articulation process. The paper specifically draws on a series of workshops conducted within the collaborating company inviting all employees to participate. The series of workshops were based on a game-like setting and introduced an emergent framework for accessing implicit knowledge in textile design. The framework is based on the distance to the fabric. Present at each workshop were materials, chairs and images as initiators for articulation. In each workshop rules for playing and gaming materials were introduced by the author – being a textile designer herself, who functioned as the facilitator. This paper uses two examples from the series of workshops to exemplify a facilitated articulation of implicit knowledge in textile design. From the examples the following themes are synthesised as being important for articulation: The hands-on experience as initiator for articulation; the game-like setting including rules and gaming materials as a facilitating set-up; and finally feeling as experts enables the participants to contribute and articulate their experiences. In future exploratory workshops it is suggested to elaborate on an introducing, an exploring and a summarising phase in order to work more in-depth with articulation and contribution to the design process.

## Keywords

Emotional values, articulation, textile design, exploratory approaches, design process

## Introduction

This ongoing research project is conducted in collaboration with a Danish company within the textile industry. The company develops and manufactures fabrics for upholstery, fabric solutions and related services. The research project has a strong relation to design practice – the author being a textile designer herself, and it has a special interest in investigating, exploring and defining emotional values of fabrics in function. The overall research purpose is to contribute to the generation of explicit knowledge in textile design.

An assumption in the project is that companies working with an extended value chain – offering e.g. fabrics on rolls, fabric sheets ready for upholstery and upholstery suggestions – can benefit from an active involvement of various stakeholders and end-users in the design process in order to develop as well as refine their offers to their customers e.g. furniture manufacturers. The question is then: How can the textile design practice meet and benefit from other peoples personal and individual experiences of textiles?

The research project proposes exploratory approaches as a way for the industrial textile design process to handle emotional values such as sensuous qualities and aesthetic appeal which are hard to quantify and immeasurable (Brand, 1964; Hatch,

2006). This paper specifically draws on a series of workshops conducted with employees – which were considered as end-users, from the funding company.

### **Implicit knowledge in textile design**

Articulation of implicit and sometimes tacit knowledge is seen as a first step on the way of involving non-designers in the textile design process. Articulation is considered a premise for verbalisation, dialogue and mutual understanding which again are premises for an open-ended discussion and an in-depth design process.

As stated within textile science (Hatch, 2006) there is no reliable method for the quantitative evaluation of hand qualities in textile science even though it is “often the fundamental aspect that determines the success or failure of a textile product” (ibid: 53). There are several words attached to hand qualities and “these words do not have the same meanings to everyone who uses them” (ibid: 53). Nevertheless words are – also in textile science, considered an important research tool for what is called a subjective evaluation of fabric aesthetics in textile science (Brand, 1964:791).

When it comes to soft and immeasurable aesthetic properties such as e.g. surface appearance, colour, and hand qualities the textile designer is the skilled practitioner responsible for approval. Schön (2001) introduces the terms “knowing-in-action” and “reflection-in-action” to describe a practice based problem solving opposed to a technically based problem solving. “Knowing-in-action” should be understood as the kind of knowledge that is revealed in the way we conduct tasks whereas “reflection-in-action” is what happens when a more or less unexpected problem is addressed in action. The processes are to some degree conscious but not necessarily verbalised. Addressing various, unique and often complex everyday tasks a textile designer draws on her technical knowledge as well as her experiential knowledge – in Schön’s terminology her “repertoire” (Schön, 2001:124). A thorough knowledge about materials, techniques, use and signal value forms the basis of the textile designers’ knowledge on textile means. Cultural references, personal experience, and trend and market research substantiate the knowledge. In her communication the textile designer uses a mix of visual and verbal means exemplified by samples and prototypes. A subtle sensibility to textile characteristics and properties is acquired through design practice, craftsmanship, and functional and aesthetic experience (Bang & Nissen, 2005).

Textile designers are skilled practitioners in designing fabric structure and fabric aesthetics as well as they are concerned with the ways the fabrics apply to product and context. They are also familiar with project management and coordination. In industrial design and manufacturing they collaborate or communicate with various other professionals such as engineers, technicians, logistics staff, marketing staff, salesmen and management in order to facilitate and contribute to the design and development process in all stages from research of ideas to mass production. Besides this they also collaborate and communicate with customers, suppliers and end-users.

### **An emergent framework**

Being considered as the expert it is not always necessary to explicate your knowledge and experience during the development process. But in situations working as an expert among other experts the case is quite different. Being an expert it is highly important to explicate issues on debate whether it is articulated and explicated by words or by other means.

### ***The matter of distance***

In this project the distance to the textile forms the basis for an emerging framework considering how to access implicit textile design knowledge. Basically it draws on Austrian art historian Alois Riegl's theory on perception (Bek and Oxvig, 1997). According to Riegl the observer's position to the actual piece as well as the character of the perception is of importance for the perception. Riegl operated with three distances: the close up/detail (Nahsicht), the normal distance (Normalsicht) and the long distance (Fernsicht) and two main characteristics of perception: a haptic and an optic view (Bek & Oxvig, 1997:46).

The close up/detail indicates a relatively short distance between object and eye, a distance where it is possible to get only a partial view of the object. At a close distance even three-dimensional objects appears as surfaces, since it is not possible to watch the form giving shadows. According to Riegl the close up/detail are linked to a haptic perception which covers tangibility and tactility.

From a normal distance the form giving shadows are visible. At this distance the object can be seen as a whole and also the surface details are visible. This distance is haptic – the detailed surface appearance, as well as optic – the object as a whole.

From a longer distance the form giving shadows will disappear and leave only the most intense shadows as dark areas. From this distance the shadows appear as coloured surfaces but not as form giving areas. From the long distance the sight is linked to an optic perception which means that the objects appear as two-dimensional surfaces in a spatial context (Bek & Oxvig, 1997).

Transferring this to textile design the close up/detailed distance is comparable to the material sensation of the actual piece of fabric: structure and surface appearance. The normal distance is in this case the fabric as part of an object e.g. as upholstery fabric on an office chair. The long distance is the fabric/object in a spatial and signal value context such as an office in a company. The three levels of distance are illustrated in figure 1 below. The observations or experiences can be of: experiential as well as more formal/technical character.



Fig. 1: The matter of distance: Close up/detail, normal and long distance

### **An exploratory approach**

Textile designers in the industry often work as part of multidisciplinary teams. Their ability of communicating and activating immeasurable properties of textile design is crucial for a team based in-depth development process and for the ability of end-users and other stakeholders to contribute to the design process.

What people say, think, do, use, know, feel and dream is different levels of experience that – on a sliding scale – are explicit, observable, tacit or latent. There are various ways to understand people's different levels of experiences and understanding is crucial in order to empathise with them (Sanders & Dandavate, 1999:88). In present research project exploratory approaches are investigated as a way for the designer to empathise with various stakeholders. In the preliminary phase

of the project a pilot study using the repertory grid technique to investigate tactile sensations of upholstery fabrics and other flexible materials were conducted (Bang, 2007). One important finding in that study was that a variation of repertory grid actually functions as a tool for dialogue. Further studies have substantiated this finding (Bang, 2009) through experiments applying elements from the repertory grid technique into cultural probes (Cultural probes e.g.: Gaver et al., 1999; Mattelmäki, 2006) and exploratory design games (Design games e.g.: Brandt, 2006).

### ***Repertory grid embedded in a game structure***

The repertory grid technique is a one-to-one qualitative interview technique originated in psychology. It considers the client an expert in his/her own life (Fransella, Bell & Bannister 2004; Kelly, 1955).

Especially the triadic difference which is an element from the repertory grid technique: "Presenting three elements at a time asking: 'How are two alike in some way, but different from the third?'" (Fransella et al., 2004:7) has been investigated as an exploratory approach for articulation in the actual research project. Working with the triadic difference a bipolar construct is elicited where two elements form one pole – the similarity – and the third element – the difference – forms the other pole. All elements explored can be scaled and judged according to the bipolar construct. Applied to approaches built over a game structure the triadic difference seems to enable the "non textile design experts" who are considered to be experts in their own everyday life to articulate their experiences. Embedded in a game structure with rules and gaming materials it enables a facilitated articulation of about implicit knowledge in textile design.

## **Facilitated articulation**

### ***Study (Purpose)***

This section gives examples from a study going beyond what people can spontaneously tell about their experiences with fabrics in function and what the observer can actually see when observing.

All employees within the collaborating company were invited as end-users to participate in a series of 6 games concerning fabrics in function. Being considered end-users they were invited as experts in their own (work) lives. Participating in "The game of the day" by solving different tasks they elicited words and statements as well as they chose and commented on images through various configurations of the gaming materials.

The research purpose with the series of games was to investigate if an exploratory approach could be appropriate for articulation of emotional values concerning fabrics in function. Furthermore the emerging framework "A Matter of Distance" as briefly outlined above was investigated as a model for how to access implicit textile design knowledge.

### ***Study (set up)***

The series of games took place in autumn 2008 as 6 workshops during lunch-time. People were asked to spend a couple of minutes of their lunch time participating in a game.

Each workshop included a hands-on aspect like sensing materials or trying chairs as well as various images played a role as game material. The 'game of the day' emphasised articulation of personal experiences either by judging or sorting images or adding keywords or statements to materials, chairs or images following rules for participation.



Building on the emergent framework the series of workshops took their starting point in fabric considerations (day 1 and 2) before scaling out to chairs (day 3), offices (day 4) and signal value (day 5). The final workshop (day 6) was a concluding workshop asking people to design an emotional barometer based on the previous workshops.

## Participants and facilitation

The participants were invited to participate in games focusing on upholstery fabrics, office chairs, offices and signal value. It was optional to participate and between 24 and 30 employees participated in each workshop. A rough estimate – made by the CEO, says that approximately 100 employees are working in-house each day. Participants were all kind of employees coming from stock, logistics, production, sales, service, it, design, quality and management. A few participants solved the tasks in small teams and some participants discussed their choices with colleagues before leaving the workshop.

As the facilitator my job was to plan and introduce the task of the day to each participant and to be the main dialogue partner if needed. During the week all "answers" hang on the wall – as images and words – and each day flyers were distributed about the workshop to come. This is illustrated in figure 2 below:



Figure 2: Distribution of flyers and the wall presenting previous "answers".

## Data

The data used for analysis is primarily the participants' configurations of game materials, words and statements.

## Examples

This paper specifically looks into two examples from the series of workshops. This is due to the provided space in the paper. Furthermore these two examples are considered appropriate as examples of facilitated articulation of implicit knowledge in textile design.

### Example 1 – Material experience, words, triadic difference, bipolar constructs

6 boxes with materials were present in this game. As figure 3 shows they contained cut grass, wheat flour, pudding rice, a piece of rubber, a piece of cast plaster and a mix of feathers and down.





Figure 3: Materials used in workshop 2.

Two office chairs were present as well. As shown in figure 4 it was an office chair upholstered with a smooth black woven fabric and an office chair upholstered with fur dyed in a mauve nuance on the backrest and a slightly darker mauve woven fabric on the seat.



Figure 4: The two chairs present in workshop 2.

The participants were familiar with materials and chairs from the previous workshop where the task was to pick a material that felt similar to one of the chairs. After that the participants had to consider which type of material sensation they liked and which they disliked. This workshop functioned as an overall introduction to the series of games and the exploratory approach.

In the actual example from workshop 2 two piles of cards were present together with chairs and material boxes. One pile contained cards with an image of either the black chair or the fur chair. The other pile contained cards with images of the materials in the boxes.

Each participant began by choosing one of the chairs spontaneously. After choosing a chair the participant picked two material cards randomly. The task was then to decide – using the triadic difference, which material could be connected to the chair and which couldn't. As shown in figure 5 the participants sensed the materials in the boxes and then formulated their answers on writing on the images.



Figure 5: Material sensing and formulating poles in the bipolar construct

The participants were asked the following question: How are the chosen chair and one material similar as opposed to the other material? This formed a bipolar construct where one pole was a chair and a material and the other pole was a single material. The participants were now urged to articulate their choice by describing each pole with a word.

In this example the participants were urged to articulate bipolar constructs about material sensation according to an office chair. 28 people participated in the material workshop eliciting 27 bipolar constructs as listed in table 1 (translated from Danish to English by the author):

Pair (Chair and	single	Construct by chair	Construct by material
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material)			and material	
black	plaster	feather	Cool	Silly
	plaster	grass	Stylish, no nonsense	Too organic**
	rubber	grass	Nice, nice to sit on	Soft, a little resistance*
	rubber	flour	The colour, warmth	Cold
	rubber	plaster	Soft, springy	Hard, cold
	feather	grass	Soft and comfortable	This sense doesn't fit
	feather	rubber	Peacock	Cow
	flour	rice	Exceptional softness	Hard – also soft but in another way
fur	feather	rubber	Warmth, snug	Cold
	feather	rubber	The softness	Cold
	feather	grass	The softness	Hard and difference compared to feather
	feather	rubber	Airy	Massive**
	feather	flour	Soft, "long-haired"	Mute
	feather	plaster	The softness	Smooth
	flour	plaster	Inviting	Hard**
	flour	rubber	Soft	Resistance
	flour	grass	Soft in the same way	Another softness, stiff
	flour	plaster	Soft, comfortable	To hard for a chair, uncomfortable
	rice	rubber	Movement	"Blunt", compliant but with strength
	rice	plaster	Adjusts to the body	Stiff, hard
	plaster	feather	Smart	Too colourful
	plaster	flour	Smooth, soft, nice to touch (the backrest)	Too coarse or rustic (fits the seat but the backrest is dominant)
	plaster	rice	Serene	Messy
	grass	rubber	Freedom	Vapid**
	grass	plaster	Furry, like fur	Cold
	grass	rubber	Fresh	Dull
	grass	rubber	Wellness	Emptiness**

\* Elicited by 2 persons working as a team.

\*\* The highlighted constructs were chosen for the task in example 2.

Table 1: 27 constructs elicited using the triadic difference.

### Example 2 – Chair experience, scaling, preference, statement

7 different office chairs were present at the third workshop. In addition to the original two chairs – the black chair and the fur chair, I have searched the company for five additional chairs. As shown in figure 6 these chairs vary in upholstery and style:



Figure 6: the 7 chairs present in workshop 3.

The third workshop was based on the material experience using 5 constructs from the second workshop (highlighted in table 1) as a starting point for the chair experience. Among the 27 constructs 5 were chosen as ambiguous and open for various interpretation possibilities as shown below in table 2:

stylish><organic
inviting><hard
freedom><vapid
airy><massive
wellness><emptiness

Table 2: The 5 bipolar constructs used in workshop 3.

Each participant picked a bipolar construct randomly and the task was now to place the 7 chairs on a sliding scale according to the construct. They could try out all chairs since these were present in the canteen. The task of scaling all chairs to a randomly chosen construct forced the participants to investigate each chair in all possible ways before scaling them: e.g. look at them, try them, touch them and talk about them with fellow participants. Before leaving the workshop I asked each participant to tell me which chair he/she would choose and why. Almost everybody knew at once which one to choose – they felt familiar with the chairs after judging and scaling them.

In this case I didn't ask specifically for new words when the participants scaled the chairs. The results were articulated as images of the chairs scaled on a prefabricated form naming the poles in the bipolar construct. Instead I asked for a statement in the end of the workshop.

Each participant was asked to pick out a favourite chair among the 7 chairs and argue for their choice articulating a statement on an additional slip of paper. 24 people participated in the workshop about chair experience. The statements made were as follows in table 3 (translated from Danish to English by the author):

Bipolar construct		Chair	Statement
Freedom	Vapid	fur	Special, different
		black	Comfort
		red	The pattern, the colour
		red	Firm and good

Inviting	Hard	mesh	Comfortable and manageable
		chess	A good seat
		stripe	Comfortable. A short seat. Good support.
		red	Funny, light, fresh
Stylish	Organic	fur	Soft, comfortable and posh
		red	The colour, the pattern (embossing)
		red	It supports the back. The look. Stylish
		green	Comfortable. Classic
		mesh	It is the best designed chair
		stripe	Eye-catching, elicits "joy" when I sit on it.
Airy	Massive	fur	Most unpredictable
		fur	Airy, comfortable
		mesh	The best lumbar support
		mesh	Good, you "float" in it, soft and light
		green	(no answer)
Wellness	Emptiness	fur	Fur and combination. Posh, different.
		fur	Cool. Good comfort
		fur	Best comfort, bodily sensation
		mesh	Comfortable. Soft
		chess	Best comfort.

Table 3: Comments on the choice of favourite chair.

### **General remarks:**

In the beginning the participants were hesitating, a little shy and humble. They doubted if they could come up with "the right answer" and if their participation would be of any value. I put a lot of emphasis in answering them that it was very important and also useful if they participated since I considered them as experts in their own (work) lives and that "the right answers" were similar to their specific answers because this was about personal experiences.

I also emphasised that this series of workshops were a pilot study in order to explore how other people can articulate emotional values concerning fabrics in function based on the emergent framework.

During the sessions they began to feel confident and even to look forward to "the next game". The series of workshops were received as a happy incident during lunchtime and once they decided to take part all participants were very serious in their comments. Once in a while it was very hectic with a lot of participants at the same time and at other times I had time to concentrate on just a few persons. Furthermore it was a funny, lively as well as educative way to communicate the research project within the company.

### **Findings**

In the analysis I have looked specifically for articulation based on facilitation. Is the emerging framework "The matter of distance" a way to concretise implicit knowledge

in textile design in a way so that other people through an exploratory approach can actually contribute with their experiences of emotional values of fabrics in function? During the workshops I acknowledged all articulation without asking supplementary questions. This was due to the very limited timeframe – people simply had to finish eating, participate in a workshop and be back at work within half an hour.

### **Material Experience**

Going through the bipolar constructs formed in example 1 (see table 1) several of the elicited words are about softness (12 poles in 27 answers) or hardness/coldness (11 poles of 27 answers). In 6 instances softness and hardness/coldness are opposite poles in the same construct. The remaining poles are more airy and ambiguous or refer to other experiences such as "nice to sit on", "movement", "messy" or "dull". One answer – which is cow >< peacock, is nothing else but odd for this author.

In this workshop the articulation were facilitated by a rule asking the participant to form a bipolar construct using the triadic difference asking: How are the chosen chair and one material similar as opposed to the other material? This clear rule and the provided gaming material as well as the materials and chairs present made it fairly easy to form the bipolar construct and elicit words describing the poles. However combining a chair with somehow odd materials was a challenge for some participants. As a facilitator I urged them to experience the chairs and materials in order to elicit the words. In the end all participants succeeded in eliciting words articulating their experience of the chair/material combination opposed to the single material (maybe except the cow><peacock statement).

As mentioned above a relatively large amount of the bipolar constructs in workshop 2 were about softness and hardness/coldness. I chose not to pursue this subject further because the purpose with the series of games was to explore the full scale of the emerging framework "A matter of distance". Clearly future work should look into softness and hardness/coldness in order to elaborate and refine on this seemingly important perspective when sensing materials as a part of objects (office chairs).

In this case I chose to continue using the 5 most ambiguous and open-ended bipolar constructs in workshop 3 about chair experience:

### **Chair experience**

The reason for picking the most airy and ambiguous bipolar constructs from workshop 2 was that I wanted the participants to move from material sensation focusing on the upholstery fabric in function (on office chairs) towards the experience of objects including upholstery fabrics (again: office chairs but from another point of view). At the same time I wanted to show the participants how words articulated by some of them during one workshop could be of value in another.

15 of 24 participants mention variations of comfort as the main reason for choosing a specific chair. Eight of the answers are about other preferences such as colour or design. Finally one chose a chair but didn't answer the question why. In this paper I didn't look into the "image scaling" of chairs on the provided forms. In future analysis it would be obvious to consider how these rows of images can be understood as articulation.

The articulation of statements was facilitated by the image scaling task which urged the participants to explore the present 7 chairs thoroughly. The rule of scaling according to a bipolar construct was easy to understand and again for some of the participants – a challenge because of the airy and ambiguous bipolar constructs. To facilitate the process I urged them to explore the chairs and discuss their experiences with fellow participants. In the end all participants succeeded in defining the scale.

None of the participants had problems choosing a favourite chair and state why (except from the one that didn't answer to that).

## Concluding remarks

In this paper I have pointed out possibilities for end-users to articulate their fabric experiences accessing implicit knowledge in textile design through a framework focusing of distance to the fabric. It is part of an ongoing research project and as such both the framework and the exploratory approach are work in progress.

Based on the above findings I have synthesised the following themes which I find is substantiated by the exploratory approach:

Hands-on experience or an “experiential experience” – based on sensing and experiencing materials and chairs is seen as an initiator for articulation of experiences.

Using rules to enable the participants to quickly feel confidence in participating and contributing and gaming materials such as materials and office chairs as initiators for articulation the series of workshops have given an insight in the potentials of an exploratory approach even though that the time limit were a hindrance for in-depth exploration. The game-like setting is seen as a tool for the facilitator in exploratory workshops.

Finally the acknowledgement of everyday experience as a valuable experience gives an expert feeling and is seen as a way as a way to build up confidence through the series of workshops.

Even though that there was a relatively high number of employees participating in an enthusiastic and serious way it is necessary to emphasis that making workshops during lunch breaks is not supporting for an in-depth and substantiated process since all participants are busy either eating or going back to work. In this analysis I therefore looked into possibilities for articulation more than specific and concrete results.

Finishing the research project by the end of 2009 the author seeks to contribute to future research by providing the framework “The matter of distance” as a way to access implicit knowledge in textile design. Furthermore an exploratory approach based repertory grid embedded in design games is seen as a way to activate the framework and enable stakeholders and end-users to contribute to the textile design process.

## Future work

In the very near future (spring 2009) additional workshops are planned for the designers in the collaborating company. The purpose is further investigations of the emerging framework and the exploratory approach. In one workshop other stakeholders such as external sales people, buyers and end-users are invited to contribute with their experiences of emotional values of fabrics in use. The workshops will focus on office chairs which are a present in the everyday life of all participants: the designer, the sales people, the buyer and the end-user. The plan is to focus on three phases during the workshops. An introducing phase: clarification of the subject, rules for the game is introduced and a mutual understanding for participating is established. An exploratory phase: focusing on the subject through mutual understanding and collection of main data within an agreed time frame. A summarising phase: finishing the game, inviting the participants to contribute to an initial analysis.

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# The power of visual approaches in qualitative inquiry: The use of collage making and concept mapping in experiential research

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## Abstract

The burgeoning interest in arts-informed research and the increasing variety of visual possibilities as a result of new technologies have paved the way for researchers to explore and use visual forms of inquiry. This paper investigates how collage making and concept mapping are useful visual approaches that can inform qualitative research. It outlines specific ways that each approach can be used with examples to illustrate how the approach informs the researcher's experience. The two approaches are compared and contrasted and issues that can arise in the work are discussed.

Key words: collage, concept mapping, arts-informed inquiry, qualitative research

## Introduction

...it has become increasingly clear since the latter half of the 20<sup>th</sup> century that knowledge or understanding is not always reducible to language. ...Thus not only does knowledge come in different forms, the forms of its creation differ. The idea of ineffable knowledge is not an oxymoron (Eisner, 2008, p. 5)

This paper investigates how collage making and concept mapping are useful visual, interpretive tools that inform experiential research approaches. The burgeoning interest in arts-informed research and the increasing variety of visual possibilities as a result of new technologies have paved the way for researchers to explore and use visual approaches in qualitative research. These new, arts-informed modes of inquiry mediate different kinds of understandings grounded in direct experiences (Butler-Kisber, 2002; Vaikla-Poldma, 2003), expand the possibilities of diverse realities (Butler-Kisber 2007), counter the hegemonic and linear thinking associated with traditional research (Butler-Kisber, 2008), increase voice and reflexivity in the research process (Vaikla-Poldma, 2003), and create more embodied and accessible research results (Eisner, 1991; Richardson, 1995).

Qualitative research approaches, and more specifically visual modes of inquiry are predicated on a constructivist epistemology that posits that there are multiple realities and ways of doing and understanding (Creswell, 2003). These are co-constructed in human interactions and activities and are contextually dependent, eliciting "...multiple participant meanings..." (p. 6). Visual inquiry is used to yield insights and reconstruct data to understand phenomena (Rose, 2001). Visual inquiry approaches, such as collage making and concept mapping, are a means for formulating ideas and articulating relationships among these to help understand phenomena

in their formative stages, work through emergent concepts, or to help represent them to others. Collage making and concept mapping, in particular, are useful ways for “listening visually” and getting into “liminal spaces” where “knowledge...never arrives...it is always on the brink” (Neilsen, 2002, p. 208).

## **About collage**

Collage, taken from the French verb “coller” which means to stick, is the process of using fragments of found images or materials and gluing them to a flat surface to portray phenomena. Collage is not new. Over 1000 years ago Japanese artists used collage to enhance their poetry which was written in calligraphy. It was also used in folk art in the 1800s, such as in the paper mosaics created by Mary Delany (Hayden, 1980). Collage came into its own, however, in the early 20C when the “fathers” of collage (Picasso and Braque), used it in their work to counter the representational demands of formalist art. In this work, they attempted to make art more accessible, and to use it to question political and social agendas of the times. Collage has continued to permeate the art world since then as a genre of art, and as the postmodern way of thinking, knowing and communicating (Brockelman, 2001). With the growing interest in arts-informed approaches in research, collage, as a form of inquiry (Butler-Kisber, in press), has been attracting interest in qualitative circles because it allows the researcher to work in a non-linear and intuitive way by arranging image fragments that reveal unconscious connections and new understandings (Davis, 2008a). In fact, “... collage reflects the very way we experience the world with objects given meaning not from something within themselves, but rather through the way we perceive they stand in relationship to one another” (Robertson, 2002, p. 2). Furthermore, the basic skills of cutting and sticking are developed early in life and become part of everyone’s repertoire, so collage can be done by novices while acquiring more sophisticated aesthetic and compositional expertise.

## ***Uses of collage***

Collage, created from a synthesis of shattered fragments, realized in an emergent, often randomized composition, arrives at meaning in a very different way - accidentally, capriciously, provocatively, tangentially. (Davis, 2008b, p. 250)

It has been described elsewhere (Butler-Kisber, 2008; in press) how, to date, collage has been used in inquiry in three basic ways - as a reflective process, as a form of elicitation, and as a way of conceptualizing ideas. As a reflective process, collage acts in much the same way that memoing does in qualitative inquiry. Memos serve the research process by providing a series of pauses in the work where the researcher writes in abbreviated form about thoughts, connections, and questions that are arising in the analysis (Miles and Huberman, 1994). Memos help to open up thinking to new possibilities and interpretations. Memos, however, maintain linear thinking. When using collage reflectively, the researcher focuses on a question, dilemma or the like, and then selects pictures that metaphorically reflect aspects of this thinking. Then operating intuitively she creates a collage, producing a visual composition with the selected fragments. This collage process breaks away from the linearity of written thoughts by working first from feelings about something to the ideas they evoke, instead of the reverse. The resulting visual juxtapositions frequently reveal new connections and understandings that have previously remained tacit (Butler-Kisber, 2007; 2008; Davis and Butler-Kisber, 1999).

For example, Mary Stewart (personal communication, January 2003) in her collage below has explained how:

This visual image of an outdoor dining room helped me to understand and articulate what I was learning about our research group in terms of the need to provide spaces for ideas to emerge and for synergy to build. I feared that without more structure, we would lose sight of our goals or privilege some voices over others.... (Butler-Kisber, 2007, pp. 272-3)

As a result of her collage work, Mary was able to understand differently the relationship between balancing her need for structure with the flexibility and openness needed for collaboration and creativity and to enjoy the work in which she was involved with the research group.



Figure 1: The Silent Light Dance by Mary Stewart (2003)

Magazine fragments glued on cardstock (8.5 x 11 inches). Used with permission.

In literary circles, free writing is used as a way of moving beyond the linear boundaries and logic of written text. It elicits and allows inner and unconscious thoughts to bubble to the surface. In fact some writers fold the page in half during a free writing sprint so as to disrupt even the physical boundaries that constrain the written word (Charlotte Hussey, personal communication, 2002). When collage is used as an elicitation approach to help the researcher articulate her writing, it acts in a similar way. Pamela Markus (2007) used this approach in her thesis, a self-study of her experience as an artist and art teacher. Once her major themes had emerged from her field observations and journals, she created a collage to represent a particular theme and then used the resulting visual to bring forth the words that she subsequently used to elaborate and discuss her interpretations. The collage process elicited ideas that prior to this work remained elusive.

Collaging can also be helpful in conceptualizing a phenomenon by fleshing out different facets in order to get a nuanced understanding of it. A useful way of doing this is to create a series, or a cluster of collages (Butler-Kisber, in press) about a phenomenon. "Artcards," or small-scale collages the size of hockey cards (2 x 2.5 inches) provide a helpful structure because their sheer size limits the number of fragments that can be used, hence the metaphorical content becomes quite focused. It is productive to work intuitively repeating in each collage how the phenomenon "feels" or what it "feels like" to experience something. It is important to work from the feeling to the idea and not the reverse. Once a cluster of three or four collages have been produced showing various visual portrayals of the phenomenon, the collages can be named

based on the essence of what has emerged. Each collage then shows a facet of the phenomenon. Finally, the collages can be examined collectively based on content, colour, shape, size, content, space, directionality, or any other compositional dimensions to see if there are unintended commonalities that exist across the collages. When identified, these common aspects help to push the analysis further and provide a deeper interpretation of the phenomenon in question.

For example it has been described elsewhere (Butler-Kisber, 2008) how a cluster of four collages focusing on what it felt like to work collaboratively in a research group revealed that it produced a sense of serenity, camaraderie, energy and challenge. However, it was the commonalities that existed across what appeared to be four very different collages that "...identified the recurring shades of red and the repeated use of spheres ... (and as a result) ... in each collage there is a suggestion of a vortex that threatens to submerge the lips, swallow the birds, and erase the tree" (Butler-Kisber, 2008, p. 271). These common dimensions revealed that a tension existed in this collaborative group work, and provided a deeper understanding of what was transpiring. On the one hand, the group provided support as well as intellectual and emotional nourishment, while on the other it threatened the retention of individuality and voice.

### ***Issues in collage inquiry***

Collage work is always an engaging process. Whenever it is introduced to a group of researchers, they become totally engrossed and inspired by the work (Butler-Kisber, Davis, and Stewart, 2007). Inevitably new insights emerge about the research in question, or about the researcher herself. As mentioned earlier, making a collage is not daunting because everyone, whether a novice or experienced, can cut and paste and ultimately gets a sense of satisfaction with the product. It is always delightful to see how researchers who would never consider they have artistic talent are able to gain confidence using this visual medium, and how some have gone on to produce wonderful instances of collage inquiry (Promislow, 2005). It remains an issue, however, in collage and other arts-informed inquiry, about who should actually undertake collage work in research. A polarized version of this issue is that on the one hand, anyone who wishes should use collage, and a somewhat elitist view on the other, that collage should be restricted to those researchers who have acquired the necessary artistic skills. The middle ground is that researchers wishing to use collage in formal and public products need to develop the necessary skills to produce technically sound work and develop aesthetic sensitivities so that the gains that have been made in arts-informed inquiry in the last decade are not lost by the proliferation of poor-quality work. This still provides lots of leeway for using collage as part of the analytic process to reap the positive kinds of understandings that result from this approach to inquiry. It suggests, however, that more of an emphasis has to be made on support systems in graduate programs for developing both an awareness of the potential of collage inquiry, and developing the necessary artistic skills and aesthetic sensibilities.

The second issue that is closely related to the first is how arts-informed inquiry and more specifically collage work, can and should be evaluated. This conversation has been growing but the jury is still out, and in the conversations that have transpired, most have focused on arts-informed literary/written work rather than visual texts. Space does not permit a summary of what has emerged, but Bamford (2005) has offered some interesting insights on the evaluation of digital theses that holds promise for ways of assessing collage inquiry and other visual forms of research. What is clear is that this conversation merits broader involvement and extended discussion that will encourage and not penalize work that is worthy.

Finally, there is yet insufficient guidance on the copyright issues around using found images from popular magazines in collage inquiry (Butler-Kisber, 2007; 2008; in press). Discussion ranges from total tolerance for appropriation, to fair use of a small percentage of an image, to no use without legal permission which inevitably requires some form of purchase. The solution is of course, to avoid using found images, or to use public images not constricted by copyright, but this has implications for both the researchers and the types of collages that can then be produced. As the interest in collage inquiry increases, as it is bound to, more discussion and guidelines/solutions are needed.

### ***About concept mapping***

Concept mapping is a diagrammatic and visual means of expressing ideas held in the mind. Concept maps are created using hand-drawn sketches or virtual tools in a non-linear and visual format by drawing on paper to show the thinking as it emerges, or to represent ideas in their embryonic stage. Concept mapping was first developed in the early 1970s at Cornell University when psychologists were exploring ways to illustrate children's changing conceptual understandings of science. Concept maps permit the viewer to understand complex phenomena at a glance in order to make new connections, build new knowledge, and/or analyze difficult topics (Blanchet-Cohen et al. 2003). Concept maps are a means to document emergent phenomena visually in ways that words or other visual forms are incapable of doing. In different design disciplines such as architecture, or industrial or interior design, for example, concept mapping is used to document the inter-relationships of aspects of a design in its earliest stages, or as a brainstorming method of documenting ideas (Hanks and Parry, 1991).

Concept mapping is an interesting strategy to use in qualitative research because it allows the researcher to make sense and keep track of data interpretations as they first begin to emerge. It is particularly useful for documenting the relational aspects of initial data interpretations. Whether done as rough, hand-drawn maps of initial ideas (Margulies, 2002; Vaikla- Poldma, 2003) or as schematic diagrams that map out emergent thinking in the research, concept maps help to formulate analytic ideas as they are being conceptualized (Maxwell, 1996).

### ***Uses of concept mapping***

Concept mapping is used extensively in the visual arts in formulating initial ideas, in advertising and innovation thinking, and in personal visualizing techniques (Margulies, 2002; Poldma, 2009). For example, concept maps are used in various design disciplines as a representative form of visual thinking, as a catalyst for brainstorming emerging design ideas or developmental ideas for projects, for documenting processes of design as they are worked through and for retaining ideas that can be referred back to later on in the design process (Poldma, 2009). Yet despite the knowledge that concept mapping is particularly suitable for qualitative work because it retains context, supports qualitative underpinnings, helps reduce data, and has an excellent revisiting capacity, it has received little attention (Daley, 2004). With the increased interest in reflective practices in qualitative research and in giving meaning to voice in research texts, concept mapping can be used as a way of conceptualizing emergent ideas before they take form by giving a visual sense to messy thoughts held in the mind during the analytic process, and by helping researchers to represent visually ideas that emerge from the data being analyzed. As with collage, the mapping process can give way to a visual restructuring of ideas with text being reduced to a series of small words or phrases encircled and then linked through priority of thought in a series of symbols and drawn shapes.

In the following example, Sylvain Bertin (2008) developed his master's work on the complexity of lighting the urban environment. His study focussed on both the processes involved the work and how the different stakeholders are involved in conceptualizing lighting the urban environment. He collected interviews to try to understand the underlying meanings in what he believes is a complex inter-relationship between theories and practices of conceptualizing the practical and aesthetic dimensions of lighting an urban environment. In a series of concept maps, he tried to understand both his research process and how his own 'reflection-in-action' (Schön, 1987) affected what he saw. Sylvain observed and collected data and then reflected on the creation process of the lighting designer, the practices of other stakeholders involved in the work, and the diverse factors involved in creating the lit urban environment. Then he then began sketching some very rough thoughts in a series of concept maps, each becoming more refined than the next as he reflected on these data.

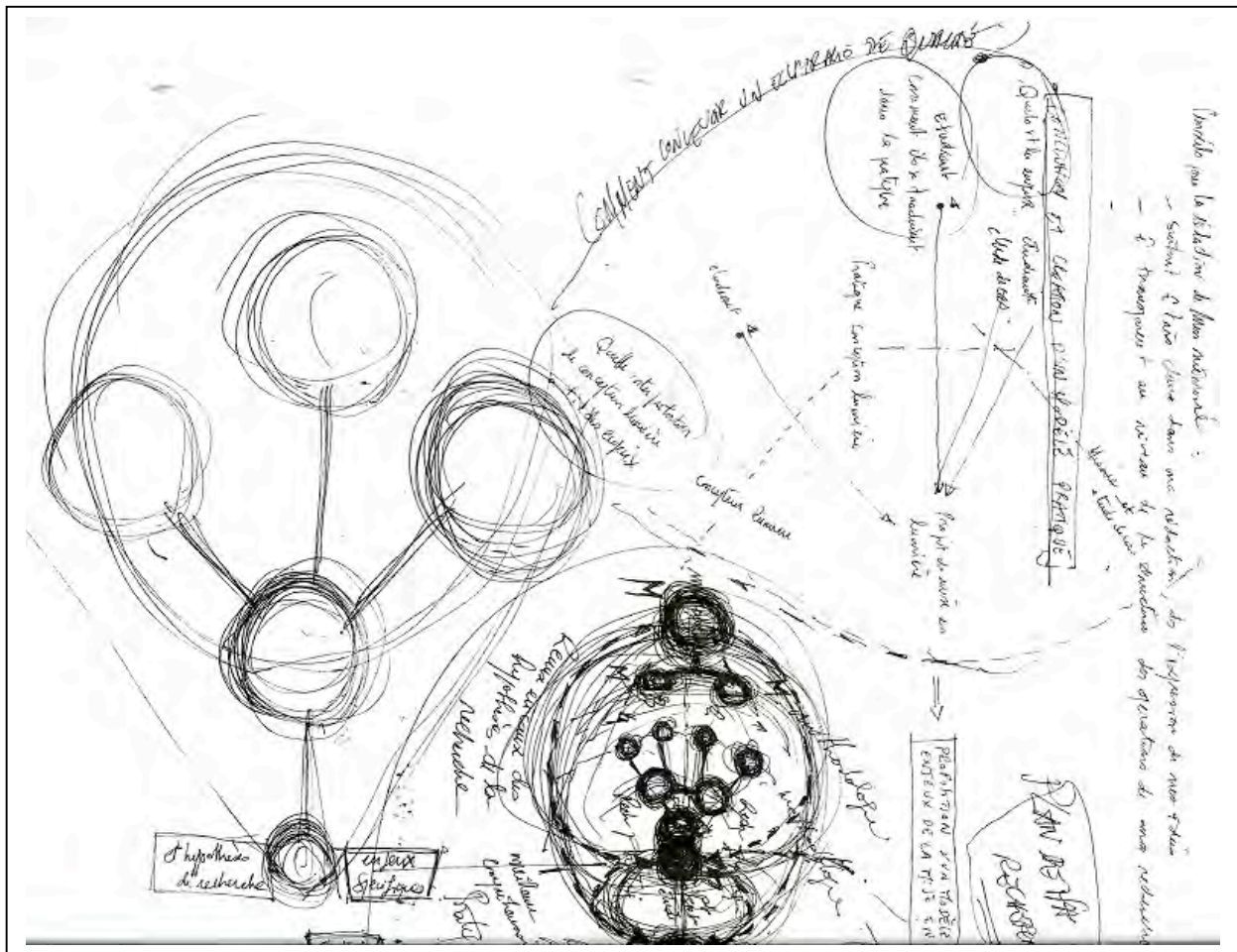


Figure 2: Initial hand-drawn concept map in black pen by Sylvain Bertin (2008). Used with permission.



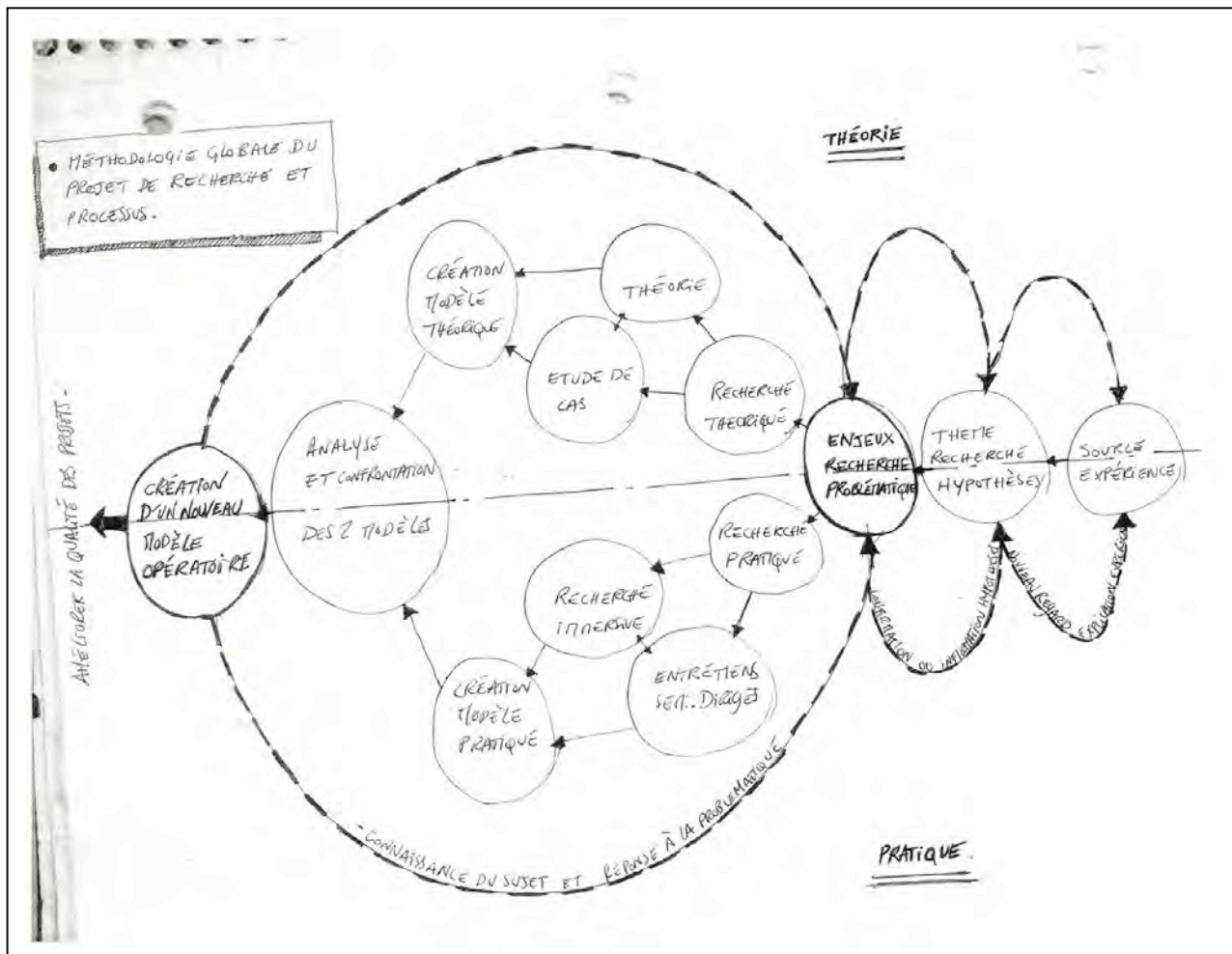


Figure 3: Refined hand-drawn concept map in black pen by Sylvain Bertin (2008). Used with permission.

Once the concepts were fleshed out, he created a final schematic concept map that synthesised the ideas visually both in terms of the research process and the conceptualization involved in solving the practical and aesthetic issues of lighting in an urban environment. As shown in Figure 4, the final schematic map is not only a relational series of ideas, but it also shows the complexity of the inter-relationships that he uncovered. In this final concept map, shown below, the inter-relationships he was developing became more refined in the schematic diagram he created:



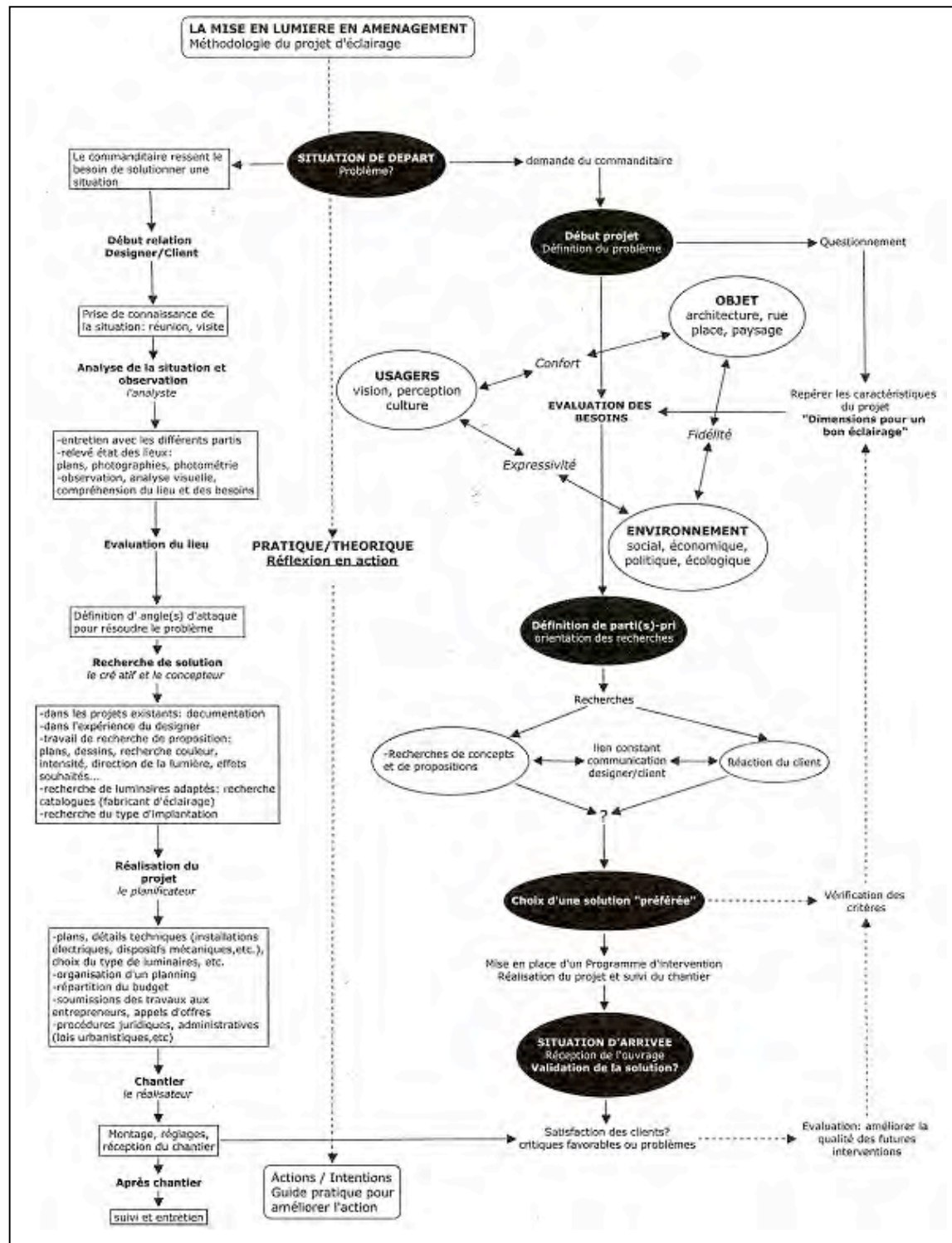


Figure 4: Final schematic concept map digitally configured by Sylvain Bertin (2008). Used with permission.

An interesting aspect of concept mapping is that it allows the researcher to move from written analytic text to the visual and again back again. During this analytic process concepts and themes begin to emerge, while both analyzing the research texts and analyzing the visual content of the data (Rose, 2001; Vaikla-Poldma, 2003). Concept mapping can help to synthesize ideas that are becoming evident in the analysis that are difficult to put into words alone. Often the design researcher is compelled to extract categories or concepts to make links in the data being analysed (Miles and Huberman, 1994). It is at this point, when thoughts are racing as the emergent ideas and concepts are beginning to take shape, but have not yet crystallized, that concept maps become very helpful. They allow the researcher to develop quick representations of the phenomena first by jotting down key words and phrases, and then by linking relational ideas as they emerge. This mapping process deepens the analysis and facilitates the development of propositional statements for a more conceptual understanding of the phenomena being studied (Vaikla-Poldma, 2003). The following example shows how a concept map takes shape during the coding process but before the salient themes and categories are reconstructed:

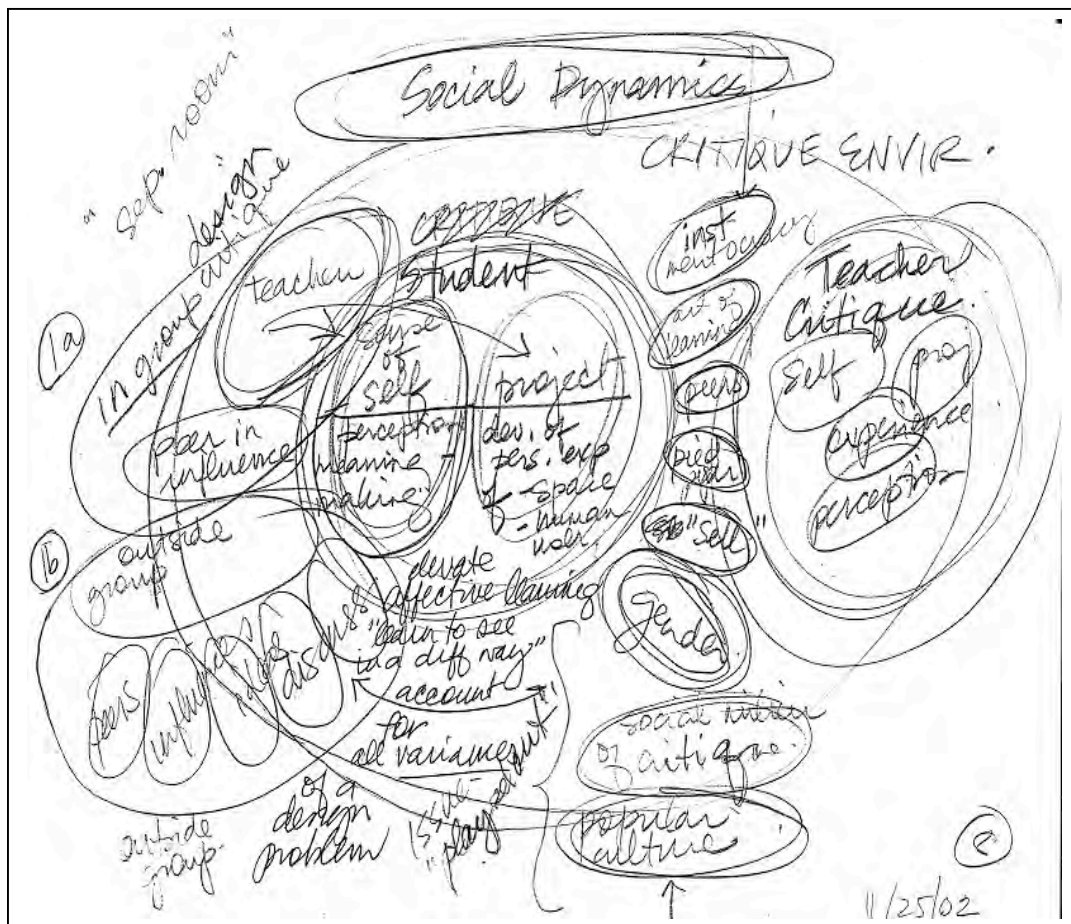


Figure 5: First conceptual sketch, hand drawn pencil on paper by Tiiu Poldma (2002).

Figure 5 shows how rough initial thoughts and ideas are put down in a free-flowing series of key words. These types of initial maps remain quite rough. Later they can be tidied up for a more formalized portrayal in graphic schematic representations. Figure 6 below illustrates how a concept map evolves from an initial, rough form into a more refined schematic representation.

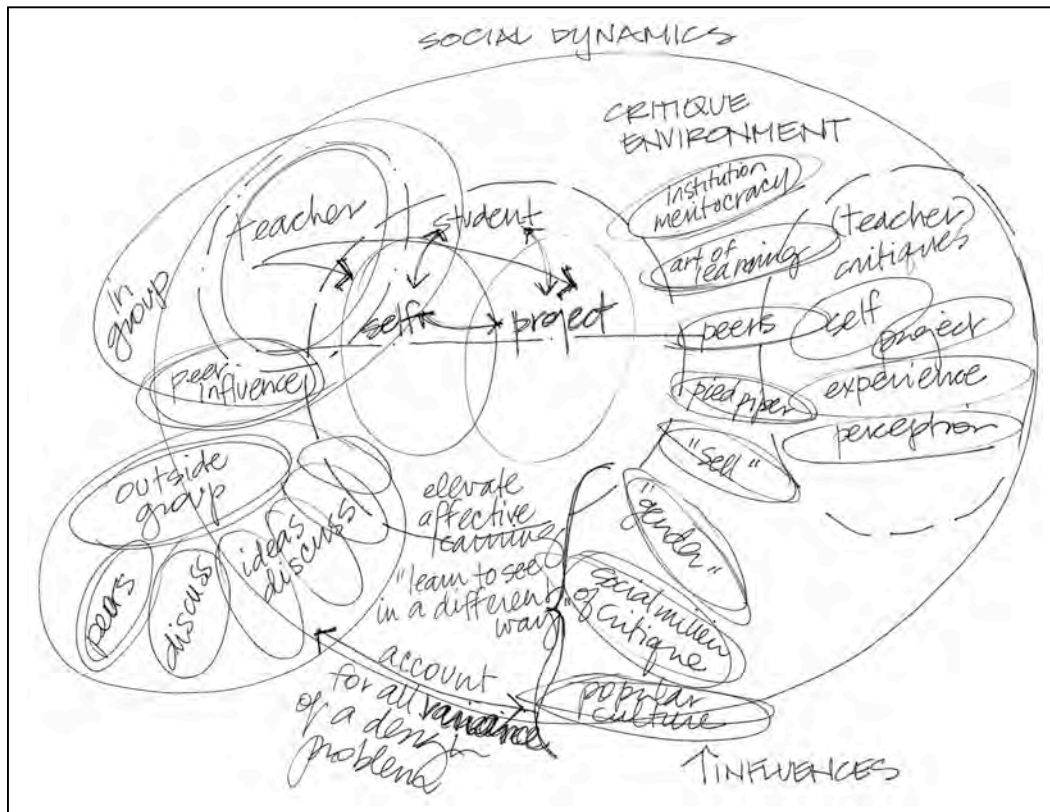


Figure 6: Refined version of ideas in sketch form hand-drawn black felt pen by Tiiu Poldma (2003).

For example, in the Figure 5 concept map about one particular student's experience in a design course revealed how there were multiple influences acting on her understanding of the project the students were required to do. These included teacher, peer and environmental factors. While redrawing and formalizing the sketch in Figure 6, the process revealed that at the core of these influences was the dynamic between the teacher and the student in the group critique session, suggesting that this student was struggling between her personal sense of self and her project, and the student-teacher interaction that occurred in front of her peers. This concept map was developed with input from several other students. Each helped the researcher to clarify these evolving ideas, enabling a return back to the textual analysis and writing with new understandings.

The concept maps illustrated here are only one example of what is possible. Concept maps can and have been developed using many different styles, layouts, and approaches. Current digital technology offers many interesting possibilities for pushing the stylistic boundaries further, and/or for portraying sophisticated and aesthetically pleasing representations. However,

whether hand-to-paper approaches are used, or the finest digital technology, the process and result are still the same. Concept maps allow the researcher to step outside the constraints of linear thinking, and to engage in and encourage the messy and nonlinear work of the brain, and in so doing, tease out ideas and connections in the data that might otherwise remain implicit and/or not be conceptualized in ways that push the analysis deeper.

## Issues in concept mapping

The intuitive and experiential nature of the concept mapping process makes it extremely attractive for design researchers, because the process of visualization comes quite naturally to them and they often use visualization processes to enhance their textual analyses. First, when multiple researchers are exploring issues within a project, the concept map can be done simultaneously during a discussion to situate the explorations, as in a brainstorming session. Second, during the conversations between researchers, when one researcher is explaining a process to another, concept maps become a form of visual dialogue wherein the map outlines quickly the representation of the bulk of data analysis by synthesizing the concepts into a concise series of words and images (Poldma and Stewart, 2004). Third, the tensions and issues that arise in emergent research can be documented quickly and helpfully while simultaneously working through research texts.

However, challenges do exist. One issue is how best to integrate concept mapping into the research process systematically. Concept maps work when they are read alongside textual analysis as a juxtaposition of the verbal and the visual together, and as a means of reconstructing ideas in a relational manner (Poldma, 2006). They are not independent forms of analysis. Second, the skills required involve the creation of the sketches and the ability to use visual graphic tools to refine the work. And while these are fairly easy to learn, for some they do not come easily (Margulies, 2002).

A third issue is how refined concept maps should become once they have been created. Because the maps are created in the messy phases of the research process, further development of the map changes its original intention as a messy document representing the ongoing thinking. Each version of a concept map becomes more refined and rational. There is a “smoothing out” which results from this ongoing refinement of the original map. The final version may be more aesthetically pleasing, but it may also change the meanings that were first formulated and the researcher needs to be aware of this change.

## Comparing collage and concept mapping as inquiry processes

As themes and research concepts emerge, both collage and concept mapping are visual approaches that can be used to construct initial ideas, concepts or early thoughts about a phenomenon. Both methods are forms of visual representation that portray the essence of emerging concepts. These tools are often used in the early brainstorming stages of research, and can be used as a way of thinking reflectively about data, or as a way to elicit unconscious thoughts about the research and/or to make connections among the data. They can also be used as a way of representing what finally emerges in the research.



Where collage and concept mapping differ from one another, or from more traditional analytic forms of inquiry, is in both how they are used and how they help the researcher construct meaning. Analysing and interpreting data means sifting through research texts and unearthing meanings held within data about what participants are saying about a phenomenon, or how they express what they do in practice. Collage represents ideas by creating links between fragments that represent emergent feelings first and then ideas. These fragments are reconstructed to represent feelings that when viewed can suggest new meanings, or a whole “new take” on a phenomenon because of the artful way the ‘pieces’ are put together and portrayed.

Concept mapping, on the other hand, rebuilds rational, analytic ideas into a new visual form. Analysing and interpreting data means sifting through research texts and as interpretations of the text emerge, documenting these in a visual series of inter-relational concepts. Concept mapping allows the researcher to step temporarily away from the textual analysis, visually document the relations between the interpretations of voices or relational concepts emerging, and develop relational diagrams, matrices or groupings of these ideas in a linking series of ideas. The resulting schematic provides a means to express the relational aspects of the emergent progression of ‘messy thoughts,’ transferring the written word to the visual word and conceptual idea. When the diagrams are developed, the researcher then can return to the writing and use the diagrams to organize the concepts that have surfaced. The table below summarizes the similarities and differences between collage and concept maps.

Collage	Concept Maps
Visual form of inquiry	Visual form of inquiry
Analytic or representational form	Analytic or representational form
Nonlinear process	Nonlinear process
Reveals implicit/unconscious understanding	Reveals implicit/unconscious understanding
Moves from feelings to ideas/words	Moves from ideas/words to relational dimensions
Juxtaposes image fragments to create meaning	Frees ideas/words from texts to see connections and new understandings using visual graphic tools
Evokes intellectual and affective responses	Permits graphic, holistic understanding/ generates intellectual response
Creates ambiguity offering alternative insights	Reduces ambiguity; increases search for new meanings

Table 1: Similarities and differences: Collage and concept maps

## Conclusion

The examples of collage and concept maps described earlier demonstrate how emergent experiences can be portrayed through both these visual mediums. They provide a place for the researcher to document and record ideas, concepts and meanings gleaned during the ‘making’ process itself. This direct experience helps the researcher to construct the meanings in the data

and make links needed to synthesize thoughts and push the analysis further. In each case, new insights emerge through these visual processes. Collage hones research through an intuitive-rational process, while concept mapping shapes the work through a rational-relational process, and each one contributes to new insights and understandings of research data. We believe these two approaches to inquiry merit further attention, development and use.

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# Experiential Knowledge Representation and the Design of Product Usability

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## Abstract

The topic of designers' knowledge and how they conduct design processes has been widely investigated in design research. Understanding theoretical and experiential knowledge in design has involved recognition of the importance of designers' experience of experiencing, seeing, and absorbing ideas from the world as points of reference (or precedents) that are consulted whenever a design problem arises (Lawson, 2004). Hence, various types of design knowledge have been categorized (Lawson, 2004), and the nature of design knowledge continues to be studied (Cross, 2006); nevertheless, the study of the experiential aspects embedded in design knowledge is a topic not fully addressed. In particular there has been little emphasis on the investigation of the ways in which designers' individual experience influences different types of design tasks.

This research focuses on the investigation of the ways in which designers inform a usability design process. It aims to understand how designers design product usability, what informs their process, and the role their individual experience (and episodic knowledge) plays within the design process. This paper introduces initial outcomes from an empirical study involving observation of a design task that emphasized usability issues. It discusses the experiential knowledge observed in the visual representations (sketches) produced by designers as part of the design tasks.

Through the use of visuals as means to represent experiential knowledge, this paper presents initial research outcomes to demonstrate how designers' individual experience is integrated into design tasks and communicated within the design process. Initial outcomes demonstrate the influence of designers' experience in the design of product usability. It is expected that outcomes will help identify the causal relationships between experience, context of use, and product usability, which will contribute to enhance our understanding about the design of user-product interactions.

## Keywords:

Experiential knowledge; Tacit knowledge; Usability; Product design; Knowledge representation

## Introduction

Experience underlies all kind of human knowledge and it is context dependant; people's experience within a particular social, cultural and physical context-of-use determines how they interact with products. This concurs with various research that investigated experience and its relevance for the design of products from various perspectives (Forlizzi and Ford, 2000; Jordan, 2002; Rosch, 2002; Kuniavski, 2003; Sleswijk Visser, Stappers, Van der Lugt and Sanders, 2005; Battarbee and Koskinen, 2005; Popovic and Kraal, 2008). In design, experience related research has been mostly centred on enhancing the development of more pleasurable user-product interactions (Sanders, 2002; Overbekee, Djadjadiningrat, Hummels and Stephan, 2002; Sengers, 2003).

This paper presents a work in progress; a continuation of Chamorro-Koc (2008) preceding study that focused on identifying the relationships between human experience and products' context-of-use and the ways in which these inform the design of products. This study aims to build on these findings and extend the previously identified design principles. It is expected that understanding how experiential knowledge influence on the way people relate to products and the way designers inform their design process, will contribute to enhance the design of user-product interaction.

The following sections introduce the background study and describe the sources of experience identified as significant to the design of product usability. The current investigation, the research design, its aims and methodology are explained next. They are supported by examples of the instruments and stages of the experiment. Next, analysis of the initial outcomes is presented along with segments of the data collected in order to demonstrate arising issues and describe the emerging coding system. An initial interpretation of results is then described, and initial outcomes including types of experiential knowledge are discussed. Finally, the conclusions section outlines future research directions.

## **Experiential knowledge and causal relationships**

Lawson (2004) explains that both theoretical (precedents) and experiential knowledge inform the design process, but they are stored and recalled in different ways. They are two independent systems. Precedents are partial pieces of information (designs) that the designer is aware of, and have not been experienced live, but through images on the internet, in books, magazines, and television. Differently, experiential knowledge comes from events in the designers' life, and they can be remembered with great level of detail.

The designers' knowledge has been studied as part of research into design thinking; however, an issue not addressed in earlier investigations is about the ways in which users' experiential knowledge informs their interactions with products, and how to bring such information into the design process. Chamorro-Koc (2008) empirical study identified relationships describing the aspects of human experience influencing users' understanding of everyday products. It established similarities and differences between designers' and users' concepts of a product use arising from experiential knowledge, and verified the applicability and relevance of these findings for the early stage of a design process. The research approach employed visual representation of concepts, retrospective verbal reports and interviews to elicit users and designers' concepts about their experience and concepts of a product's use and of its context of use. Visual representation of concepts was employed to elicit the participants' concepts of a product, and to reveal aspects of their experience with regard to their user-product interactions. The use of visuals to reveal aspects of experience is supported by previous studies in which images produced during research have been studied as representations of reality — who, where, and what — (Van Leeuwen and Jewitt, 2001), and by studies in which visuals have been studied as representations of experience or knowledge (Oxman, 2002; Rosch, 2002; Tang, 2002; Dahl, 2001). It is important to note that in the design domain, words, images and shapes in combination or independently, are used to communicate the concepts and represent the understanding of the physical world of artifacts. These are the most common media that designers use to interpret and reformulate the design concepts. They also convey representation of experiential knowledge (Popovic, 2004). In Chamorro-Koc's (2008) earlier study, retrospective verbal reports were employed to allow participants describe and explain their visual representation of concepts, to point out any aspect that they could not convey in the drawings, and to support clearer understanding of tacit knowledge used during the design process. This approach follows previous studies that found experience as a subjective event comprehended only by the person who experiences it (Sanders, 2001), and that the interpretation of any kind of representation from a person's own experience must be done by the person himself or herself (Loizos, 2000).

Interviews were employed to gain further insights into what the participants 'say and think' (Sanders, 2002) about the concepts revealed in visuals and retrospective reports, and to provide an opportunity to participants to expand their previous responses. The experiment sessions were video- and audio taped (Chamorro-Koc et al., 2008).

Data collected in sketches, videos, and interviews, show that users' knowledge of product use - tacit knowledge - comprises knowledge emerging from the experience of using a product or from seeing a product in its context of use. This agrees with other studies about experiential knowledge suggesting that tacit knowledge is primarily seen from an individual's actions (Polanyi, 1996). Chamorro-Koc's (2008) findings identify four sources of human experience influencing people's understanding of product usability; these are: familiarity, episodic experience, experience from cultural background, and experience from expert domain. It is understood that the cultural background generates strong concepts of a product's social context-of-use which is ingrained in a particular culture or tradition. Thus, the user's cultural background influences his or her understanding of a product's usage and its context-of-use. It can also generate knowledge about the product's intended use, a description of its features in the context-of-use, and principle-based concepts that explain the product's functionalities. These relationships can be employed in the early stages of the design process to inform designers about the areas of human experience that must be addressed to support particular aspects of the design of product usability. Consequently, designers can enhance users' understanding of product usability by designing and incorporating 'clues' that appeal to particular areas of the intended users' experience (Chamorro-Koc and Popovic, 2008).

The preceding study established relationships between experience, context of use, and product usability from users and designers' knowledge representation about their 'use' of everyday type of products. The identified sources of experience were translated into design principles that aim to assist the design of product usability by informing designers about the aspects of human experience that trigger people's understanding of products (Chamorro-Koc et al, 2009). This knowledge advances an understanding of how people use products; nevertheless, further study is required to explore if same relationships influence designers' process for usability design.

## **Investigating causal relationships in the design of product usability**

This paper reports on work-in-progress that focuses on further understanding the role of experiential knowledge in the product design process. Through the observation of designers undertaking a usability design task, this study aims to identify the experiential aspects of designers' knowledge and its representation within the design process (Chamorro-Koc, 2008). It is based on the premise that design knowledge consists of explicit and tacit knowledge and that it is not only a reference to past experience but also an anticipation of the future (Friedman, 2001). It also considers studies in which various knowledge categories are identified such as descriptive, prescriptive or procedural (Howell 1996). Therefore, this study is set out to investigate: how do designers design for usability? What types of designers' knowledge informs such process? And what kind of linkages between designers' individual experience, their knowledge of context of use and product usability take place during the design process? To address these questions an empirical study was undertaken involving sixteen product designers representing different age groups and levels of expertise. The study was conducted in two stages: (i) design stage, (ii) interpretation.

### ***Research Design***

This empirical study undertook a qualitative methodological approach and employed predefined design tasks that focus on the design of product usability. This research considers previous studies pointing out limitations of current approaches for uncovering

design knowledge, in particular: (a) difficulties to observe designers in action and understand their creative process as not all design knowledge is externalised; and (b) difficulties to conduct an empirical study and observation with enough realism to simulate what designers do in real practice (Lawson, 2004).

To overcome these limitations, this study is set out as collaborative design in order to: (a) provide designers with a natural setting that prompt them verbalise their thoughts, (b) provide a means to fill in gaps of information arising from the design brief that otherwise would be achieved via discussions with the client or experimentation with similar products. In this study, it is anticipated that facilitating designers to discuss the design task with a peer, will prompt different perspectives about the usability design issues. Observing the natural conversation between designers working on a design task will provide richer data about designers' experiential knowledge.

The study focuses on observing and investigating the early stages of the design process where usability issues are to be considered. It aims to identify the aspects of designers' experience and knowledge that are transferred into the design process, and the relevance of those aspects to the design of product usability. As it has been stated by other researchers, drawing is a useful source of insight into designers' knowledge; it provides a way to understand what they know (Lawson, 2004; Goel, 1995). The use of drawings to uncover experiential knowledge has been employed by Chamorro-Koc et al., (2008) in a study that focused on identifying people's concepts of product use. In this study, by employing drawings in a similar way, it is expected to identify aspects of designers' experiential knowledge influencing usability within the design process.

The pool of participants is comprised of product designers who are grouped in pairs for the collaborative design sessions. Designers are grouped according to their age group, gender and level of expertise, and they are invited to participate in a design session with two design tasks (Chamorro-Koc and Popovic, 2008). Experiment sessions are audio and video recorded and took place during 2008; data collected comprises: video-recorded observations, design sketches, and verbal protocols from design tasks and retrospective interviews. Table 1 summarises the research design.

Table 1: Research design summary

Objective	To investigate how designers design product usability, what informs their design process, the role their individual experience and episodic knowledge play within the design process
Expected outcomes	<ul style="list-style-type: none"> <li>• Identification of designers' experiential knowledge influencing the design of product usability</li> </ul>
Participants	<ul style="list-style-type: none"> <li>• Product designers representing differences in age, gender, and experience</li> </ul>
Design Brief	<ul style="list-style-type: none"> <li>• Two design tasks focussing on particular usability issues:</li> <li>• Design task 1: Design of Blood Pressure Monitor for elderly user</li> <li>• Design task 2: Design of Coffee Grinder for young professional multicultural couple</li> </ul>
Data collection methods	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Design task simulation (design scenario and design brief)</li> <li>• Retrospective verbal protocol</li> <li>• Interview</li> </ul>
Experiment session	<p>Sessions were organised in two parts:</p> <ul style="list-style-type: none"> <li>• Part 1: Design task 1, retrospective report</li> <li>• Break</li> <li>• Part 2: Design task 2, retrospective report</li> <li>• Interview</li> </ul>
Setting	People and Systems Laboratory at Queensland University of Technology (Australia)



### **The experiment session**

Two design tasks are involved in the experiment session. Each task dealing with usability issues particular to the user group identified in each design brief. It is expected that differences of design tasks would appeal differently to the designers, who might be knowledgeable about one topic but completely unrelated to the other one. This approach will help to compare design tasks and identify designers' experiential knowledge underlying their design process.

Data collection is organised into **two stages**: (i) design and (ii) interpretation. The design stage focuses on a design task which is presented through a design brief and a scenario. Figure 1 illustrates the design scenario and design brief presented to the designers.

Design Task 2: Coffee grinder
<p>Mei and Josh are a middle age professional couple who are enjoying their life together. They have spent time in developing common interests, like collecting Alfred Hitchcock movies and experimenting with B/W photography. Now they are into coffee and the diversity of flavors, aromas and types of coffee (espresso, cappuccino, latte, etc). They usually buy the coffee already packed, however they have found out that they can make their own combinations. They have decided to buy a coffee grinder so that they can create their very own combination of coffee.</p>
<p><b>Design Brief</b></p> <p>The design task is to design a domestic coffee grinder that allows at least 3 or 4 types of grinds according to the various types of coffee. The grinder capacity should allow for the equivalent of 2 cups of coffee, and it should allow for ease of use when measuring the amount of coffee required for 1 or 2 cups. Usability aspects of the design must be the focus of the design.</p>

Figure 1: Design scenario and design brief

In the design stage, designers are asked to work collaboratively and produce initial concept designs. The interpretation stage focuses on a retrospective verbal report in which designers are asked to describe the design concepts generated in the design stage.

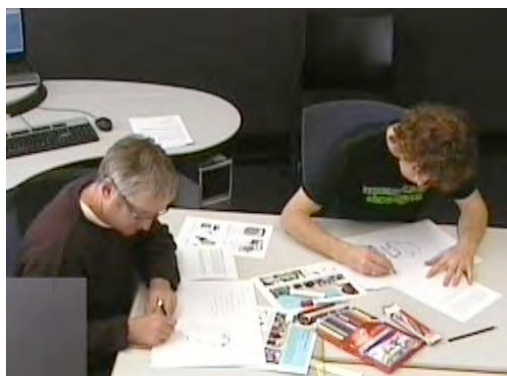


Figure 2: Design stage



Figure 3: Interpretation stage

Figure 2 illustrates a segment when both designers are producing and drawing their own ideas. It must be noted that this was prompted by initial discussion of the design brief and utilisation of their knowledge about the product based on individual experience. Initial ideas were triggered after consideration of the various aspects outlined in the design brief.

Concepts were then developed upon an iterative reflective process of design issues that were known to the designers or that were previously experienced. Outcomes from this stage consisted on: drawings, annotations, and observations of the collaborative design process in which designers' individual experience were verbalised. This data is later employed to gain insights about the ways designers incorporate their individual experience, knowledge of product and context of use into their design concept.

Figure 3 shows a segment of the interpretation stage session in which designers are describing their concepts, ideas and the design process undertaken. This session focuses on understanding the designers' design outcomes through their own interpretation. Retrospective verbal reports are employed to collect a description from the designers' own perspectives about the design task represented in the sequence of sketches (Hannu and Pallab, 2000). After the design task 1 and 2, questions presented to the participants were: (i) please describe your design as it is in the sketches, tell us about the design process, and (ii) how did you address product usability in this design? At the end of the session, an open ended interview is conducted to ask designers about any other issue arising from the initial observation of sketches, and provide the researcher an opportunity to ask about any gaps or doubts arising from the retrospective report. The final interview questions are: (iii) please compare design tasks 1 and 2: Which design do you think addresses usability issues better? Was one of the tasks more appealing to you? Why?

## Analysis of initial results

Drawings, annotations, and verbal reports were analysed and interpreted; this process aimed at identifying references made to usability and experience issues in visuals and verbal reports (Chamorro-Koc, Popovic and Emmison, 2008). The interpretation and analysis of visuals and verbal reports is assisted by ATLAS.ti, specialised software to assist qualitative analysis of data. From the data, textual and visual references to designers' knowledge, design process, usability issues, and type of solutions, were identified by the researcher and established as a system of coding categories. Table 2 shows the coding system.

Table 2: Coding scheme

Category	Code	Description
Experience (personal)	<b>IE</b>	Individual experience (of doing-using) – tacit knowledge
	<b>EE</b>	Episodic experience (memory) – situated experience/knowledge
Use (ways of use)	<b>Tu</b>	Typical use (function/ intended use) – current mental model
	<b>Au</b>	Anticipation – idea of future use (assumption)
Solution (artefact)	<b>Ps</b>	Prototypical solution or prescribed/general knowledge (adaptation or typification of knowledge)
	<b>Cs</b>	Creative solution – new design
	<b>PBC</b>	Principle base concept (tacit knowledge: knowing how - procedural)
	<b>DBC</b>	Descriptive base concept (explicit knowledge?)
Context	<b>Ac</b>	Activity
	<b>St</b>	Situation (physical, social, etc)
Usability	<b>Eu</b>	Ease of use (how easy or difficult it is to use?) – future use
	<b>Iu</b>	Intended use (what – how –where?) – new design
Process	<b>Ds</b>	Discovery (solo ideation – new ideas)
	<b>Rf</b>	Reflective (while discussing, outcome from participatory context)
	<b>AnU</b>	Analysis of the user (or 'use')
	<b>AnP</b>	Analysis of the product



The emerging coding system reveals different types of experience. In strict relation to the focus of this research, the coding system aims to identify references to the designers' individual experience with similar products (tacit knowledge); reference to a particular experience situated in particular context (individual or episodic experience), procedural knowledge, and anticipation of future experiences. Codes also aim to identify the usability aspects considered by designers, thus, aspects of the process are identified as reflective, discovery, creative; and usability issues have been referred to aspects of 'use', for example: intended use, ease of use.

The coding system was applied to the appropriate segments of text or drawing produced by the designers. For example, figure 4 shows an image of a coffee grinder designed by a pair of novice female designers (20 years old) and who have some work experience at coffee shops. In this section of the drawing, the code 'Principle Base Concept' (PBC) has been applied as it refers to the product design described by the rationale behind its functions. In this instance the drawing suggests that the designer knows how this type of product works and therefore, he has tacit knowledge of the assembly and function of the product, and thus, it indicates that tacit knowledge informs their usability design.

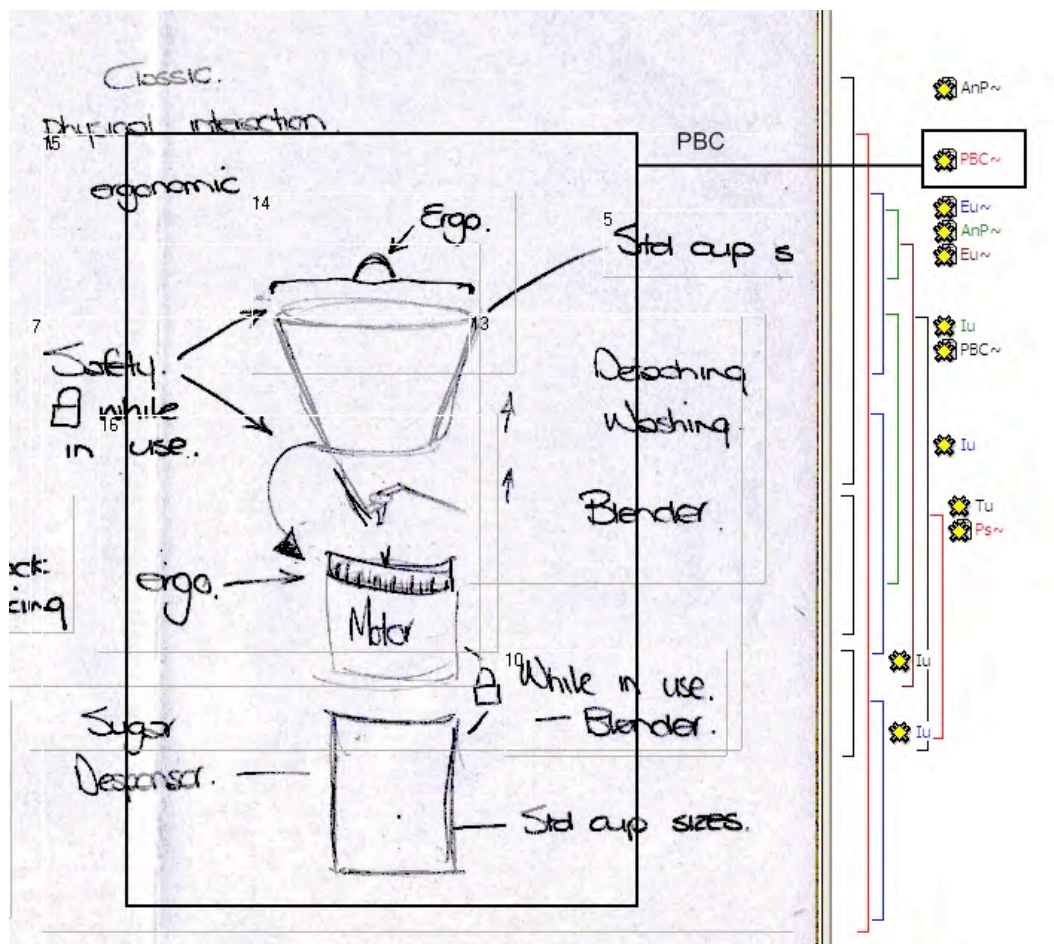


Figure 4: Exemplar of an application of the coding system

Each drawing and transcription were analysed by applying the relevant codes. Three independent coders did the coding in order to achieve consistency and eliminate potential bias. In addition, memos and notes were used to note discrepancies, uncertainties, ambiguities or other characteristics which were to be discussed after the coding was completed. This approach helped to validate the coding.

## Initial interpretation of results

Observation of code frequency and how codes relate to one another at particular segments of drawings and transcriptions from verbal protocols was employed to respond a set of questions outlined for the final analysis. This set of questions provided the basis for the initial interpretation:

- How do designers inform usability design? (sources of design knowledge: prototypical, assumption, experience)
- What types of 'designers' knowledge' inform usability design process? (tacit, explicit, adapted?)
- How do they design for usability?
- How do designers know their design is useful for intended users?

Responding to these questions helped the interpretation of how the designers have applied various levels of knowledge, experience and understanding of context of use to inform usability design. Table 3 summarises findings emerging from the initial interpretation.

Table 3: Summary of initial findings

Analysis question	Related codes
How do designers inform usability design?	DBC, PBC, Ps, Au, Tu, Cs
What types of designers' knowledge inform usability design process?	IE, EE
How do they design for usability?	Ds, Rf, AnU, AnP
How do designers know their design is useful for intended users?	Eu, Iu, Ac, St

For example, it was found that expert designers demonstrate a variety of design knowledge to inform their usability design. Such knowledge is evident in their representation and explanation of their concept designs, where solutions go from description base concepts (DBC), to detailed explanation of principle base concepts (PBC). Their knowledge comes from individual experience (IE) and episodic experience (EE); thus, it can be inferred that their usability design process is informed by the designers' tacit knowledge. In designing for usability issues, expert designers refer predominantly to the user's capabilities emphasising aspects of ease of use (Eu), intended use (Iu), references to the activity (Ac) and situation of use (St). The design process manifested by expert designers demonstrates a thorough assessment of solutions based on user (AnU) and context, and this process leads to 'solo' discovery moments (Ds), as well as iterative reflection (Rf). Finally, designers assess usefulness of their concept designs based on consideration of ease of use (Eu) and intended use issues (Iu), for which they refer to their individual experience and assumptions of future use.

In order to discuss indicative results, an initial comparison of data corresponding to a different category of: age, gender and expertise is presented. Comparison consisted of the following groups:

- Group Age: 20 year-old designers compared against 40 year-old designers
- Group Expertise: Novice/Expert designer compared against Expert/Expert
- Group Gender: Male/Female designer team compared against Female/Female team

**Group Age: (20s + 20s) compared against (40s + 40s)**

The group consisting of two expert designers in the 40 year-old age category applied a consistent design methodology which drew on a broad range of experience, knowledge sources and understanding of context of use to inform their usability design. This was evident in the discussion taking place during the design stage. The expert group made significant references to their individual experience throughout their design activities, and provided the highest diversity of usability design knowledge and application. This knowledge was evident in their design solutions, which they explained around the topics of ease of use, intended use, activity and context. Comparatively, the group consisting of two 20 year-old designers applied an inconsistent and moderate understanding of context of use, experience and knowledge to inform their usability design.

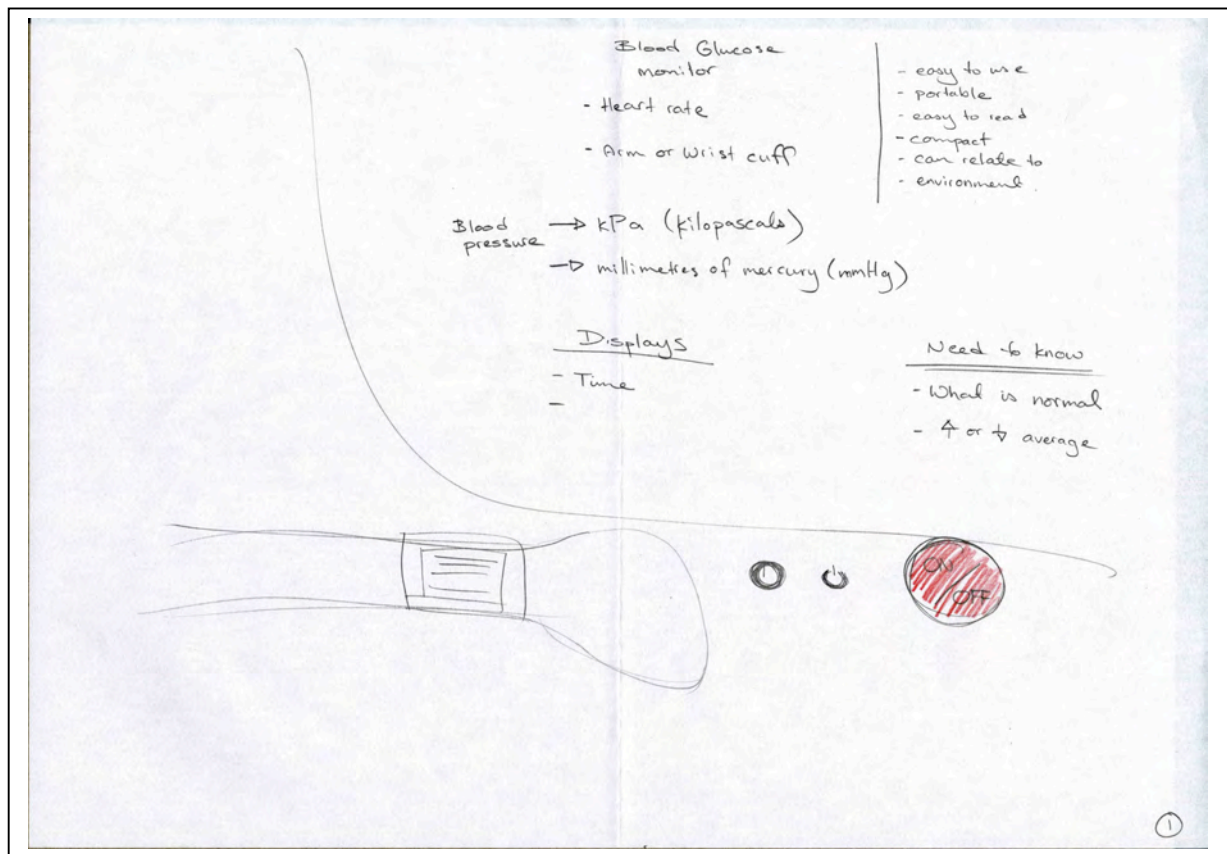


Figure 5: 20s year-old designers' concept

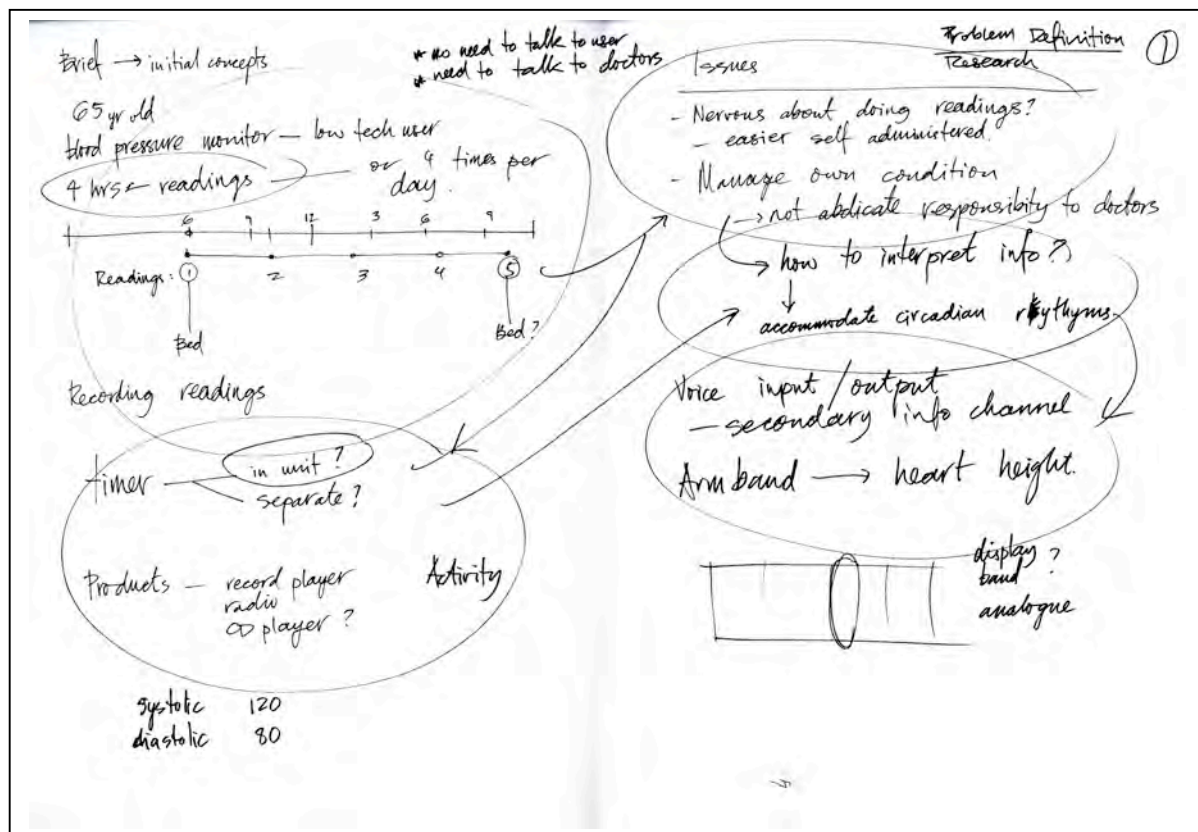


Figure 6: 40s year-old designers' concept

For example, figures 5 and 6 illustrate design outcomes from the 20 and the 40 year-old designers. In figure 6 it can be noted that usability aspects considered by the 20 year-old designers are mostly around the physical aspects of use of the product. They refer to the display, a portable device, the colour of the on/off button, and mention the 'ease of use' without identifying what makes this solution easy to read or to use. Differently, figure 6 shows that the 40 year-old designers considered various 'use' aspects of the design problem. They considered the type of information that must be available for the user, and the format in which this should be presented for ease of reading; types of input and output, the issue of 'how to use' the device; and the context in which the device would be used. Figure 7 shows only one part of the concept design, many more details of this concept development are presented in other drawings not shown here.

### **Group Expertise: (Novice + Expert) compared against (Expert + Expert)**

As described previously, the expert designers made significant references to their individual experience to inform their usability design. Comparatively, the group consisting of one expert (more than ten years of experience) and one novice designer (recent graduate) demonstrated an inconsistent application of different sources of knowledge. This is evident in the drawings and their retrospective interviews. For example, the collaborative design prompted a rich discussion about their individual knowledge and episodic experiences relevant to the design problem. Although such discussion resulted in the consideration of future contexts of use, it produced a limited concept development, where usability issues were considered second to the mechanical and functional aspects of the design. Nevertheless, during the interpretation stage, both novice and expert demonstrated knowledge and understanding of the context of use and usability aspects, drawing from diverse sources of experience; which were not referred to during the design stage.



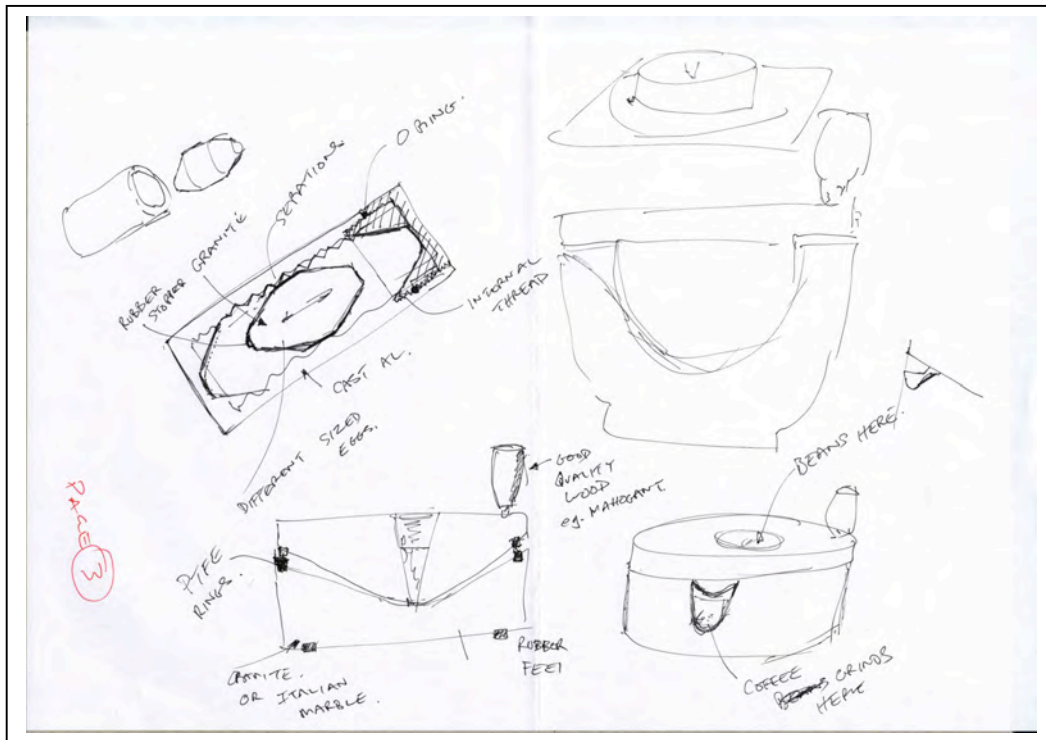


Figure 7: Novice/Expert designer concept

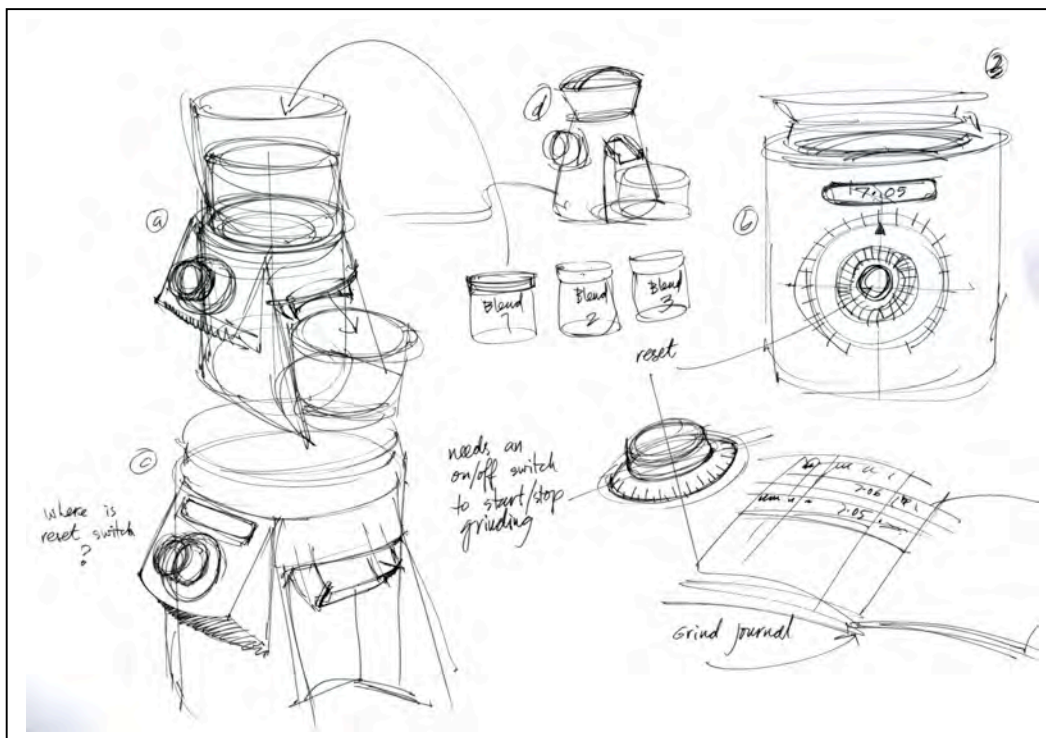


Figure 8: Expert/Expert designer concept

Figure 7 shows the novice/expert designers' concept design; it elaborates on the details about features, functions and mechanism of the product. Differently, figure 8 presents the expert designers' concept design, demonstrating not only understanding of the principles behind the functions and use of this type of product, but also it presents a 'story' behind the product use. This story refers to a particular function of the product, a type of 'selection' or 'setting', which can be recorded for future uses.

**Group Gender: (Male + Female) compared against (Female + Female)**

The group consisting of one male and one female designer refer to a diverse range of experience and understanding of context of use to inform their usability design. This was mainly observed from their discussion during the design stage. They referred to various past and episodic experiences relevant to the use of the product showing different points of view about the current and future use of the product. This discussion produced different ideas that they elaborated on, and transferred into concept designs. Comparatively, the group consisting of two female designers demonstrated similar points of views and experiences about the use of the product. Their discussion produced limited design concepts and low variety of ideas. Usability aspects relevant to ease of use and context of use were mentioned but not developed. Figure 9 shows the female/male designers' concept; the drawing shows a series of steps describing the different issues considered as part of the design process and three possible design directions. These solutions assume a future context of use. Figure 10 illustrates the female/female designers' concept, which emphasises mainly on the parts and main function of the product. Their design concept is based on a context of use they know.

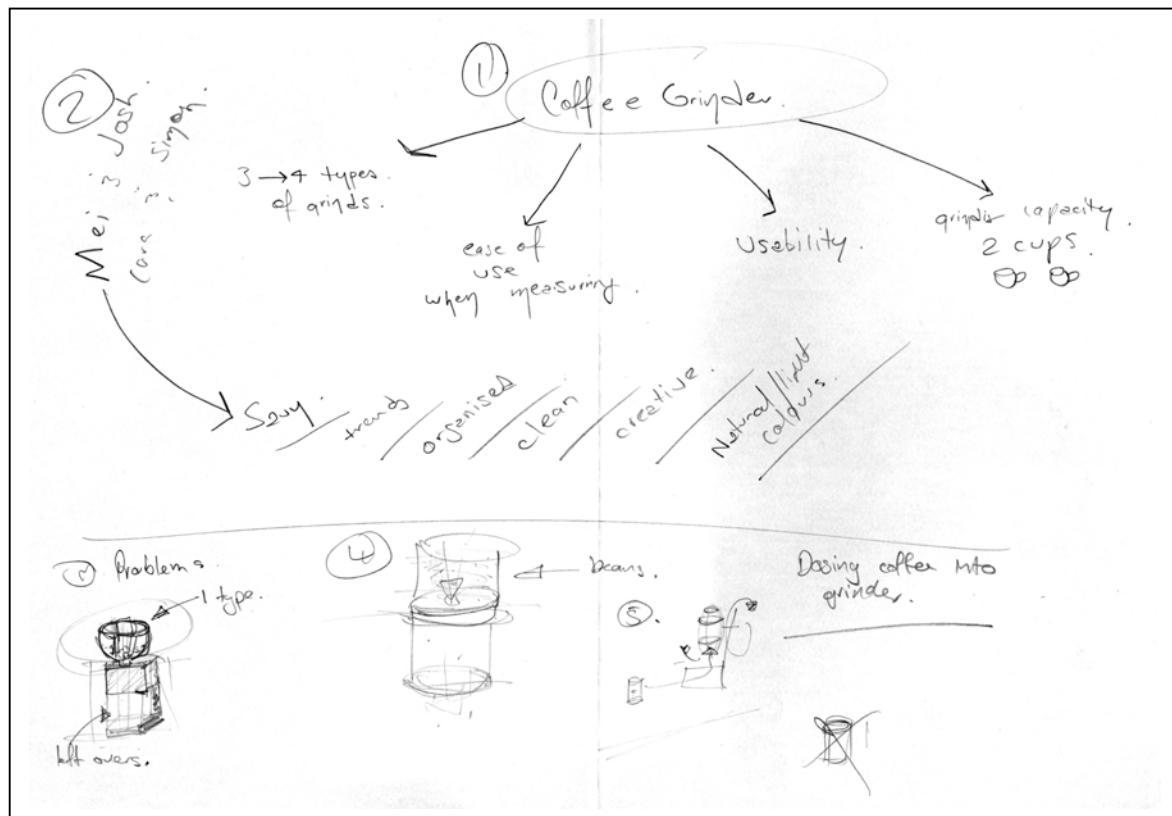


Figure 9: Male/female designers' concept

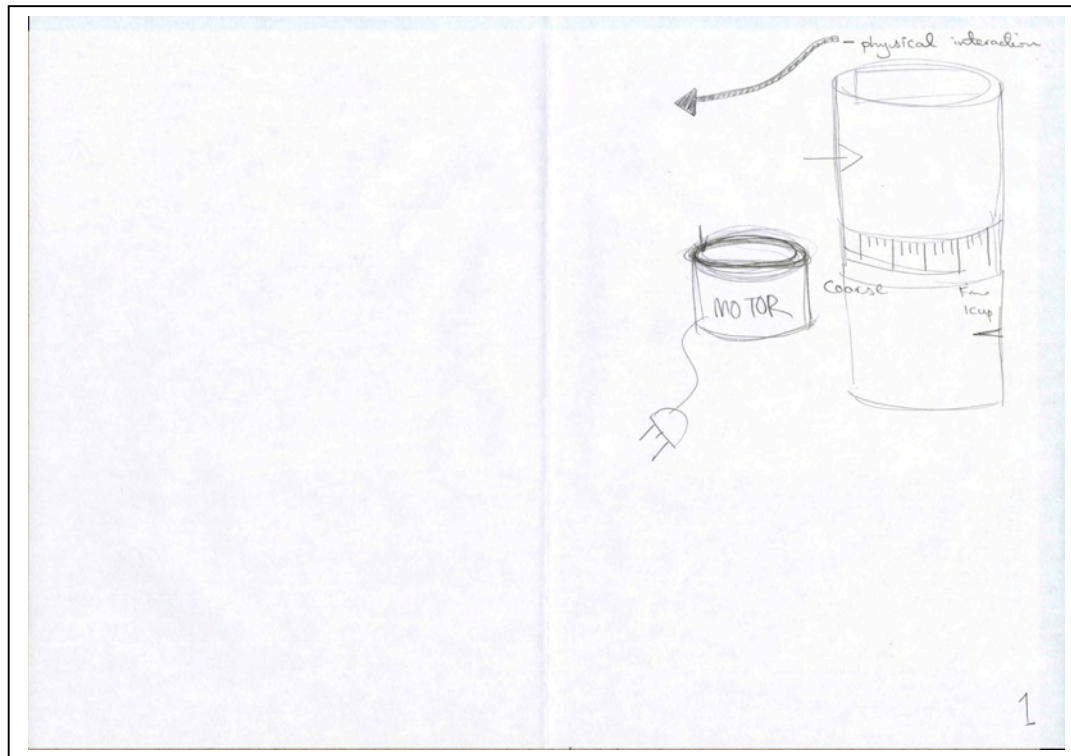


Figure 10: Female/female designers' concept

## Conclusions

Initial results show that designers' knowledge comes from their experience of using products or from episodic experience. It also demonstrates that designers transfer their experiential knowledge into solutions where tacit knowledge is represented through the procedure of a product's use, or into basic descriptions of features. Results also show that designers prefer to develop design concepts based on anticipatory knowledge (assumptions or predictions) rather than generalizing (or adapting) known solutions.

At this stage of the analysis, this study shows that designers' experiential knowledge influences the way they reinterpret the design task, and drives the usability design process. Designers' individual experience mandates the implementation of usability issues as part of the early stage of design process; where novice designers are less constrained than expert designers and design from assumptions of future experiences. These outcomes demonstrate the influence of various aspects of designers' tacit knowledge and experience in the design of product usability. Results also indicate that the collaborative design approach was critical in order to identify the role of designers' individual experience and the types of knowledge they use to inform usability design during the design process.

As this paper reports on work in progress, the final part of the analysis remains to be concluded. It is expected that comparisons among groups will help establish specific relationships between individual experience, knowledge of context of use, and the design of product usability. Identifying those relationships will complement the knowledge gained from Chamorro-Koc (2008) previous research, where similar relationships were found from the users' point of view. Knowing about users and designers' different views about product usability, and the sources of experience prompting that knowledge will contribute to our understanding of user-product interactions, and therefore, it will contribute to develop theory to better support usability within design process.



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# Graphic design pedagogy: Employing reflection to support the articulation of knowledge and learning from the design experience



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## Abstract

This paper describes the methodology for an ongoing PhD study that explores how reflection supports articulation of design knowledge by the tertiary graphic design student. The study seeks to make connections between the reflective process and the articulation of knowledge inherent in the design experience, leading to the transfer of that knowledge to future problems.

A case study strategy of inquiry has been employed, which draws on a mixed methods research approach, framed by cognitive psychology theory. An intervention in the form of a structured critical reflective learning framework has been developed and applied. To analyse the outcomes emerging from the learning framework, a taxonomy identifying levels of cognition evident in student reflective reports has been developed. The rationale for this methodology is discussed, along with how the approach was implemented.

Preliminary findings from the case study are reported. Initial observations suggest that structured critical reflection can play an important supporting role to encourage enhanced cognitive engagement and to support articulation and knowledge transfer by the design student.

## Keywords

Design pedagogy, reflection, design knowledge, cognition, knowledge transfer, research methodology.

## Introduction

This paper describes an on-going PhD study investigating how structured critical reflection can support the graphic design student articulate knowledge and learning from the design experience, in a manner that encourages knowledge transfer.

Traditionally, graphic design education has drawn on the principals of studio-based learning, project-based learning, and public critique (Davies & Reid 2000). This reflects the general approach in the graphic design program at the University of Wollongong, Australia, where this study is situated. Guided by feedback from teachers and peers, these learning approaches typically engage students in authentic learning environments with increasingly more complex design projects as

they advance through the course. This learning-by-doing approach reinforces a traditional pedagogical belief in design curricula that the best way to learn about design is through the act of designing (Dorst & Reymen 2004). This seems on the surface to be an effective way to approach the complex and ill-structured nature of design problems, however, on close examination this may not be the most effective way to teach or learn, and opportunities for learning may be missed. In the traditional pedagogical model the final design artefact is the primary measure of learning, which has the effect of focussing students on the outcome of the project rather than the process by which that outcome is achieved (Kvan 2001; Lawson 2006). It is seldom clear what the student has actually learnt as the new knowledge is bound within the artefact and the context in which it was developed.

To address these limitations, a revised pedagogical approach has been developed that seeks to: support cognitive engagement through reflective practice, encourage abstract levels of cognition, and support articulation of generalisations from the learning experience. Through this process of generalisation, the aim is to assist the learner to articulate the knowledge represented in their design experience, establishing a platform to support transfer of knowledge to other situations.

## **Methods used**

### ***Research design***

Cognitive psychology is the theoretical basis framing the intervention for this study, in particular the concepts of 'high road' and 'low road' transfer (Perkins & Salomon 1989). A primary aim of the intervention is to support the articulation of design knowledge in ways that would encourage the transfer of that knowledge to future situations. 'High and low road' transfer provide a means by which to conceptualise this process.

A case study strategy of inquiry was chosen, as the study is located in a single setting (a classroom), a specific bounded system, from which an in-depth understanding is sought. The research seeks to understand how one group of students enrolled in a single subject of study respond to a specific intervention.

Use of a mixed-methods approach allows a more complex picture of the case study to be developed. By employing both qualitative and quantitative methods it is possible to obtain a more comprehensive data set, thus enhancing the impact of the study.

### **Theoretical framework: Cognitive psychology**

The primary aim of the intervention in this study is to encourage students to learn from the specific projects in which they engaged in ways that would allow them to use that knowledge in future situations. Put another way, the aim is to enable learners to 'transfer' their knowledge from their student projects to their future practice as designers. The phenomenon of transfer has been of interest in educational psychology for many years (Perkins & Salomon 1988); (Bransford & Schwartz 1999), and in particular the concepts of 'high road' and 'low road' transfer (Perkins & Salomon 1989).

'Low road' transfer occurs when skills and knowledge learned in one context can be readily applied to another similar context (Perkins & Salomon 1989). This process occurs with relative ease because the similarities between the learning context and the new context allow the learner to recognise which skills and knowledge are useful and how they should be applied. 'High road' transfer, by contrast, occurs when knowledge is used in a new context that is different to the learning context (Perkins &

Salomon 1989). This type of transfer is believed to rely on mindful, deliberate abstraction of principles, either in advance of its new application or by recalling past experiences in light of a new situation and abstracting relevant principles retrospectively.

In graphic design practice, new problems often bear little surface similarity to past experiences because the particularities of design problems are highly variable. Instead, graphic design professionals rely on 'high road' transfer to learn lessons from current projects that will be useful in future practice and to draw on past experiences when faced with a novel problem. Further, in graphic design education it is not possible for students to be introduced to every type of problem as part of their training. They must learn from a limited number of student projects, which may or may not closely resemble their future work as a designer. Therefore, the practice of high road transfer is essential to the preparation and practice of graphic designers.

For these reasons, teaching for high road transfer has been used as the theoretical basis for the intervention in this study. It should be noted that in order to manage the scope of the study, the researchers have been concerned with promoting abstraction through reflection as a precursor that supports transfer rather than attempting to measure transfer itself.

### **Case study as a research strategy**

A case study approach departs from other traditions of qualitative research in that it focuses on a bounded system (the case) that is studied in depth (Creswell 2005).

Yin defines a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly defined" (Yin 2003 p. 13). A case study approach is particularly suited when 'how' or 'why' questions are being posed and when the investigator has little control over events, and should be seen as a comprehensive research strategy that includes the logic of the research design, data collection techniques, and specific approaches to data analysis (Yin 2003).

This case study sets out to provide an insight in to how the implementation might enhance student learning. Case studies of this kind, in which the researcher develops and implements an intervention based upon instructional theory, offer a powerful means for investigating and furthering theories of instruction (Reigeluth & Frick 1999). This is because they can investigate the effects of an instructional intervention that operationalises particular theoretical principles in a natural setting. This has the strength of allowing a realistic assessment of a new instructional approach in combination with a comparison of the actual outcomes and experiences with those predicted by the theory. Thus the implementation of the intervention bounds the case and allows for in-depth investigation of the phenomenon.

### **Mixed methods as a research methodology**

Social phenomena are complex and a range of research methods are needed to better understand these complexities (Creswell, Plano Clark, Gutmann & Hanson 2003). Whilst employment of mixed-methods approaches in social science research has been widespread (Maxwell & Looms 2003), as a research method it is still in its adolescence (Tashakkori & Teddlie 2003). By using more than one research method it is possible to obtain a more complex picture of human behaviour and experience, and increase the scope and comprehensiveness of the study (Creswell et al. 2003; Morse 2003; Mertens 2005).

This study has implemented a sequential mixed method approach (Creswell 2009) where qualitative methods are the primary method and supplementary quantitative data in the form of a survey to provides a more comprehensive picture of the case.

Qualitative methods suit research that is designed to provide an in-depth description of a specific program, practice, or setting and involves a set of interpretative material practices to reveal the world in which the research and observer are located (Mertens 2005); qualitative researchers “study things in their natural settings, attempting to make sense of, or to interpret phenomena in terms of the meanings people bring to them” (Mertens 2005 p. 229).

## **Research context**

### **The setting for the study**

This study was conducted with students enrolled in a core design subject in the final session/semester of the three-year Bachelor of Creative Arts (Graphic Design) at the University of Wollongong. Thirty-four students were enrolled in the subject. The student cohort consisted of an equal gender split, with approximately 75% of the cohort aged 18-22, 20% aged 23-30, and 3% 30 years and above.

## **The Intervention**

### **A structured critical reflective learning framework**

An intervention was developed to address the limitations regarding traditional approaches to graphic design pedagogy outlined in the introduction by formally engaging with the design process and the learning opportunities it presents. Through this approach the intervention seeks to support the learner to articulate their new knowledge in a generalised manner, decontextualised from the design artefact. The proposition is that supporting the learner in this way serves to unlock the knowledge bound within the design artefact, establishing a platform from which the learner can transfer this knowledge to other situations.

The intervention has been articulated in the form of a *structured critical reflective learning framework*. *Structured reflection* has been described as the process of “systematic reflection that is performed in a regular way during a design process” (Reymen, Hammer, Kroes, van Aken, Dorst, Bax & Basten 2006 p. 148). *Critical reflection* is defined as reflection that “necessitates a change to deep-seated, and often unconscious, beliefs and leads to new belief structures” (Kember, McKay, Sinclair & Wong 2008 p. 2).

### **Background to the framework**

The framework builds on a foundation of studio-based and project-based learning, and engages with the principles of: reflective practice (Schön 1987; Valkenburg & Dorst 1998), problem-based learning (Koschmann, Myers, Feltovich & Barrows 1994), and experiential learning (Kolb 1984; Boud & Walker 1991). These learning approaches are briefly outlined below.

Project-based learning, a common practice employed in graphic design education (Pearson, Barlowe & Price 1999; Davies & Reid 2000; Ehmann 2004), has been described as a “comprehensive approach to classroom teaching and learning that is designed to engage students in investigation of authentic problems” (Blumenfeld, Soloway, Marz, Krajcik, Guzdail & Palincsar 1991 p. 369). By placing students in realistic, contextualised problem-solving environments, project-based learning can serve to establish bridges between knowledge gained in the classroom and real-life experiences (Blumenfeld et al. 1991 p. 369).

Studio-based learning is traditionally situated in a design studio environment under tutelage of a master designer (Lackey 1999). It encourages 'learning by doing' in a professional environment similar to one students would experience in industry (Carbone, Lynch, Arnott & Jamieson 2001). In the studio, the teacher engages the student in the activity of designing with the relationship between teacher and student framed by the master-apprentice approach (Kvan 2001). Kvan describes four fundamental steps in the traditional studio-based learning process: the formulation of the problem, the exploration of solutions through 'action-based activity', problem re-examination, and examination by jury. The exploration of solutions and problem re-examination steps are cyclic in nature with the student preceding to final examination once they are satisfied (or the deadline is reached) with their design solution.

Schön (1987) highlights reflection as a critical element of professional design activity. Describing the notion of the reflective practitioner, Schön articulates two types of reflection, reflection-in-action and reflection-on-action. Reflection-in-action takes place when the design professional is 'surprised' by, or experiences a unique situation during the development of the design solution. Reflection-on-action involves the review of actions from the recent past and has been described as the "process of making sense of an action after it has occurred and possibly learning something from the experience which extends one's knowledge base" (Eraut 1994 p. 146).

Valkenburg and Dorst (1998) apply Schön's reflective practice theory to outline the process of practice in an industrial design studio. They articulate the mechanism of reflective practice based on Schön's reflective practicum in four stages: 'naming', in which the problem is articulated; 'framing', the context of the problem; 'moving', the design activity; and 'reflecting', in which the designer assesses the design development within the frame (problem context). The reflective stage is a "conscious and rational action" (Valkenburg and Dorst 1998, p. 254) that may guide the student towards re-framing the problem, further design activity, or addressing new issues that emerge through the reflective process. Valkenburg and Dorst conclude the descriptive method provides a framework that allows the breakdown of the design process for observation and discussion. They suggest this approach could be beneficial in the education environment as it provides a framework in which to articulate the activity of design.

Problem-based learning has been described as an instructional educational methodology in which students engage with contextualised problems and look to discover meaningful solutions (Rhem 1998). An essential aspect of problem-based learning is the use of 'real-world' problems to frame the approach to learning (White 1996). It is through this discovery that the students identify what they know and importantly what they don't know, establishing a framework in which to approach the problem (Duch 1997; Major & Palmer 2001). Koschmann et al. (1994) describe five fundamental steps in problem-based learning:

- 1) problem formulation;
- 2) development of a solution through a self-directed learning approach;
- 3) a re-examination of the problem to test the proposed solution;
- 4) abstraction where the solution is contextualised with other known cases;
- 5) a final reflection stage where the students reflect and critique their learning process seeking to identify areas for future improvement.

Usually working in groups, the students circulate through the first three stages until a satisfactory solution is developed before moving to the stages of abstraction and reflection. The final two stages of problem-based learning, abstraction and reflection



provide a structure in which to approach the final stage of the framework devised for this study.

A common understanding of experiential learning is based on the work of Kolb (Moon 2004). Informed by the work of Dewey, Lewin, and Piaget, Kolb (1984) describes the cycle of experiential learning in four linked stages: concrete experience; reflective observation drawn from the experience; abstract conceptualisation which involves the development of general rules describing the experience, or the application of known theories to it; and active experimentation involving the formation of approaches to modify the next occurrence of the experience. Kolb (1984) states that learners might cycle through the four stages a number of times and may start their learning at any stage of the cycle.

Reviewing the literature, Moon (2004) observes that there are many criticisms of Kolb's cycle including that it is overly simplistic and formulaic, does not adequately consider transfer of learning, is too focused on the notion of the experience as a phenomenon of the individual, and does not take into account tacit knowledge. However, Moon does suggest that these criticisms may have more to do with the way the cycle has been reinterpreted, rather than the cycle itself.

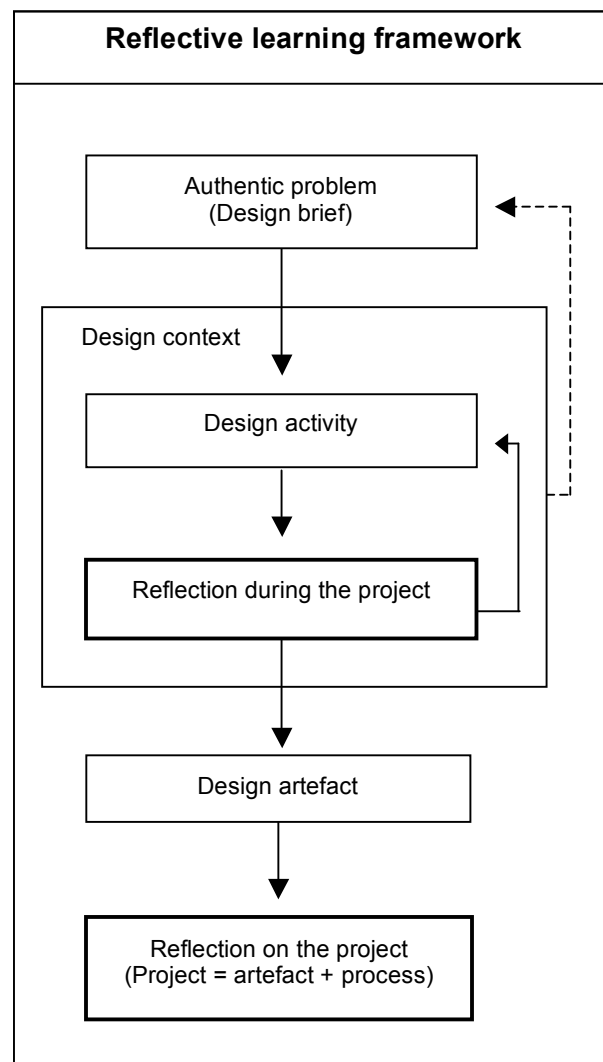
An important aspect of learning from experience is that an intervention in some form or another is required to facilitate the generation of knowledge from that experience. Criticos makes the observation "if experience in itself was so valuable, then humans who are enmeshed in experience ought to be more knowledgeable than they are. Sadly the only conclusion that can be reached is that we do not learn from experience" (Criticos 1993 p. 161). Criticos suggests that to generate knowledge from experience, some form of processing of that experience should take place.

### **Framework described**

Drawing on elements of the learning approaches described above, the framework (described in figure 1) commences with an *authentic problem* or design brief, the frame or design context is established, learners then engage in a cyclic process of *design activity* and *reflection during the project*. Once the design solution is complete (or the deadline reached) the students submit the design artefact and then move to the final stage of *reflection on the project*.

The *authentic problem* or design brief can be structured or unstructured depending on the learning objectives and level of study, or even developed by the student themselves. More importantly, an authentic problem is established to drive the learning (Blumenfeld et al. 1991). The *design context* is then articulated with the extent of detail determined by the learning objectives and level of study. While the design context has been articulated separately to the design brief in this framework there is no reason it could not be included in the design brief. What is important is that the design context is separated from the design problem as this plays an important role in the later stages when the student is asked to make observations regarding their design outcomes in a decontextualised and generalised manner.

Once the problem and context are established the student enters the stages of *design activity* and *reflection during the project*, which occur in a cyclic manner within the *design context*. The *design activity* stage is the activity of designing or 'learning-by-doing' and is fundamental to the authentic learning environments of the learning models that have informed this framework. The *reflection during the project* stage draws on the principle of reflection-in-action from Schön's model of the reflective practitioner (1987). During these two stages the *design context* and/or the original *problem* maybe re-examined.



*Figure 1: Structured critical reflective learning framework developed for study*

Once the design solution is satisfactorily developed or the deadline is reached, the student enters the *design artefact* stage where they present their solution in the form of a physical artefact. What form this might take will again be influenced by the learning objectives and level of study, but also the time allocated to the project. Presenting the design solution in the form of a physical artefact is also fundamental to authentic learning environments.

Up to this point the framework would be very familiar to those educators following a traditional learning approach as the learning framework has close parallels with the fundamentals of project-based and studio-based learning. Where the framework begins to depart from these models is with the formalised articulation of reflective practice. While it could be argued that reflection is inherent or implicit in project-based and studio-based learning models, by formally articulating reflective practice, the new framework seeks to highlight for the student the role reflection plays in the learning process.

By breaking down the design experience for the student into discrete stages, provides points of reference for them to evaluate and analyse their design experience. This is formalised through the introduction of reflective assessment

tasks. These tasks lead students through a series of learning prompts (Nuckles, Hubner & Renkl 2009) to document their design ideas and thinking, their research, and design process. Students also document the feedback they receive during formalised critique and importantly how they feel about that feedback. This serves to engage the student in the feedback process and the emotional aspect of their learning experience (Boud & Walker 1991).

The new framework departs from the traditional graphic design pedagogical approach with the inclusion of an additional stage after submission of the design artefact. This additional and final stage is identified as *reflection on the project*. The students are prompted: to stand back and distance themselves emotionally from the design artefact and process so they are better placed in which to observe and analyse their experience; to identify and analyse significant moments in the process and outcomes from the artefact; and to employ these observations to develop generalisations about their experience. The students express this in a written report guided by a series of learning prompts.

This stage is primarily influenced by the Schön's notion of reflection-on-action and also draws on the principles of problem-based learning and experiential learning. This stage has similarities with the *reflective stage* of the competency centered and project-based curriculum developed in the department of Industrial Design at Eindhoven University of Technology (Gielen, Janssen Reinen & Dorst 2007).

Standing back from the design experience has parallels with the abstraction stage of problem-based learning. Abstraction provides "an objectivity in relation to the initial learning experience, which has the effect of clarifying it and fostering the ability to work with it, so the learner can draw out potential learning" (Walker 1985 p. 63). Once students are through the design artefact submission phase they are in a better position to distance themselves emotionally and look objectively at their solution. This is achieved by prompting the students to describe the design problem, their primary research, and their design process in a report format.

The students are then prompted to identify and describe what they believe are critical moments in their design process/outcomes and explain why. This aspect draws on critical incident analysis described by Tripp (1993)(1993) and Ghaye & Lillyman (1997). Tripp notes "incidents happen, but critical incidents are produced by the way we look at a situation, it is an interpretation of the significance of the event" (1993 p. 8). It is reflecting on and analysing these critical incidents that "assist the practitioner in moving their practice forward and obtaining expert status" (Ghaye & Lillyman 1997 p. 80).

Building on the observations that emerged from the critical incident analysis phase, the students are then prompted to; describe possible alternatives to their submitted design artefact, to identify and generalise what they learnt from their experience, and how they might approach a similar design problem in the future. This has parallels with the experiential learning stages described by Kolb (1984) of *abstract conceptualisation* involving the development of general rules describing the experience, and *active experimentation* involving the formation of approaches to modify the next occurrence of the experience. Figure 2 summarises the framework, key literary influences, and the learning supports described above.

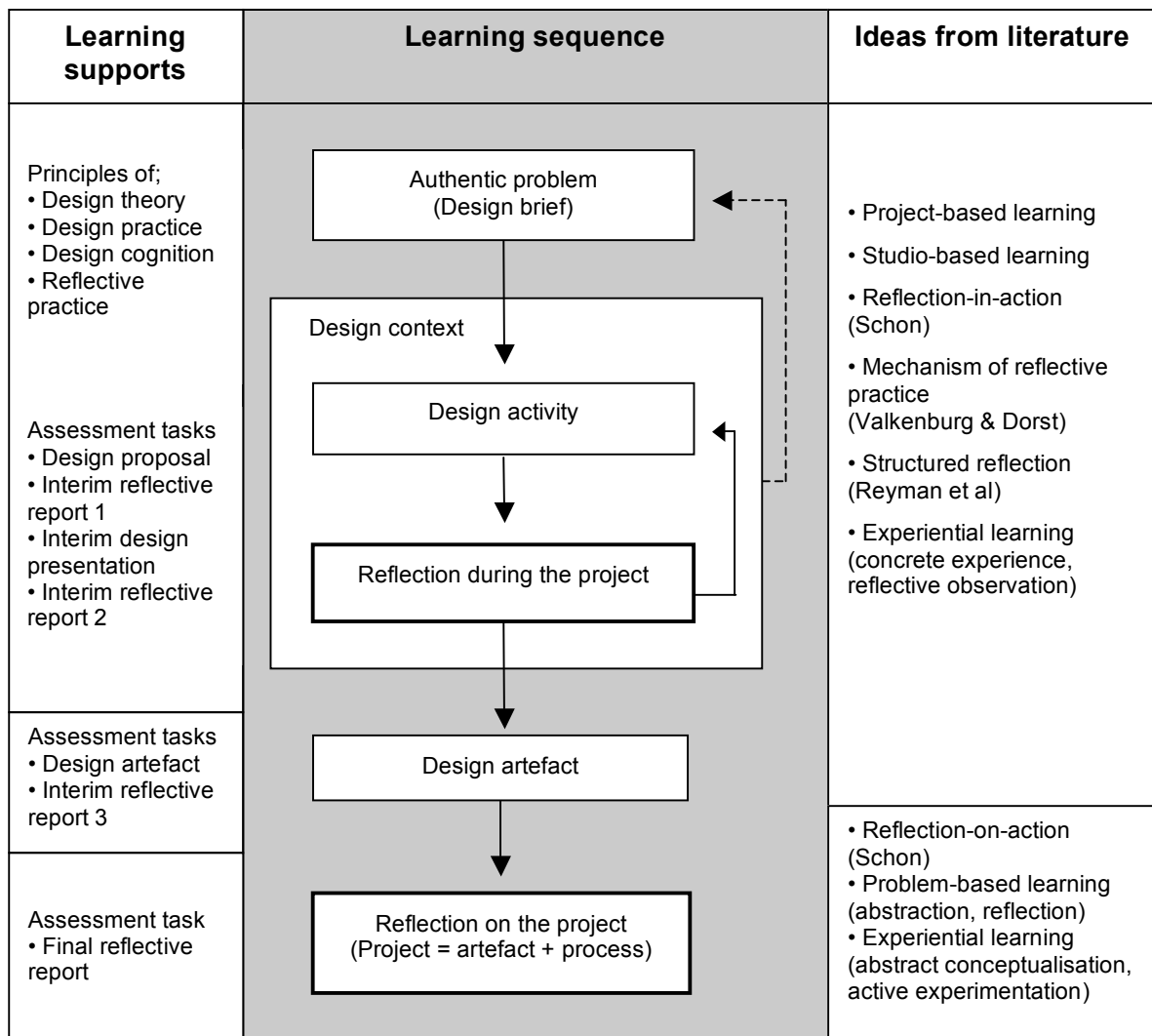


Figure 2: Structured critical reflective learning framework with key literary influences and learning supports

**Data collection**

Multiple data sets are employed for the study in keeping with a mixed-methods approach and to assist in developing an in-depth picture of the case (Creswell 2007) and provide a triangulation strategy to enhance data dependability, credibility, and confirmability (Mertens 2005; Creswell 2009). Data includes a survey, semi-structured interviews, observation, a researcher’s journal, and participant artefacts.

A survey with quantitative and qualitative questions was applied to establish research participant background, their understanding of the design process, thoughts and opinions regarding reflection during the design process and on completion of the design artefact. Semi-structured interviews were conducted with nine volunteers at 3 points during the course of the study to provide in-depth individual cases within the broader case. This is described as a nested case study. An alternative person was commissioned to conduct the interviews to avoid a conflict of interest for the researcher (also lecturer for the subject).

A key feature of the data approach for this study is the collection and analysis of participant artefacts (written reflective reports). The reports were based on the reflective learning framework and were embedded into the subject curriculum in which the study was based. The reports took the form of assessment tasks including

a 1200 word interim reflective assessment task repeated three times at significant points during the development of the design project, and a concluding 4000 word reflective assessment task completed after submission of the final design artefact that directed participants to look back over the whole project.

The reflective assessment tasks are structured in four key sections, describing the design process, summarising critique feed back, identifying critical incidents, and making observations about the design experience. The final reflective assessment task incorporates the same key sections, although omitting feedback (as no further feedback takes place once artefact submitted), but adding two new sections, identifying new learning, and how the experience could impact on future practice. The tasks guide the student to capture, in a formalised manner, their design experience and thinking during these key discrete stages.

### **Data analysis**

Qualitative analytic strategies are being employed to analyse the data collected during this study including, coding, memoing, pattern identification, and the drawing of conclusions (Miles & Huberman 1994). Analysis to date has focused on coding the reflective written assessment tasks, which has involved the development of a taxonomy to identify and code the levels of cognition present, and also the use of the software program QSR NVivo for it's data search options and ability to manage and map large volumes of data.

### **Development of a cognitive taxonomy**

To identify the levels of cognition evident in the written reflective assessment tasks, a taxonomy was developed based on the work of Hatton & Smith (1995) and Bennett (2002). Hatton and Smith developed one of the best known frameworks describing levels of reflection (Moon 2004) which drew on experimental work from the reflective writing of teacher education students, and was developed into a tool for wider application.

Adapting the work of Hatton and Smith (1995), Bennett (2002) developed a cognition taxonomy to identify levels of reflective thinking evident in reflective writing of students in a Masters of Education. Bennett identifies and describes five levels of cognition: *reproductive description*, *summarising description*, *interpretation*, *judgement*, and *generalisation*. The levels of cognition with descriptors are outlined in Table 1. In collaboration with Bennett, these descriptors have been modified to allow application to this study. A sixth level of cognition has been added, described as *abstraction*, to differentiate thinking that moves beyond the context of the design project to address wider or future design practice from generalisations about the project context.

The aim is that the student demonstrates evidence of engagement with the *generalisation* and *abstraction* levels of cognition. *Generalisation* prepares the student for low road transfer and *abstraction* for high road transfer. A general observation or conclusion articulated within the context of the project (*generalisation*) prepares the student to transfer that knowledge to a similar context (low road transfer). By articulating a general principle or procedure that moves beyond the design project (*abstraction*), the knowledge is decontextualised from the learning situation. It is here that the new knowledge has the potential for high road transfer, that is, to be applied in a different context to the learning context (Perkins & Salomon 1989).

<b>Cognitive levels</b>	<b>Cognitive Descriptors</b>
<b>Abstraction</b>	Presents a general principle or procedure that moves beyond the design project to address wider or future practice
<b>Generalisation</b>	Presents a general observation or draws a generalising conclusion within the context of the project
<b>Judgement</b>	Goes beyond re-presenting or interpreting information to offer a value judgement or claim within the context of the project
<b>Interpretation</b>	Identifys and seeks to explain or make sense of an event or statement by interpreting information from the project.
<b>Summarising description</b>	Descriptive response that summarises or recounts information presented in the project. This includes re-wording and re-structuring of a number of events into one statement
<b>Reproductive description</b>	Descriptive response that reproduces information directly from the case with no elaboration

Table 1: Cognition taxonomy

## Preliminary observations from the data

This paper presents some preliminary results and observations from the study, however detailed analysis is still ongoing and will be reported more fully in future publications. The four reflective reports were coded in the QSR NVivo data analysis software program using the analysis framework. This was done by assigning individual sentences in each report to one of the levels. When assigning an individual sentence to a particular cognition level, the context of the sentence was considered, and if some doubt existed regarding levels placement, then the sentence was coded at the lower level.

The data from an individual participant is presented below (figure 3) to illustrate the data analysis approach and the nature of the results that can be derived. The figure shows the four reflective assessment tasks (identified as RT 1-4), divided into the key sections (as previously described) and coded using the six levels of the analysis framework (cognition taxonomy). The table beneath the graph indicates the percentages at each level for each section of an assessment task.

Focusing on the concept of high and low road knowledge transfer, which would be evident in the *generalisation* and *abstraction* levels of cognition, it was anticipated that engagement in these levels would occur across the key sections of Observation (RT1-4), New Learning (RT4) and Future Practice (RT4), and strengthen towards the later reports. This was due to the nature of the learning prompts for these sections and the effect of participants gaining familiarity with the nature of the tasks. While the example presented concords generally with this expectation there is a lack of higher level thinking within the Observation section of RT4, but stronger engagement in the New Learning and Future Practice sections. Also of interest is that thinking in the baseline category of *reproductive description* only occurs in the final reflective task (RT4). This may be due to the increased length of the final task, allowing the participant space to explore across the full range of cognitive levels.

Patterns present in the broader data set will reveal insights into how student engagement with reflection as a support mechanism impacts their levels of cognitive engagement.

**Individual participant profile**

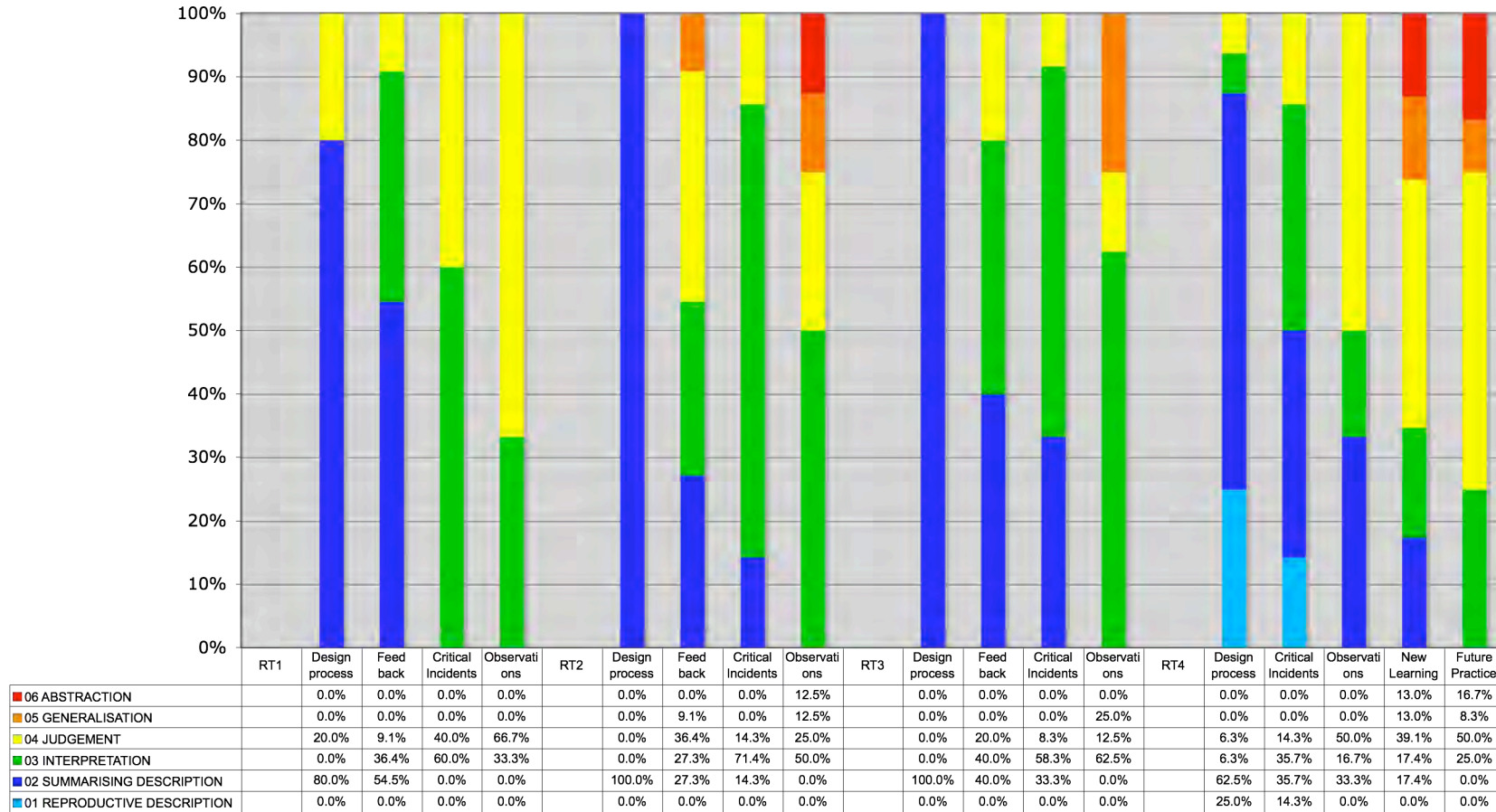


Figure 3: Individual participant profile: Reflective tasks 1-4 coded to levels of cognition



## Conclusion

Explored here is the notion that structured critical reflective practice has the potential to support enhanced cognitive engagement and transfer of knowledge in design education. The paper describes an ongoing PhD study that seeks to make connections between reflective practice, the articulation of knowledge inherent in the design experience, and how this might support knowledge transfer to future design problems.

This paper has focused in particular on the research methodology developed for the study. An important challenge has been to develop a methodology that would provide a sound academic basis in which to conduct the research. Utilising a case study strategy of inquiry, a mixed-methods research approach, and drawing on cognitive psychology theory, has provided an academically robust framework in which to undertake the research. This has the benefit of bringing credibility to the conclusions that are emerging from the study, and importantly, has also provided a structure to guide the development of the research method. This has allowed the case to be fully investigated and reported in a manner that will contribute to the body of research in design pedagogy. This is particularly evident in the manner in which the intervention for the study was developed and successfully implemented, and in the development and application of a taxonomy to identify and code the levels of cognition present in participant artefacts.

Based on the quality of data collected and preliminary analysis, the research methodology developed for this study has been successful in delivering tangible insights into the effectiveness of the intervention, from which credible conclusions may be drawn. The result is a research methodology that the authors believe is highly suitable to the conditions of the study and the type of research questions being asked, and is comprehensive and flexible, allowing a thorough investigation of the case. This methodology could justifiably inform future research in design pedagogy.

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## **Creative professional practice in methods and methodology: case study examples from Ph.D's in industrial design**

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### **Abstract**

In addition to making a contribution to new knowledge, other key requirements for a Ph.D are the application of robust research methods within an appropriate and pre-defined methodology. It is central to any methodology to collect data by various means and from various sources and opportunities exist to undertake this by the researcher engaging in creative professional practice. When considering the application of such methods, it is necessary to ask two key questions: can the process/outcomes supply robust data and does the researcher have the necessary capability as a practitioner to enable generalisations to be made. The latter issue brings into question the need for appropriate supervision, as judgements must be made on the capability of the researcher and quality/relevance of creative output i.e. do their supervisors need expertise in practice? It is also necessary to acknowledge the motivation of visually creative researchers who may have a fundamental desire to continue to engage in practice.

Much of the published material in this field focuses on more theoretical positions, with limited use being made of completed thesis that demonstrate or discuss case study examples. The aim of this paper is to contribute to the debate by exploring the issues of data collection and researcher capability/motivation during what the author defines as 'researcher-practice'. This is achieved through the use of Ph.D case studies that were either undertaken or supervised by the author in the area of industrial design. Specific examples of researcher-practice focus on the following activities:

- The use of output from practice for quantitative data collection (e.g. for comparative analysis)
- The use of output from practice for qualitative data collection (e.g. reflecting on new working practices)
- The use of practice to progress the development (design) of research output (e.g. designing design tools)

The paper concludes by drawing together the strategies employed in the Ph.D's to identify themes which enables the definition of a generic researcher-practitioner methodology.

### **Keywords**

Practice; industrial design; case study; Ph.D; creative arts

## Introduction

The data collection techniques available to the design-based researcher range from quantitative methods, with their origins in scientific investigative enquiry, to qualitative methods that are more typical of the social sciences and humanities. The nature of the research methods applied during practice-based creative activity has led to a tendency to assume that qualitative methods are the most appropriate. This is summed up by the UK Council for Graduate Education (1997, p. 16) who state that:

Research in the practice of the Arts related subjects is more likely to employ qualitative research methods. This kind of research does not, typically, begin with a predetermined set of questions or assumptions but arises from particular situations or contexts, which can be described with sufficient precision for a project to emerge which can be scrutinised and approved by the institution and supervisor.

Ultimately, the specific combination of research methods will be dependent on the nature of the research questions being addressed and, providing these can be robustly answered, the use of both quantitative and qualitative methods may be relevant. It is important to stress that there is not necessarily a 'right' way to undertake Ph.D research, but the methodology must be capable of being robustly defended.

This paper gives examples of data collection through researcher-practice using both quantitative and qualitative methods. It goes on to extend the role of researcher-practice for 'data translation' in which practice is used to design a component of the research output but not directly acquire data.

When a research methodology has been devised that includes practice undertaken by the researcher it is fair to say that alternatives that do not involve practice exist, such as engagement with other practitioners through interviews, questionnaires, focus groups, observations and case studies. In many respects, methods that do not include researcher-practice may be more straightforward due to the problems associated in employing a single subject (the researcher) to provide data from creative activity that may well be expressive, emotional, ill-defined and with open-ended solutions. However, the scope of a Ph.D remains relatively broad and it is helpful to note the fundamental requirements as identified by Archer (2004, p. 10):

- To demonstrate competence in higher levels of research skills
- To make a substantial contribution to knowledge in a given discipline
- To become qualified to supervise others in the conduct of research programmes
- The critical appraisal by the candidate of prior research
- Close attention to the principles and practice of research methodology
- The conduct of a single major systematic investigation
- The delivery of a substantial contribution to knowledge

With relatively few pre-conditions for Ph.D study, significant opportunities exist for the researcher wishing to employ their capability in practice within the methodology. The key challenge is how to apply a researcher-practice approach as a research method.

## Research methods

Moore (1983) categorises case studies as an approach to research as opposed to a research method, with a capability, "to describe and understand the phenomenon 'in depth' and 'in the round' (completeness). In this role, case studies serve a useful purpose, since many important issues can be overlooked in a more superficial survey" (Birley and Moreland, 1998). Robson (2002) identifies two types of case study: individual case studies (a detailed account from one person that can be used to explore possible causes, determinants, factors, processes, experiences etc.) and a set of individual case studies (as individual cases studies but involving the study of a small number of individuals with some features in common). A sole researcher undertaking practice would clearly fall within the domain of an individual case study and the way in which data is collected and analysed "implies the collection of unstructured data, and qualitative analysis of those data" [ibid]. In focusing on specific methods applied as part of case study research, action research is of relevance when exploring issues relating to practice (Moore, 1983; Gomm and Hammersley, 2000; Cohen and Manion, 1980). Action research has been defined as:

an on-the-spot procedure designed to deal with a concrete problem located in an immediate situation. This means that the step-by-step process is constantly monitored (ideally, that is) over varying periods of time and by a variety of mechanisms (questionnaires, diaries, interviews and case studies, for example) so that the ensuing feedback may be translated into modifications, adjustments, directional changes, redefinitions, as necessary, so as to bring about lasting benefit to the ongoing process itself. (Cohen and Manion, 1980, p. 178)

The cyclical nature of action research has been identified by Birley (1998) who sees it as being conducted by a professional into their own activity, the aim of which is to bring about an improvement in practice. The notion of an "action research cycle" is noted by Robson (2002) and involves "planning a change; acting and then observing what happens following the change; reflecting on these processes and consequences; and then planning further action and repeating the cycle". Providing an appropriate data collection process can be put in-place, action research can be considered as being an appropriate research method when exploring issues relating to professional practice. There are similarities between action research and reflective designing, in which the subject or researcher undertakes practice and articulates the process and outcomes. The process of reflective designing is described by Schon (1983, p. 79):

The designer's moves tend, happily or unhappily, to produce consequences other than those intended. When this happens, the designer may take account of the unintended changes he has made in the situation by forming new appreciations and understandings and by making new moves. He shapes the situation, in accordance with his initial appreciation of it, the situation 'talks back', and he responds to the situation's back-talk.

The use of practice within a case study can be employed when data is collected through reflective designing/action research. However, the use of such methods is by no means straightforward as a strong argument must be given for the ability to generalise from the practice of an individual (possibly a recent graduate) who may have had little or no experience in a professional environment. There is also a degree of uncertainty when attempting to develop tools to enhance practice, as the possibility exists for them to fail to deliver the required benefits.



## Motivation

When faced with significant challenges, it is easy to understand why more conventional data collection techniques might be employed during a Ph.D, such as interviewing practitioners. It is therefore necessary to consider the underlying motivation that leads researchers to engage in practice. Experience of this activity in the area of industrial design as part of the author's Ph.D plus subsequent supervision has identified three primary factors:

- **Designers enjoy designing**  
The practicalities of the design-based Ph.D (or Ph.D's generally in the creative arts) often fails to recognise the wider needs of the researcher who would typically have bachelors and masters degrees in their field and where the structure of their degree programme(s) would have been practice-based i.e. they have considerable prior history of creative practice; they enjoy creative practice; and they may well miss the fulfilment of creative practice if none was undertaken during a three to five year full time Ph.D.
- **Students need tutors that can design**  
Practice-based learning at undergraduate and masters level requires a significant taught input by competent practitioners. It is all too common for academics to loose or fail to develop capability in practice as they move through an academic career that is based on teaching and research. The typical route by which full-time academics with a practitioner background acquire a Ph.D is through part-time study. In order to maintain competence as a practitioner for the benefit of students, there is a case to encourage the use of practice in staff Ph.D's.
- **Research outcomes need designing**  
An unexpected outcome from the author's experience of Ph.D supervision in creative disciplines has been the scenario where professional practice was necessary for the progress of the research. 'Tools' are a popular and relevant outcome from design-based Ph.D's and situations arise where the tool itself must be designed in order to facilitate its validation. It is therefore necessary to consider the use of researcher-practice where practice is not a direct means of the data collection but a process by which research outcomes can progress to validation.

These three motivational scenarios will now be contextualised and the methods/methodologies applied within three Ph.D's discussed, making specific reference to:

- The use of output from practice for quantitative data collection (e.g. for comparative analysis)
- The use of output from practice for qualitative data collection (e.g. reflecting on new working practices)
- The use of practice to progress the development (design) of research output (e.g. designing design tools)

### ***The use of output from practice for quantitative data collection***

Title of Ph.D: The integration of rapid prototyping during industrial design practice

Researcher: Mark Evans

Supervisor: Ian Campbell

Quantitative output: Cost and time data for contrasting techniques

As designers make the career transition from practitioner to educator, it is all too easy to lose the core competencies of professional practice when the role as an academic takes over. This can be compounded by a requirement from institutions to focus non-teaching activity on research and possibly attain a Ph.D. Such progression may not necessarily be in the best interest of students, where emerging skills and knowledge are developed through demonstration of technique and direct modification of their work by the tutor. Having been employed as an in-house and consultant industrial designer, the author took up a full time academic post as a lecturer in industrial design in a research-focused university. Whilst continuing to undertake professional practice as part of this role it became apparent that the University would not award a Ph.D for designing a product. However, examples of such practice exist elsewhere, such as a Ph.D arising from the industrial design of seating for orchestral musicians awarded by the National College of Art and Design, Dublin. A published summary of this thesis identifies activity typical of professional industrial design practice: “a great deal of the work was informed by the collation of facts, statistics, data and testimony. The marriage of the two was the thrust of the thesis: an integrated process interweaving the two strands, in which the facts guided the creative search, the ideas generated further questions that needed factual answers which, in turn, sparked further creative activity” (p. 22).

The strategy undertaken during the authors Ph.D avoided any attempt to translate the design of a product into a Ph.D due to the problematic nature of research questions and the necessity to generate new knowledge that was above and beyond that undertaken by practitioners. This position led to the formulation of research questions and methodology that would facilitate data collection through the design of two (but ultimately four) consumer products. The focus of the study was in the field of professional practice with the aim of facilitating the integration of a specific and emerging technology (rapid prototyping). To undertake this, a four phase research methodology was devised:

- Phase 1: Literature review - Nature of industrial design/rapid prototyping.
- Phase 2: Draft method - Practitioner feedback; revised method
- Phase 3: Comparative evaluation - Product design activity; evaluation of physical models (x3)
- Phase 4: Resolution of modelling issues - Additional case study(s); final method for integration of rapid prototyping defined
- Phase 5: Validation - Appraisal framework

Having defined a draft method for the integration of rapid prototyping within practice, this was executed through a case study which identified problematic issues through a method of reflective designing and the recording of design activity. The evaluation and appraisal of the strategy for integration provided an opportunity to reflect on and modify this through additional case studies by employing the cyclical nature of action research as identified by Cohen and Manion (1980).

Key outcomes from the comparative evaluation in Phase 3 were the production of two appearance prototypes for a relatively complicated consumer product. One appearance prototype was produced using rapid prototyping and the other using conventional workshop-based techniques. Costs and component build times were recorded to provide quantitative data for each appearance model. As the product contained electro-mechanical elements, the reflective nature of the method enabled the use of rapid prototyping to be extended for the production of a fully working appearance prototype for which production/finishing/assembly data was recorded. The recording of quantitative data was an essential part of the evaluation

process and provided objective information during appraisal. When the findings were presented to practitioners as part of the validation process, the use of 'hard data' provided a commercial realism that was easily understood by the interviewees.

Whilst one additional case study had been planned for Phase 4, a total of three were required to resolve issues identified during Phase 3. These focused on the fact that considerable rigour was needed to produce the 3D computer geometry required for rapid prototyping; rapid prototyping could not make a cost-effective contribution to the production of physical sketch models; and as a remote build system, rapid prototyping removed the ability for the designer to engage in the definition of form through the tactile sculpting of a physical material.

These issues were the subject of further literature review and the identification of potential solutions. The three issues went on to be investigated and resolved to varying degrees of success. Having explored the three issues, the outcomes enabled the final Computer Aided Industrial Design/Rapid Prototyping (CAID/RP) method to be defined. The key feature of the CAID/RP method was the capacity to operate almost exclusively in a digital environment whilst still engaging in a degree of tactile interaction with the emerging form. This strategy facilitated the use of rapid prototyping in the production of the key forms of physical model required during industrial design practice i.e. sketch model, appearance model, appearance prototype.

The final phase of the Ph.D was to validate the CAID/RP method using an appraisal framework. This involved interviews with industrial design practitioners. The interviewees received a briefing on the method followed by the completion of a questionnaire that was later normalized using a weighting/rating method (Pugh, 1991).

Completion of the Ph.D resulted not only in the development of research capability, but skills and knowledge in computer aided industrial design; haptic feedback modelling; the finishing of rapid prototype components; and maintenance of sketching capability. All of these were found to be of direct relevance to undergraduate and masters teaching.

### ***The use of output from practice for qualitative data collection***

Title of Ph.D: The development of a curriculum for the study of digital industrial design

Researcher: Noor Al Doy

Supervisor: Mark Evans

Qualitative output: Reflective designing through the use of advanced design technologies

The typical route to a Ph.D is via bachelors followed by a masters degree, although it is becoming increasingly common to find candidates that progress directly from undergraduate study. For those students with bachelors/masters qualifications in creative disciplines, this would have necessitated engagement in a high level of practice for between three and six years of study. For those with a background in this level of creative practice, the transition to Ph.D can be extreme as literature reviews and primary data collection have little in common with creative practice. Having decided to undertake a Ph.D, the absence of a creative activity that was central to previous studies can come as somewhat of a shock.

Having acknowledged the contribution of practice as a research method or component of a research method, if undertaken by a suitably qualified researcher its inclusion can provide variety in the scholarship and continuation of an activity for which the student usually has talent and passion. Those that have completed a Ph.D are all too aware of the motivational issues experienced during the course of the research and the contribution of creative practice towards a suitably qualified Ph.D candidate's motivation should not be underestimated.

During a Ph.D to develop a curriculum for the study of digital industrial design, the typical research methods of literature review, interviews and questionnaires were employed to develop parameters for the research and specify a totally digital workflow for professional practice that progressed from first concepts through to pre-production. The Ph.D employed the following five phase research methodology:

- Phase 1: Literature Review – The nature of industrial design practice; tools; education
- Phase 2: Development of method - Questionnaire to establish extent of use; definition of a draft digital industrial design method; evaluation of method via action research; revisions to method
- Phase 3: Appraisal of method - Interviews with practitioners to receive feedback
- Phase 4: Development of digital industrial design curriculum - translation of findings into an academic curriculum
- Phase 5: Validation of the digital industrial design curriculum - Interviews with educators, exposure of students to the curriculum, final appraisal

Having defined the digital industrial design method, it was necessary to provide data on its capacity to deliver the potential benefits that had been identified through the literature review. To achieve this, reflective designing with the use of a design diary was employed to record the activities undertaken during the design of a consumer product. This included the comprehensive documentation of sketches, models (2D/3D) and prototypes produced during the design activity. This was achieved through 14 design modelling operations which took place during the three distinct phases of the design process. Specific modelling operations include the use of a digitizing tablet with interactive display (Wacom Cintiq); laser cut contour modelling; virtual prototyping and virtual reality.

As the researcher had bachelors and masters degrees in industrial design, they were already a capable designer. However, it was essential that the design-based action research took place in a context that closely followed commercial activity, so modes of practice were cited from relevant literature and use was made of the supervisors experience as a practitioner to ensure that this followed the format of a live project.

### ***The use of practice to progress the development (through design) of research output***

Title of Ph.D: Enhancing collaboration between industrial designers and engineering designers

Researcher: Eujin Pei

Supervisor: Mark Evans

Research output: The design of a card-based tool to enhance practice

When undertaking research into practice, it is not uncommon for the outcome of the Ph.D (the new knowledge) to be a tool that has the capacity to enhance practice. As the aim would be for the tool to be used by designers, there are expectations and requirements that

it should be well designed on a visual level, not just functional. Whilst it is quite feasible for a researcher to commission a consultancy to undertake the design work, if self funded or the recipient of a studentship, the cost would rarely make this a viable option. It therefore becomes the responsibility of the researcher to engage in professional practice that generates neither quantitative nor qualitative data, but where their practice is essential for the progression of the research agenda i.e. the tool.

In a Ph.D that aimed to enhance collaboration between industrial designers and engineering designers, data collection was undertaken through literature review and interviews with practitioners. This led to the specification for tool that was loosely based on a children's gaming card- format. It was then necessary to design and prototype the cards to allow validation by practitioners. The methodology employed for the Ph.D in the development of the tool followed six phases:

- Phase 1: Literature review - Industrial/engineering design, collaboration, design methods
- Phase 2: Practitioner interviews - Interviews/observation to identify barriers to collaboration
- Phase 3: Categorisation of design representations - Interviews; taxonomy
- Phase 4: Draft collaboration tool - Collation of data to produce first embodiment of tool
- Phase 5: Refinement of collaboration tool - Pilot study
- Phase 6: Validation - Practitioner interviews; case study; definition of final tool

Having explored options for virtual and physical tools, the card-based format was selected due to its portability and accessibility. The design of the cards went through three iterations following practitioner evaluation, but the researcher's capability as a designer was essential in making the cards useable, believable and appropriate for the target market. The pack consisted of 134 cards which were sub-divided in to three sections. Section 1 illustrated key design stages of new product development (x4) on the front face with a definition of the design stages where industrial designers and engineering designers collaborate during the design process. The reverse had information on the popularity of design representation used by each group during each stage. Section 2 described key design and technical information used by industrial designers and engineering designers during the design process. The front face had a definition of design and technical information and the reverse had information on the popularity of specific representations for the communication of design or technical information. Section 3 defined the representations used by industrial designers and engineering designers during the design process. The front face gave a definition of the design representation and the reverse face showed the design/technical information that was embodied in the representation plus the popularity of the representation when used during a design stage.

The potential for the researcher to engage in practice for which the primary purpose is not data collection extends its role within a Ph.D. The role of practice therefore becomes that of 'data translation' as opposed to data collection.

## Conclusions

If employed within an appropriate methodology, the use of practice can provide rich contextual (quantitative and/or qualitative) data that would be difficult or not viable to collect using any other means (such as observing a practitioner progress a project from start to finish). However, the extension of the role of creative practice as a means of translating data into a research output presents an additional dimension that has been largely overlooked in the debate on practice in Ph.D's as it falls outside the remit of how to collect data and the validity of that data.

Having identified three roles for practice within a Ph.D (quantitative/qualitative data collection and data translation) it is possible to integrate common elements of the three methodologies to identify themes and propose a generic strategy that may be of relevance to researchers who are considering employing practice within their Ph.D. The six phase methodology has the potential to move the direction of research from conventional literature-based/empirical data collection to one where the developed tool/method is evaluated and or designed through researcher-practice. The six phase researcher-practice methodology comprises the following activities:

- Phase 1: Literature review - Areas of study defined; prior knowledge identified; research methods selected
- Phase 2: Empirical studies - Stakeholder feedback
- Phase 3: Draft tool/method - Case study evaluation
- Phase 4: Refined tool/method - Case study evaluation
- Phase 5: Validation - Practitioner/expert feedback
- Phase 6: Final tool/method - Conclusions

Whilst it is acknowledged that the methodology is not prescriptive and would require modification according to the nature of the research questions, it forms the starting point for those wishing to engage in the emerging and expanding area of researcher-practice.

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# Knowledge, experience and art in an innovative community-based study



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## Abstract

This paper describes 'Safe at Home', a creative research project being conducted by social workers and artists and examines its theoretical underpinnings in light of contemporary theory on knowledge production. It uses the framework of Mode 1 - scientific research - and Mode 2 - problem-focused, practice-oriented, cross-disciplinary, and engaged research. The latter is portrayed as compatible with social work and creative - art - research, which recognises the importance of practical, experience-based knowledge and practice-based participatory action and intervention research. Using this framework, we explore research as a vehicle to develop useful knowledge to inform practice while also engaged in a form of experiential, action or problem-based learning. Such situated knowledge is more useful for professions which draw crucially on everyday tacit understanding and peoples' lived experience. We discuss the importance of practice wisdom in creative social work practice and illustrate its application in the 'Safe at Home' project, which employs a social intervention research approach and seeks to measure the effectiveness of a community arts intervention in changing community attitudes about domestic violence. It is a collaborative study, with partners from a community-based anti-violence network. It asks: 'Is art an effective medium for achieving attitudinal change in the community?' We offer the Safe at Home project as an example of Mode 2 research which has the potential for producing significant knowledge and practice outcomes for social work, as well as for relational and dialogical community arts practice.

## Keywords

Social work, knowledge production, community arts practice

The common ground between social work and community arts practice was identified through an examination of an increasing shift by community and public artists away from the concept of 'art as object' to ideas and practices oriented toward process, relationship and community (Schubert, 2007). Commonalities are located across the work of a varied array of artists and theorists but predominately those whose work falls within contemporary *avante garde* practice:

- relational aesthetics (Bourriaud, 2002)
- connective aesthetics (Gablík, 1991)
- dialogical art (Kester, 2004)
- 'Happenings' and the blurring of art and life (Kaprow, 1993)
- new genre public art (Lacy, 1995)
- art with increasing emphasis on space, place, time, and community (Kwon, 2004; Lippard, 1997; Massey, 1995).

Focusing specifically on community-based practice - by which we mean a form of community engagement and participation where the process of engagement can vary dramatically in form from mobilising, conscientising, action, advocacy, empowerment, democracy, and citizenship - Schubert (2007) identified a range of arts practices that closely align with the everyday practice of social work. The key areas of commonality operate across six domains, namely, values, concerns, skills, communication, context, and history. It is in this common

ground, through the accumulation of knowledge from different disciplines or transdisciplinarity (Gibbons et al., 1994) that a shared discourse pool which both disciplines draw upon has been identified. Perhaps then it is not surprising that many artists, working in the community arena, are criticised for being like social workers, nor that many social worker practitioners view their work, including research which is considered integral to good practice, as an artistic or creative endeavour. The latter views are supported by a body of literature that explores the 'art' of social work in a variety of ways (England, 1986; Goldstein, 1983; Gray & Powell, forthcoming; Gray & Webb, 2008). This creative approach, which focuses on both process and outcome, is evident in qualitative, heuristic, phenomenological methodologies favoured in much qualitative social work research. It is an approach which has much to offer the creative disciplines.

An unexpected historical connection between art and social work was found in the community art literature, where Grant Kester (2004, p. 131) described Jane Addams' influence on artists working in the Settlement House Movement in Chicago in the late 1880s. Jane Addams is important in this context as she is often referred to as the mother of modern social work. Through her commitment to emancipation, empowerment and participatory democracy, Addams' work was a trigger for the development of similar values and practices across these disciplines. Within the social work literature, Addams' influence on artists is not the centre-point but rather her sociological focus. Also significant are her relationships with 'progressive' intellectuals and reformers - the most notable being John Dewey (discussed below) - and their 'advocacy of an idealized notion – or ideology – of community' (Mowbray, in Thorpe & Petruchenia, 1992, p. 54). Further, some authors note that the settlement house and 'local reform associations' movement showed extraordinary similarity with community action today (Gans, in Thorpe & Petruchenia, 1992; Weil, 1996). A key shared value between social work and art stems from Addams' and her colleagues' advocacy of grassroots democracy within communities.

Within the social context, the work of Addams and others at Hull House has been described as an archetype of practice with and in communities that moved from a focus on 'planning for these communities to planning *with residents* for social and economic development and to combined physical and social planning strategies to build stronger communities' (Weil, 1996, p. 9 *emphasis added*). It accords with much contemporary Third Way discourse. Kester (2004) inadvertently identifies Addams' influence significantly beyond that traditionally acknowledged within social work, most notably in terms of her impact on the development of social planning and sociology, in addition to social work (Deegan, in Weil, 1996). Her pioneering work developed methodologies and set standards for research within communities for social work. This methodological approach, however, does not seem to have transferred to arts practice. The 'Safe at Home' project is conducted on a similar social work research model developed at Hull House by Addams and her colleagues that directly involved residents - community members. Findings were used to extend community education and the planning of community-based action projects (Deegan, in Weil, 1996). We would posit that not only have models of community work such as organizing, planning and development that grew out of the Settlement Movement and Addams' work had a vast influence on community practice within social work (Weil, 1996) but it has also had a significant, but to date unacknowledged, influence on the community, dialogical and relational arts arena as well. Further we would suggest that the methods and methodologies developed within social work for research are, on the basis of this history and the identified shared discourse pool, applicable to research in the arena of arts practice. This is highly relevant for arts research which has a strong social element, particularly community-oriented arts research. Examples of socially oriented art research that would potentially benefit from social work methods and methodologies are just beginning to be documented, for example Barrett (2007), Barrett and Bolt, (2007) and Crouch (2007).

## Relationship to the theory of knowledge production

This literature documenting the synergies between art and social work stands in strong contrast to contemporary debates in knowledge production which are fueled by the pursuit of 'gold standard' scientific research and evidence-based practice, in which 'randomized controlled trials' are promoted as the holy grail of research in social work (Gray, Plath, & Webb, 2009). Contemporary theorists on knowledge production (Gibbons et al., 1994) have labeled this form of 'scientific' research Mode 1. It is juxtaposed against a more flexible, practice-oriented, experiential, cross-disciplinary, and engaged form of research known as Mode 2. Coined in 1994 the terms Mode 1 is defined as 'the complex of ideas, methods, values and norms that has grown up to control the diffusion of the Newtonian model of science to more and more fields of enquiry and ensure its compliance with what is considered sound scientific practice'. It contrasts with Mode 2 knowledge production 'carried out in the context of application and marked by its: transdisciplinarity, heterogeneity; organizational heterarchy and transience; social accountability and reflexivity; and quality control which emphasises context- and use-dependence' (Gibbons et al., 1994, p. 167). On revisiting their original thesis, Nowotny et al. (2003) built a new argument to support their original ideas about knowledge production making important additions such as reconceptualising research as a dialogical process which takes place in the agora<sup>1</sup>. The description of research as 'a dialogic process, an intense (and perhaps endless) "conversation" between research actors and research participants' (p. 187) is important for ensuring high levels of accountability. And the idea of the agora is important to the 'problem-generating and problem-solving environment in which the contextualisation of knowledge production takes place – a domain of primary knowledge production – through which people enter the research process, and where Mode 2 knowledge is embodied in people and project' (p. 192). Within 'Safe at Home' these ideas led to the engagement of research participants with the researcher through dialogue within the public space of the community under study.

In short, Gibbons et al.'s distinctly differing approaches to the production of knowledge, i.e., the key features of both Modes within this framework are summarised in Figure 1. Critical issues for social work practice are outlined in Figure 2. The 'Safe at Home' project demonstrates almost all of the features described within Mode 2 as they are outlined in these diagrams and explored below.

Gibbons et al.'s (1994) framework has not been without its critics with concerns expressed regarding the incorporation of political context, the promotion of value judgements in the process of knowledge production and the implied preference for Mode 2 seen as signaling an acceptance of neoliberalism (Pestre, 2000). Examples of this are evident in emerging knowledge production frameworks in the arts within Australia which locate innovation firmly within a market context – where the social context is absent (Haseman and Jaaniste, 2008). A further example is the use of the term 'engaged research' in much Third Way discourse hides the decrease in public funding for research which forces researchers to turn to alternate sources of funding. (This is reminiscent of the piecemeal way in which funding for the 'Safe at Home' project has eventuated). Thus Pestre suggests that both Modes need to be located in a much stronger historical perspective. He describes them as 'characterising practices and arguments that have been around for a long time, whose respective weights vary with the course of time and whose merits are assessed differently depending on what they could potentially bring to the diverse actors in terms of economic efficiency or social and political values. Modes 1 and 2 are only extreme and highly simplified modes for analysis' (2000, p. 177). We would suggest that rather than the Modes being 'new', the value of Gibbons et al.'s contribution was in the simplicity of the framework they offered, which

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<sup>1</sup> An ancient Greek word that means the public space used for assemblies and markets within a community

seemed quite commonsensical. It was a novel attempt to invent a new language of research (Nowotny, 2003).

In light of Pestre's critique, however, viewing social work research through an historical lens, we might conclude that Mode 2 reaches as far back as the 1880s and the research practice of Jane Addams described above. The development of the welfare state and the consequent emergence of the professions, particularly the professionalization of social work, could account for the separation that grew between art and social work and the unique influence of each while 'social change and our knowledge have evolved in parallel' (Pestre, 2000, p. 180). This might account for current pressures on the creative disciplines to engage in research.

A longer history of Mode 2 in social work is also indicated in the work of Herbert Simon who, during the 1970s, described 'a social system of science and a social system of practice'. He further identified that 'scholars in professional schools such as education, management and social work were separated and increasingly alienated from practitioners in their fields by the gap between these two systems' (cited in Yorks, 2005, p. 111) causing the rise of a significant tension that still endures within social work. Crouch (2007) has identified the potential for researchers within the creative disciplines to look to the social research used within nursing that incorporates the framework of praxis as a productive approach. We would speculate that, on the basis of the shared discourse described earlier, social work research methods could hold even greater potential, particularly research located within community or social change contexts.

Gray et al. are currently engaged in research exploring social work as the 'gold standard' of Mode 2 knowledge production in the human services. They seek to test whether there has been a fundamental paradigm shift towards interdisciplinarity, internationalization, collaboration, and engagement within human services research in Australia (Gray, Webb & Kavanagh, 2008). Of relevance for social work, and the creative arts, is the increasing pressure on researchers to produce socially relevant, accountable, transferable, and useful knowledge. This jettisons the idea of research aimed primarily at the generation of new knowledge or the testing of prior hypotheses and findings (Hammersley, 2003).

In this project, we seek to examine whether Mode 2 might also be an appropriate fit for other creative endeavours. Hence we have engaged community partners, local residents, artists, and social workers in developing the collaborative 'Safe at Home' project. Figure 2 identifies the key issues for consideration in examining Mode 2 in relation to the creative practice of social work. It illustrates the issues raised within our description of a research project that reflects Mode 2 in action.

## A HEURISTIC FRAMEWORK THAT EXPLAINS THE SIMILARITIES AND DIFFERENCES BETWEEN THE MODES OF KNOWLEDGE PRODUCTION

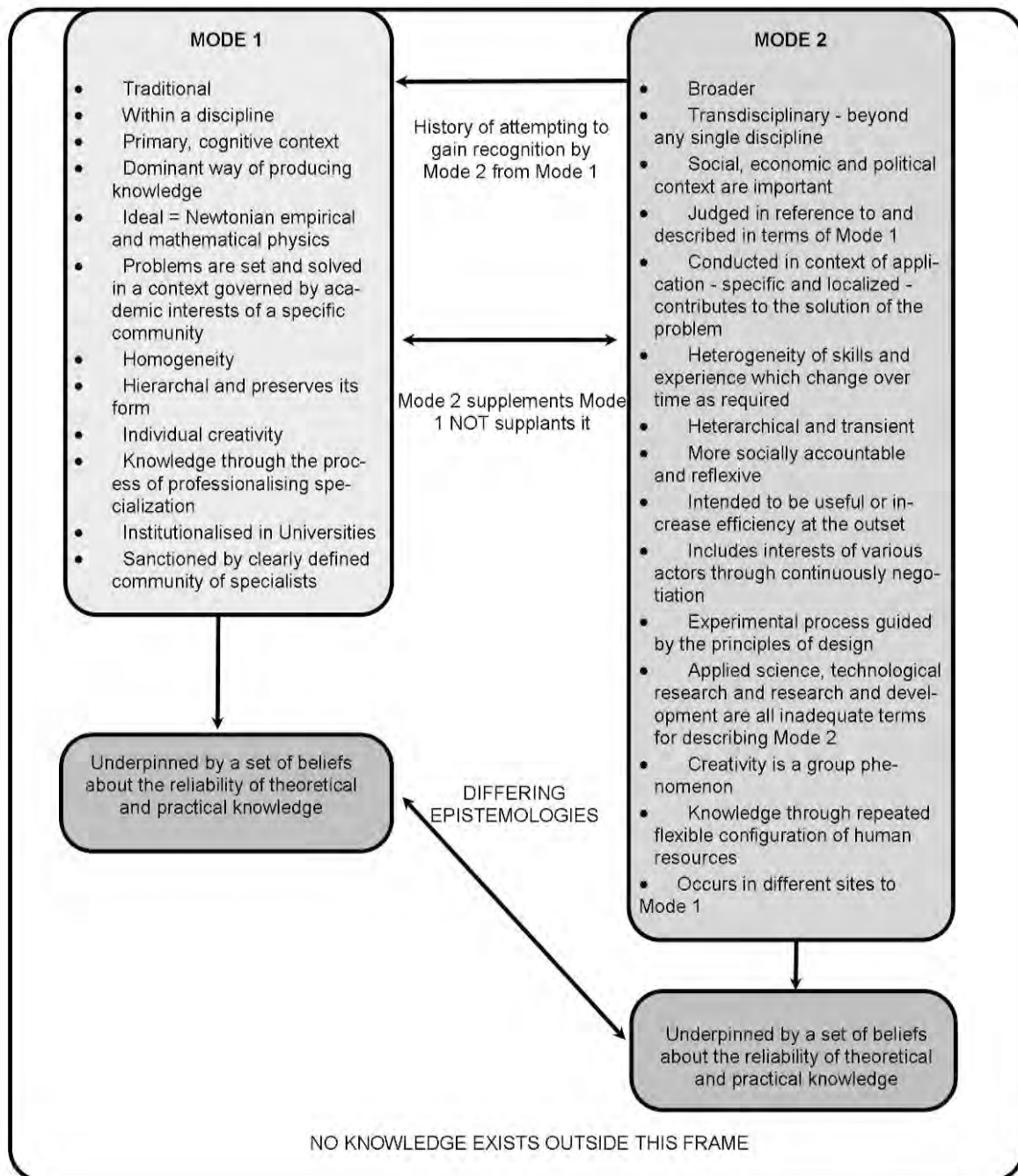


Fig 1. Diagrammatic representation of key concept of Gibbons et al (1994)



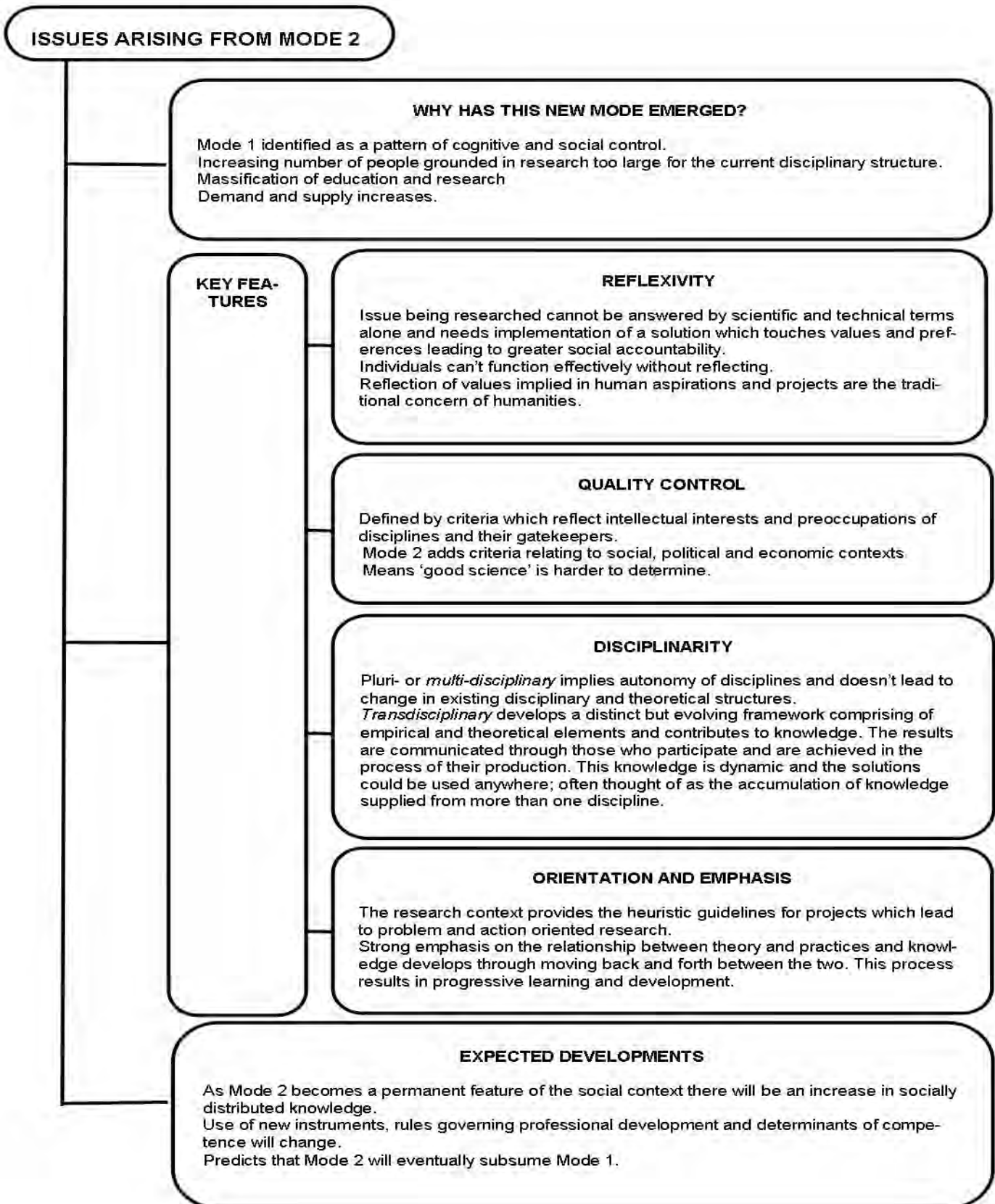


Fig 2: Key issues arising for social work in relation to Mode 2 knowledge production.

## Research as a vehicle for experiential, action or problem-based learning

Recently, within social work, a wider survey of the ways in which the production of knowledge occurs has commenced (Gray et al., 2008; Kjørstad, 2008). This has led to a closer inspection of the two key modes of knowledge production with a particular focus on Mode 2 and its heuristic oeuvre, which draws crucially on lived experience, practice wisdom and tacit knowledge.

Experiential or tacit knowledge (Polyani, 1938: 1962, 1967) is important in creative social work practice and creative arts practice. It is implicit in the process of moving back and forth between theory and practice in a constant cycle of reflection, review and continuous development. The 'emergence of novelty and ingenuity ... bring(s) out the creative dimension of practice wisdom' (Tsang, 2008). The term 'practice wisdom' is unique to social work (Dybciz, 2004; Krill, 1990) and used as shorthand for an extremely complex process of memory and pattern recognition which is receiving increasing scientific support (Goleman, 2003, 2006; Varela, 1999). This embodied form of knowledge is described in both the social work and art literature as 'reflection-in-action' (Schön, 1983, 1987) or expressed in the notion of 'common sense' (Baker in Dybciz, 2004, Kester, 2004; de Zeger, 1998). Tacit knowledge is closely tied to the Aristotelian notion of *phronēsis* or practical moral reasoning (Flyvbjerg, 2001; Habermas, 1972).

This embodied knowledge that grows out of experience, which Varela (1999) calls 'readiness-for-action' (see Gray, 2007), is critical to understand the relationship between knowledge generation and practice. For Klein and Bloom (1995) practice wisdom involves both the process of translating theories and principles into action, in terms of one's subjective experience of the situation, and the process of developing new knowledge as the practitioner-researcher learns from participant feedback. Thus the application and generation of knowledge is part of the same process. In the creative arts domain, there is an increasing recognition and exploration of the value of experiential knowledge (Barrett, 2007; Barrett and Bolt, 2007; Imani, 2007; Jarvis, 2007; Niedderer and Reilly, 2007; Sutherland and Acord, 2007). This form of knowledge is valued in similar ways within both disciplines but the challenge now within the creative disciplines is to move towards a stronger research base to produce socially relevant, accountable, useable or transferable knowledge. There is a need to move beyond the acknowledgement of the importance of the social aspects present in much creative arts research. For example, it is emergent in the work of Barrett and Bolt (2007) and Crouch (2007). Perhaps social work is a little further ahead in this respect, but only marginally. What Mode 2 does is to demystify the research approach so as to give it a feel of being an extension of our ordinary, everyday practice and professional activity. Synergies are created when disciplines come together to engage in joint projects such as that herein described. It is this 'joining together' that unleashes the power of Mode 2 – crucially its interdisciplinarity, internationalisation, collaboration, and engagement. This challenge has existed for a considerable time within social work (McDermott, 1996).

Mode 2 holds that the heuristic guidelines emerge from within the context of the research. The researcher, phenomenologically, makes these heuristics present to the participants, helps them see that the solutions were there all along, in the form of untapped resources. Mode 2 offers a way of thinking about research that is firmly embedded in concrete locations but which can draw on wider knowledge and prior research. It offers the opportunity for creative engagement, for innovation and the incorporation of participants', practitioners' and researchers' lived experience. To this end, Mode 2 serves as a 'knowledge transfer system' (McWilliam, 2007) in which knowledge transfer:

...is an ongoing interactive human process of critically considering relevant, quality research results and findings, whether factual or tacit knowledge or humanistic

understanding, blending this broader research-based knowledge with experiential knowledge and contextual appreciation, and constructing a shared understanding and knowledge application to advance the quality of ... care (p. 73).

Thus Mode 2 offers an ideal framework for social work and creative arts research that blends different forms of knowledge.

## The "Safe at Home" project

We now outline a research project which uses research not only for knowledge production – the generation of new knowledge – but also the opportunity for the research process to constitute a context for ‘experiential learning’ through the participation and engagement of community members. "Safe at Home" is an innovative, participatory, social intervention research project located in the Hunter Valley of New South Wales, Australia. It is transdisciplinary in that it engages artists and social workers who share an interest and focus on working in and with communities to address social issues, problems or concerns. In this instance, the concern is that of raising of awareness (and therefore hopefully preventing) domestic violence. The project functions in partnership with the Cessnock Anti Violence Network (The Network) thus creating a research site outside the academy and within the broader community. By taking a whole-of-community approach to raising awareness of domestic violence across the research site – the Cessnock Local Government Area (LGA) – the intention of the project is to investigate the effectiveness of using art and creative activities to change community attitudes within a medium-sized rural community. As research ‘Safe at Home’ aims to augment the evidence base regarding the effectiveness of art as a method of social intervention – based on the understanding that this is part of the common ground between disciplines – for which there is only anecdotal evidence within the community services and community arts sectors. In effect, the creative arts-based element of the project becomes part of the broader social intervention research method – that is, the art is effectively embedded within the research process and simultaneously part of the mode of research and the intervention that is being researched.

The study of intervention is integral to social work research and informs the design and development of strategies for change (Fraser, 2004). The social intervention research approach (Rothman and Thomas, 1994) actively involves community members in line with the work of Addams outlined above. Within this approach ‘Safe at Home’ uses a multi-method approach to data collection and analysis which proceeds through six stages:

- problem analysis and project planning;
- information gathering and synthesis;
- design of intervention;
- early development and pilot testing;
- evaluation and advanced development;
- dissemination (Rothman and Thomas, 1994).

These steps were used to shape ‘Safe at Home’ which involves: mastery of substantive and interventive knowledge in the area of domestic violence; skills in translating tacit knowledge into intervention protocols; partnerships and collaboration with The Network in implementing arts-based programs; and expertise in developing measures of program process and outcome (based on Fraser, 2004, p. 220).

By working collaboratively to conduct pre-and post-intervention surveys of community attitudes, researchers and practitioners (artists, community and social workers) involved with ‘Safe at Home’ have established a baseline from which to measure the degree of change that the intervention (art) will make in terms of changing attitudes and diminishing the impact and consequences of domestic violence. The intervention phase of the study, which has recently commenced with community members, consists of some twelve strategies that use art as the mode of intervention to address community attitudes that support and encourage

the prevalence of domestic violence identified through the pre-intervention survey. These community-generated strategies include activities as diverse as:

- installation works within local playgrounds;
- a mosaic work within one of the local housing estates promoting healthy, positive family relationships;
- t-shirt, poster and coaster, bookmark and billboard campaigns that incorporate works created by community members;
- collage and printmaking workshops coupled with anti-violence messages;
- community art competitions with the prizewinner's art to be reproduced on cereal packaging;
- a dramatic performance using verbatim theatre;
- a range of other smaller art-making activities that form a series of exhibitions within the community.

The number and size of the identified strategies will be determined by the degree of funding that the research team can collectively attract to the project from a variety of sources.

Within "Safe at Home" an informed, engaged form of knowledge – Mode 2 – has underpinned the modus operandi of the project at all stages from the development of the research partnership including:

- the identification of the issue as an issue of significance to the community on felt rather than substantiated need combined with an understanding of the secrecy often associated with processes of violence and control;
- the incorporation of beliefs and understandings about the community within the research site based on some fourteen years of social work practice wisdom gained from one of the researchers working within this community in a health context;
- the importance and value placed by the community on an insider connection in working with the community;
- the collaborative approach to seeking funding for the project;
- the process taken with different groups within the community in the implementation of the various interventions;
- an individual approach to each group and artwork within the project;
- a non-threatening and non-confrontational and indirect approach to addressing the issue of domestic violence and the need to challenge negative prevailing worker attitudes within the community.

This range of experiential knowledge is the essence that sits at the core of the process through which the project is transversing. Without this tacit knowledge on how to galvanize the research partner and community this project would not have taken on the dimensions it has. We now consider knowledge production and the key issues arising in relation to Mode 2 that were identified earlier in relation to "Safe at Home".

### ***Reflexivity***

The potential or actual changing of attitudes regarding domestic violence is not an issue that can easily be answered by scientific and technical terms alone. Views on violence are influenced by diverse principles and opinions which touch community members, practitioners and researchers alike. Any research within such a context requires high levels of social accountability. To ensure this, an awareness of the values and attitudes involved and a sound ethical approach is required in addition to a process of constant critical reflection and thinking. This project would not operate or proceed effectively without deep reflection at a number of levels and involving a number of actors in the form of researchers, supervisors, peers, partners and community members. The reflection of the value positions held within this project are essential to acknowledge given the sensitive nature of the topic, the associated power dynamics and taboos surrounding it.

### ***Quality control***

Like all Mode 2 research the criteria that ensure quality present within 'Safe at Home' is reflected across a variety of criteria that stem from and reflect the intellectual interests and preoccupations of both disciplines and their respective gatekeepers – most notably in this instance through the process of supervision and regular peer review and consultation in relation to particular skill sets (e.g., survey design and data analysis techniques) at various stages of the research process. In addition, there are a number of criteria that reflect the social, political and economic context and have indeed been set by the research partners and the community – and are closely monitored by several key people with a keen interest in domestic violence. We agree with Gibbons et al. (1994) that this complex mixture does indeed mean that 'good science' within Mode 2 is harder to determine. Within 'Safe at Home' this seems to be best measured through the expressed commitment to and enthusiasm for the project by others (partners, peers and community members) rather than any form of concrete measure of quality. We believe this to be an arena that requires significant further exploration.

### ***Disciplinarity***

To clearly determine where 'Safe at Home' sits in terms of its disciplinarity is difficult for in different guises it can be described by almost all of the terms that refer to more than one discipline – interdisciplinary, cross-disciplinary, multidisciplinary, pluri-disciplinary and trans-disciplinary. Without a complex review of the definition and usage of each term, which is beyond the scope of this paper, it is difficult to make any clear determinations regarding Mode 2 and the feature of transdisciplinarity. We would certainly argue that the notion of boundary crossing (Thompson Klein, 1990, 1996) between social work and fine art in this project is present. The jury remains out however, in terms of the degree of transdisciplinarity required to ensure a piece of research is Mode 2 under the schema of Gibbons et al. (1994). We suspect that it is possible for research to be Mode 2 with only minor traces of this present, but at this stage must be acknowledged as tacit knowledge.

### ***Orientation and emphasis***

As described throughout this paper the context for this research has provided the heuristic guidelines which have led to using problem and action oriented research that is also participatory. These are consistent with Mode 2. In relation to the participatory aspects of the research process, the 'Safe at Home' study represents an attempt by the researchers 'to negotiate a balance between developing valid generalisable knowledge and benefiting the community that is being researched and to improve research protocols by incorporating the knowledge and expertise of community members' (Macaulay et al. 1999, p. 774). Thus the research embodies a strong emphasis on the relationship between theory and practice and a process of progressive learning and development in which knowledge develops through moving back and forth between the two.

In keeping with Mode 2, from the outset, 'Safe at Home' as research has aimed to produce useful findings (Gibbons et al. 1994). The collaborative approach has shaped:

- the development of the research goals and objectives,
- the choice of methods and duration of the project,
- the terms of the community-researcher partnership,
- the degree and types of confidentiality based on ethical principles and structures,
- the development of the strategy and content of the evaluation of the project,
- the framework for how the data is filed, stored, interpreted, controlled and used,
- the development of strategies and methods of resolving disagreements with the collaborators,

- a process for the incorporation of new collaborators into the research team which has as a result expanded and changed across the duration of the life of the project and finally,
- a process for the joint dissemination of results in lay and scientific terms to communities, clinicians, administrators and funding agencies.

Further the range of research methods developed through the process of community consultation is highly context driven and includes:

- data gathering and linkage;
- a largely quantitative community-wide survey instrument to determine current attitudes and level of awareness of domestic violence to serve as a baseline for comparison after the intervention phase of the research;
- physical arts-based activities with community groups;
- audio and video-taping of the development of the artworks;
- visual documentation of the development of the artworks;
- exhibition and documentation of the created artworks and related processes;
- observation of non-identified people in public places to assess their reaction to the artworks;
- face-to-face interviews with key participants, and
- focus groups with community members and partner organisations.

Through this process evaluation becomes possible, tacit knowledge becomes more visible and further learning occurs.

## Conclusion

'Safe at Home' is an example of research which draws on shared values and history between social work and art that stems from Addams' and her colleagues' advocacy of grassroots democracy within community social work and art. We have proposed that this participatory action-oriented approach to research is consistent with the notion of Mode 2 knowledge production (Gibbons et al. 1994). On the basis of this shared historical and social science discourse, social work research methods could hold a potential path for research in the creative disciplines located within communities and concerned with social change.

The current exploration of social work as the 'gold standard' of Mode 2 knowledge production in the human services is an attempt to substantiate and strengthen the voice of practice-led researchers within a practice-oriented discipline that values the place of experiential or tacit knowledge or practice wisdom within the research process. Such substantiation offers the potential for greater validation of this mode of research.

We have provided one example of a social work methodology that employs a social intervention research approach and incorporates both social workers and artists in the process in an attempt to demonstrate its potential relevance for the creative disciplines. For, it is the threads of history that run between social work and art that provide not only the reality of a shared past, but also the possibility of a shared future within the context of research.

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### **Mel Gray**

Mel Gray is one of the world's leading international researchers in the field of human services and a pioneer of international social development research. Her areas of interest include Indigenous and international (comparative) social work; Social work and art (artful practice and creativity in social work); Experience-based learning in social work education; Health needs of children in foster care; Social entrepreneurship and community-business partnership development; Homelessness; Social work ethics and politics (moral and political theory for social work).

Since 2003, she has written one co-authored book, two edited collections, 9 book chapters, and 35 journal articles. She has an established international track record in publishing highly acclaimed research on knowledge formation strategies and experiential learning. She also has a wide international network and serves on the board of several major international social work journals.

### **Leanne Schubert**

Leanne Schubert is a social worker with over twenty-five years of direct practice experience in fields as diverse as child protection, out of home care, disability services and community health. She has an interest in and commitment to the practice of narrative ideas within social work. In 2003 she commenced teaching at the University of Newcastle in the Bachelor of Social Work Program's innovative experience based learning model. Her teaching strengths lie in the area of direct practice skills.

Schubert has a long standing interest in the arts and culture. She holds a Graduate Diploma in Cultural Heritage Studies and is a practicing artist. In 2005 she commenced a research higher degree at the University of Newcastle with the intention of combining her major areas of interest – Art, Social Work and Social Change.



# A Search for Unpredictable Relationships



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## Abstract

This paper explores how design research that includes experimental design practice, can utilize the researcher's background as a practitioner, and make the practice central to the research. The aim of this paper is to make a case that practical experiment in a research context is a fruitful way to produce knowledge that supports the interplay between designer, material and technique in design practice. The research reported in the paper experimentally explores how a ceramist can utilize his approach to designing in the use of 3D digital media as a design tool, and what that use of digital media can add in a qualitative sense in interplay with the ceramic material. The investigation explores themes such as movements and metamorphosis. The paper suggests a method of research that the author has named *Method of Branching Experiments*. Subsequently, the method is exemplified by the author's experiments. The method is characterized by an explorative approach based on own design practice in interplay with techniques and materials, and by relying on a cluster of parallel and interdependent experiments within a defined frame rather than single experiments. The method has shown how new questions derived from an introductory experiment have influenced the process of exploration, by suggesting new parallel experiments. The new questions do not change the direction of the original experiment, but rather clarify and specify it, allowing the process to branch off in a variety of directions, and to be fuelled by spontaneous curiosity. Furthermore the method has shown how the parallel experiments have contributed unpredictable solutions to other experiments. Thus the notion of parallel interdependent experiments can be seen as a dynamic system in which a number of unpredictable and surprising relationships can emerge and be exemplary for what can be done and how, within the context of the original research question.

## Keywords

Research method; design practice; experiments; ceramics; 3D digital media.

## 1. Introduction

As a PhD. student with a background in design practice I have been exploring how design research that includes my own experimental design practice, can utilize the researcher's background as a practitioner and make the practice central to the research. This paper is about how my approach to designing can contribute to my method of research and under what circumstances design practice can be seen as an integral part of design research; a whole rather than two parallel tracks.

The paper reflects an ongoing Ph.D. project about experimental use of 3D digital graphics in the field of ceramics.

### 1.1. Research question and Design Practice as a Tool for Design Research

My research question is about how as a ceramicist I can utilize my approach to designing in the use of 3D digital media as a design tool; and what, more generally, such a use of digital media can add in a qualitative sense in interplay with the ceramic material. The research question is investigated through practical design experiments with digital media and ceramic material that are part of the design research and contribute empirical data. The experiments explore how the designer can use themes such as movements and metamorphosis in his work.

Arguably, for this purpose the design process can be divided into three sections: problem identification, design practice and production (see figure 1). Problem identification is about identifying what to design e.g. by a participatory design process (Sanders 2000); design practice is about how to design an artefact or prototype in interplay with techniques and materials; and finally production is about how to distribute the design to the user. Thus my research question is neither about the design process as a whole nor about identification of a user problem or the context of an artefact, but is focussing on the explorative and experimental part of design practice. In this context the design practice is the shaping process; that is, the process by which the artefact emerges as physical form in interplay between designer, techniques and material. Thus I disengage design practice from the design process as a whole (see figure 2), focussing solely on the interplay between designer, material and technique (see figure 3).

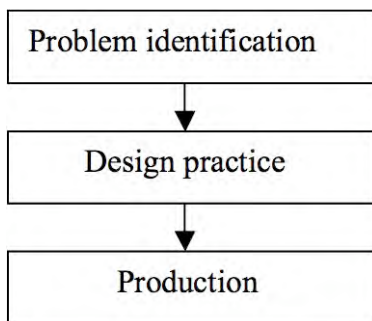


Figure 1

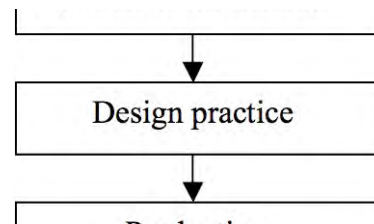


Figure 2

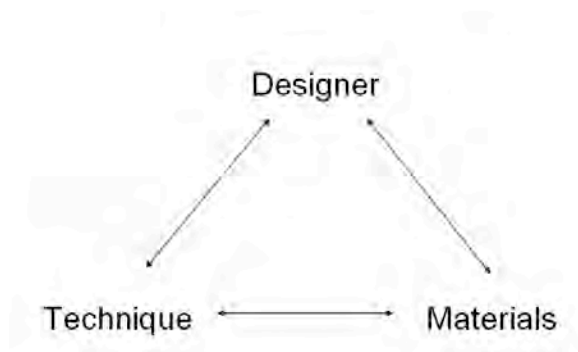


Figure 3

Michael Biggs (2004) has advocated a combined linguistic and non-linguistic research approach, in contrast to an entirely non-linguistic thesis, in so-called practice based design research. Following his combined approach, the experiments and artefacts to be described do not stand alone in the context of design research, but will always be accompanied with a verbal reflection and discussion. This supports the notion of design practice disengaged from the design process as a whole. The linguistic element will explain the background and provide a basis for communicating the experiment and artefact, as well as the findings about what is possible and how, regarding the research question. This is how, in the present project, design practice is turned into a tool for design research.

**1.2. Contextualisation in relation to Design Research**

Design research involving the researcher’s own experimental design practice can be labelled in many ways; e.g. as practice-based research, design-based research, practice-led research etc. Niedderer and Roworth-Stokes (2007) provide a critical discussion of the existing terminology concerning different roles of practice. They find a way to classify these terms in three categories but state: “Within these categories, terms are often synonymous or denote overlapping phenomena, and some terms span two categories which highlights the difficulty of interpretation and utilisation of such terms in a consistent and rigorous manner.” (Niedderer and Roworth-Stokes 2007) However their category “research involving practice” is relevant regarding the research presented in the present paper.

<b>Category</b> (with reference to terms identified)	<b>Context</b>	<b>Purpose</b>
<b>Research involving practice</b> (practice-based research, studio-based research, practice-centred research, practice-led research, arts-based research, design-based research)	Research process based on or rooted in practice, or where practice plays a lead role in the investigative process  Interventions/experiments are ‘framed’ investigate how practice can be enhanced or improved	Research outcomes make a direct contribution to, or are of direct relevance for, the advancement of practice  Practice informs theory building within research to gain new insights, knowledge or understanding

Table 1, Excerpt from a model presented by Niedderer and Roworth-Stokes (2007).

Marchand and Walker (2009) draw on the contribution by Niedderer and Roworth-Stokes’ category “Research involving practice”, which they further develop and subdivide into two main approaches. One being more oriented towards the tradition of “applied research” while the other is a counterpart of “fundamental research”.

<b>Research Components</b>	<b>Practice in research oriented towards applied research</b>	<b>Practice in research oriented towards fundamental research</b>
<b>Role of artefact</b>	Regarded as, and represents, an “end”	Regarded as a “means” and a design approach to fundamental knowledge development.

Table 2, Excerpt from a model presented by Marchand and Walker (2009).

Of particular relevance for the present project is their research component “role of the artefact” (see table 2) “regarded as a ‘means’ and a design approach to fundamental knowledge development”. My field of interest is what I will call an *exploration oriented design process* included in design research; a process focussing on the interplay between designer, techniques and materials. The role of the artefact is to act as a reflecting and responding means for pushing the research process forward to clarify what is possible and how, regarding the research question. A related example of such an approach to research is found at the research cluster *Autonomic* (2009) at Falmouth College University, which do research that explores the use of digital manufacturing technologies in the creative process of designing and making three dimensional objects.



As a contrast, consider a *problem oriented design process* included in design research. That is, designing which, although research embedded, nevertheless aims at developing working prototypes or appearance models, just as ordinary professional design. An example is the Ph.D. project by Jonathan Allen discussed by Pedgley and Wormald (2007). The aim of Jonathan Allen's research was to advance the design of, and champion new approaches to designing, products for people with severe communication disabilities and physical impairment. During his project, he developed a fully working prototype communication device.

However, in the present paper I shall demonstrate that *exploration oriented design* can be fruitful as a design research method, because it is relieved from the usual obligation to fulfil a purpose of everyday use, solve problems or fulfil certain needs. As we shall see, the exploration oriented design process does not proceed as a series of isolated experiments, but rather as a cluster of parallel and interdependent experiments, which as a whole reflect the potential of the research question. I will argue that this approach turns design practice in which the design researcher is trained into an effective tool for design research.

In the following sections I will explain more thoroughly my method of research *The Method of Branching Experiments* and exemplify the method by a series of parallel and interdependent experiments. Finally I will discuss the method.

## 2. Method of Research: Branching Experiments

As briefly mentioned in the introduction, my approach to design research is explorative, using experiments based on my own design practice in interplay with relevant techniques and materials. The role of the experiments is to contribute empirical data. This overall approach can be seen as "reflection-in-action" (Schön 1983), and is inspired by *action research* which Bruce Archer (1995) has described as:

Systematic investigation through practical action calculated to devise or test new information, ideas, forms or procedures and to produce communicable knowledge. ... the investigator is explicitly taking action in and on the real world in order to devise or test or shed light upon something. ... Action Research is pursued through action in and on the real world, in all its complexity, its findings only reliably apply to the place, time, persons and circumstances in which that action took place (Archer 1995).

An experiment executed in the context of design research is rarely seen as a stand alone, but is communicated visually and accompanied verbally by a discussion and reflection. According to Bruce Archer, research is "systematic enquiry whose goal is communicable knowledge: Communicable because the findings must be intelligible to, and located within some framework of understanding for, an appropriate audience" (Archer 1995). Recently, Per Galle defined research as "disciplined acquisition of new non-trivial knowledge and documentation of it by means of theory" (Galle 2009). Arguably the purpose of an experiment in the context of design research is to produce knowledge expressed in terms of theory, which is communicable. Thus it is the researcher's responsibility to target and make the theory intelligible to an appropriate audience. Since my research question is about design practice, so as to support it in the best possible way, the primary audience will be colleagues in design research or design practice. Thus it is not the artefact produced in the experiment that is of interest, but rather how it appeared in interplay between designer, material and technique. This relieves the artefact from its usual obligation to fulfil a purpose of everyday use. Hence it is possible to focus solely on the explorative and experimental part of the design practice to explore what is possible, and how. This encourages a mode of research, which offers unpredictable and surprising results. I have explored this by a cluster of parallel and interdependent experiments, as I shall now try to demonstrate.

The method is defined by a frame for carrying out experiments inspired by *Exemplary design research* in the sense of Binder and Redström:

With the notion of “exemplary design research driven by programs, experiments and interventions”, we refer to research based on the explicit formulation of design programs that act as a frame and foundation for carrying out series of design experiments and interventions. It is “exemplary” in the sense that it enables critical dissemination primarily by creating examples of what could be done and how, i.e. examples that both express the possibilities of the design program as well as more general suggestions about a (change to) design practice (Binder and Redström 2006).

The frame is defined by my research question (section 1.1). One experiment has formed the starting point in the research, which has given rise to new questions and experiments. Subsequently the research has comprised parallel experiments, which influence one another through verbal discussion and reflection. The frame and cluster of parallel and interdependent experiments can be illustrated as in figure 4.

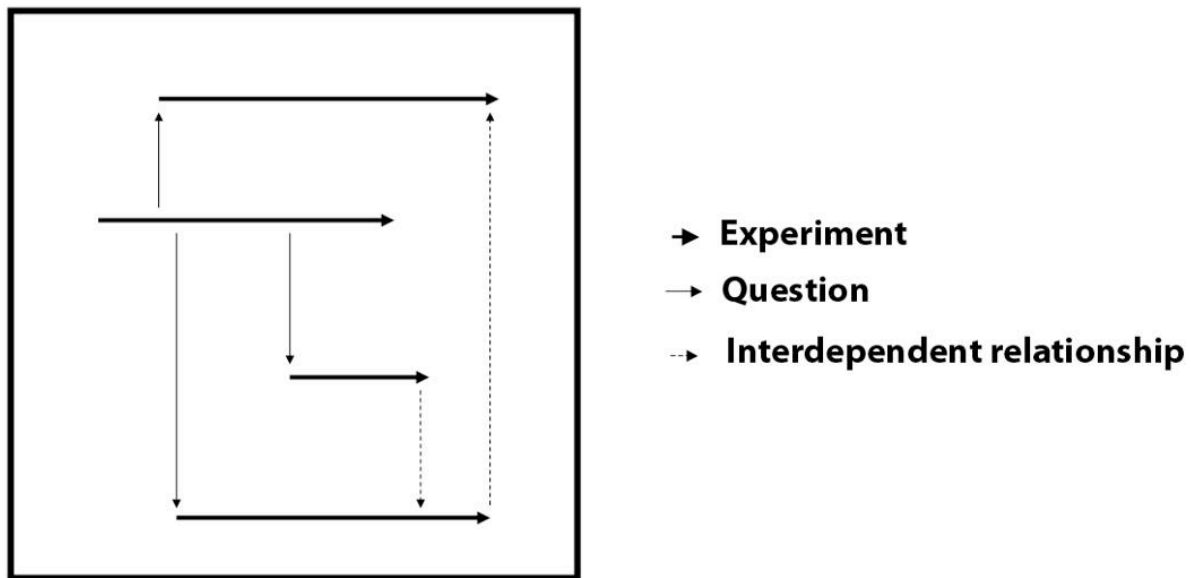


Figure 4, Cluster of parallel and interdependent experiments

It is by this approach, which I have named *The Method of Branching Experiments*, that I have investigated my research question. In the following section I will exemplify the method by describing the particular parallel and interdependent experiments that were undertaken.

### 3. Exemplification

Recall that the research question was about how as a ceramist I can utilize my approach to designing in the use of 3D digital media as a design tool and what such use of digital media can add in a qualitative sense in interplay with the ceramic material. The research question is investigated by experimenting with digital media and ceramic material. The pivotal point for these experiments is as the theme of *movement* and *metamorphosis*. To be able to explain the research method, I shall first consider the traditional approach of a ceramist and then briefly review state-of-the-art use of 3D digital media within the field of ceramics and related fields. After that I shall go into more details about my experiments, to exemplify *Method of Branching Experiments*.

### 3.1. The ceramicist's approach to form

In the field of ceramics, many approaches are taken to form-finding. The one of interest in this research is to rely on the material as a major source of design ideas. This means the material itself generates form in interplay with the designer. An example of such an approach is the design by the Danish ceramist Anne Tophøj (figure 5).



Figure 5

The pattern of the edges of the plates appeared by centrifuging fluid porcelain from the base. This pattern could never have been realized without the potential of the material to flow and be captured in this way. The material determined the spread of the pattern, and Anne Tophøj exerted her influence by controlling speed and acceleration of the centrifuging process. The pattern of the edges was determined by the interplay between the liquid porcelain, the idea of centrifuging and the intervention by Anne Tophøj (2009). This intervention relies on an explorative and playful approach to design practice regarding material. I have named this approach *material-driven form-finding*.

As a contrast, I can refer to an example of my own, which can be seen in Figure 6.



Figure 6

These plates were realized by three profiles that were initially drawn, then modelled in plaster, and finally executed in ceramic material. The ceramic material did not contribute anything to the form itself, as opposed to the example by Anne Tophøj. The design was simply determined before being executed in ceramic material. I call such an approach *constructional form-finding*. However, it is by an approach such as *material-driven form-finding* that I have chosen to explore the digital media.

### 3.2. State-of-the-art use of 3D digital media

There are several of examples of explorative and experimental use of digital media operating with themes such as movement and metamorphosis within the field of ceramics. An example is the work by Tavs Jørgensen, who is part of the research cluster at Falmouth College University “Autonomic” (2009). Tavs Jørgensen has been experimenting with a Microscribe® G2L – a digitizing arm to record a 3D gesture movement by the hand in a 3D virtual space. These data constitute the basis for a 3D digital form, which can be transformed into a physical model by Rapid Prototyping (RP). RP is a range of techniques for transforming 3D digital form into 3D physical form. Figure 7 shows the recorded gesture movement and the 3D digital form, respectively.

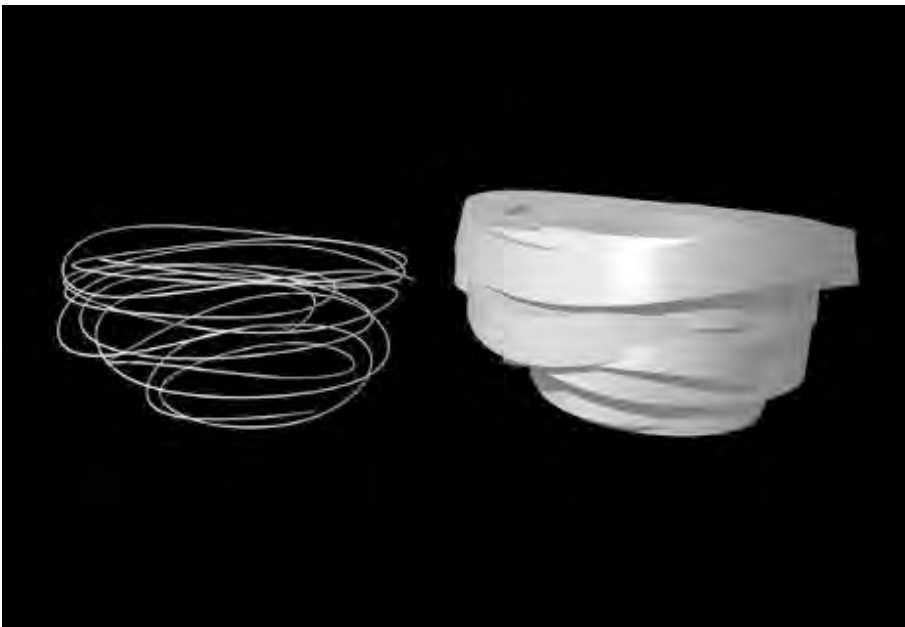


Figure 7

Another example is provided by Geoffrey Mann (2009), who has been experimenting with the use of 3D digital software to generate and simulate naturalistic phenomena such as waves on water surfaces. This was then utilized in the design of a coffee cup. The coffee cup was initially designed as a 3D digital form and was subsequently transformed into a physical model by RP and finally executed in ceramic material (Figure 8).

In the course of my project, a survey of experimental use and research in the field of 3D digital media was made. It has continuously influenced the exploration of the research question. Examples of such media range from the use of Generative Components by Bentley and primarily used in field of architecture, Interaction design by the use of the programming language Processing to animation based software developed for the film and game industry; e.g. Real Flow. The significance of these influences will be explained while presenting the experiments in the following section.



Figure 8

### 3.3. Experiments

I will now give a brief chronological presentation of the series of experiments that I have undertaken. Firstly I will present an introductory experiment, which raised new questions, and thus gave rise to new experiments. It had the important role to keep my exploration of the research question on the track. After that, further experiments will be presented and the interdependence among the multiplying experiments will be explained.

The system of experiments, questions and interdependency relationships are visualized in figure 9. The meanings of the labels are given in Table 3.

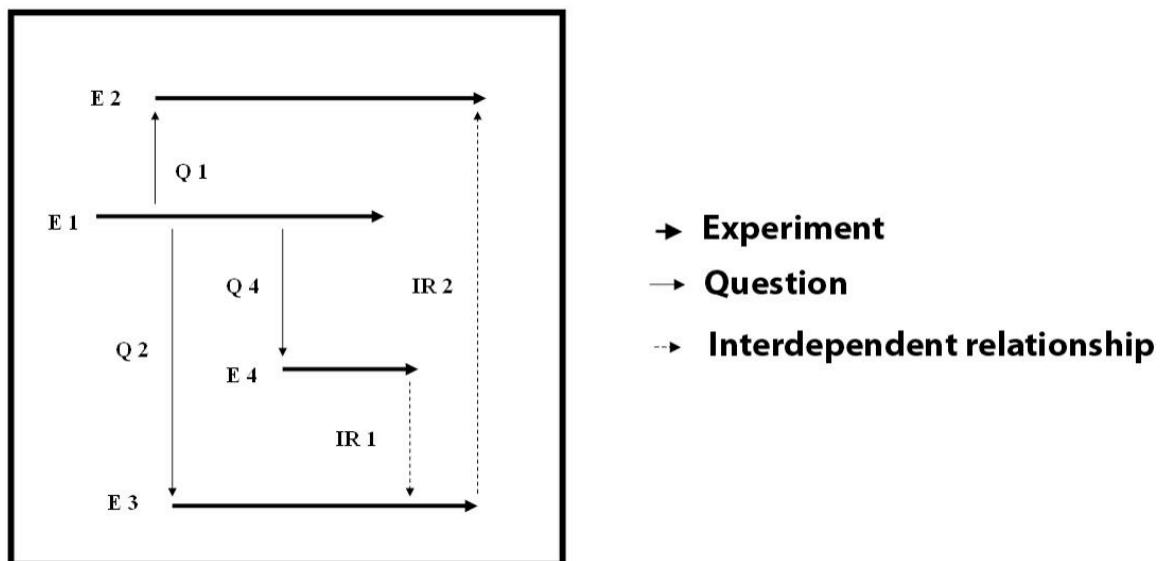


Figure 9

**Table 3. Key to figure 9.**

E1	Dynamics
E2	Interactive Dynamic Design Tool
E3	Silicone moulds and clay plaster mixture
E4	Capturing flowing form
Q1	Is it possible to achieve a higher degree of interaction regarding generative software? This question initiated the experiment: Interactive Dynamic Design Tool. E2. See section 3.3.2
Q2	Is it possible to improve the degree of complexity in the Rapid Prototyped produced model, when used within traditional techniques? This question initiated the experiment: Silicone moulds and clay plaster mixture. E4. See section 3.3.4
Q3	How can the digitally produced model contribute in interplay with the ceramic material? This question rather targets the present experiment than initiates a new one. E1. See section 3.3.1
Q4	Is it possible to capture transient phenomena and achieve similar effects as in reality by the use of e.g. plaster and what is gained by the use of digital media? This question initiated the experiment: Capturing flowing form. E3. See section 3.3.3
IR1	The mixture of plaster and liquid porcelain used in E4 was found suitable for improving the degree of complexity, when transforming the digitally produced form to the ceramic material, used in traditional techniques with moulds of silicone E3, Q2.
IR2	Complex digitally produced forms carried out by the Interactive Dynamic Design Tool in E2, can be transformed into the ceramic material by moulds of silicone and the mixture of plaster and liquid porcelain (developed in E3, Q2). The mixed material shows potentials as a material for solid models and strong textural qualities gained by firing.

### 3.3.1. Dynamics (E1)

At a very early stage I developed an interest in using digital media as generative software, as in the work of Geoffrey Mann (figure 6). It seemed quite obvious to investigate such software regarding a material-driven form-finding approach of the kind taken by Anne Tophøj (figure 3). The first experiment, which formed the starting point, is about the use of “Dynamics” in the 3D animations based software program Real Flow. Dynamics cover a range of tools in 3D digital graphic software to simulate effects related to reality such as wind, gravity, liquids etc. Dynamics allows you to simulate these transient phenomena, making it possible to work with physical representations of these. Through the use of Real Flow, I am not bound by the laws of physics and can even freeze a moment in the film sequence at any time. The generative software is very useful as a means to explore the interaction between forces and the physical representation. For example, it is possible to set up an event such as a collided water surface, which delivers a water splash (figure 10).

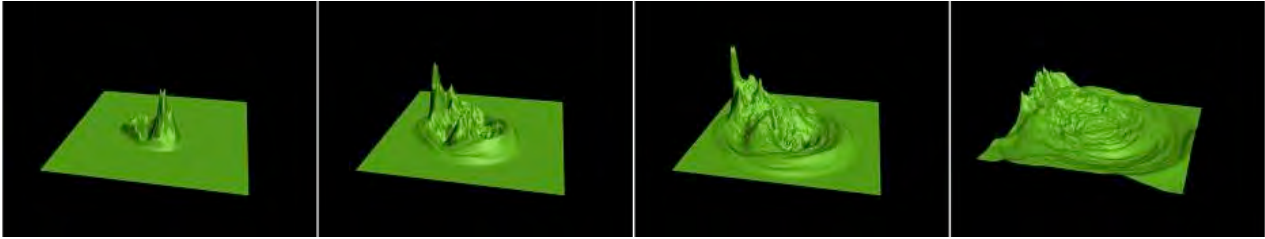


Figure 10

The event simulation in Real Flow is defined in advance with the possibility to change parameters and orientation. However, there is no possibility for the user to interfere while the simulation is executed. This differed from the material-driven form-finding approach and raised my first question (Q1): Is it possible to achieve a higher degree of interaction regarding generative software? This question initiated the experiment: Interactive Dynamic Design Tool; see section 3.3.2. Thus at this stage a new experiment was initiated about a higher degree of interaction regarding generative software, and at the same time a consciousness about a lack of interactivity became evident.

An attractive point using Real Flow is the possibility to have these naturalistic effects – in this case collided water – produced as a 3D physical model by the use of RP (figure 11).



Figure 11

The digitally produced form in Real Flow can become very complex. The technique of RP is not developed to a satisfactory degree to transform the digitally produced form into the ceramic material. Thus this project focuses on the RP-produced models used in combination with traditional techniques. This sets some limitations regarding the degree of complexity allowed in the 3D model. However, this is not a problem in our example in figure 11, but necessitates some considerations and concerns regarding the overall research question. Thus a second question (Q2) was raised: Is it possible to improve the degree of complexity in the RP-produced model, when used within traditional techniques? This question initiated the experiment: Silicone moulds and clay plaster mixture; see section 3.3.4.

Meanwhile, the RP model raises a third question (Q3): How can the digitally produced model contribute in interplay with the ceramic material? This question targets the present experiment, rather than initiating a new one.

An artefact was produced by pouring liquid porcelain onto a plaster mould, which had been made on the basis of the RP model (figure 12). As the liquid material flows across the plaster, the water



is drained out of the porcelain, whereby it slowly stiffens in its action and dries. The dry porcelain can subsequently be dismantled from the plaster mould, which now has made an imprint in the porcelain. At this stage of mould making by plaster a fourth question (Q4) emerged: Is it possible to capture transient phenomena and achieve similar effects as in reality by the use of e.g. plaster, and what is gained by the use of digital media? This question initiated the experiment: Capturing flowing form. See chapter 3.3.3.



Figure 12

The resulting artefact can be seen in figure 13. It has an organically growing and detailed formation in the middle (stemming from the 3D print), and a soft curved edge determined by the liquid material, in which it is produced.



Figure 13

The following observation relates to the third question (Q3). (How can the digitally produced model contribute in interplay with the ceramic material by a material-driven form-finding approach?) The formation describes and pictures a phenomenon about liquid. It is naturalistic but fictitious. It has never been a floating liquid itself and refers to a phenomenon that differs from its own creation,

similar to the notion of a figure, model etc. On the other hand, the contour of the artefact rather refers to itself and its creation. It simply looks like what it is. It has never been the intention for it to be anything but the flowing porcelain, which has stiffened. Thus the two expressions differ and integrate at the same time. The two expression and thus the two media are interdependent to fulfil such an expression. When contemplating the artefact, we will alternate between fiction and reality and a fluid boundary emerges presented in one and the same thing.

The next three sections follow up on the questions that emerged above.

### 3.3.2. Interactive Dynamic Design Tool (E2)

First question (Q1): Is it possible to achieve a higher degree of interaction regarding generative software?

The experiment with Real Flow showed that I needed interactive software. This led me to other artists and designers experimenting with motion and interactive systems. Such an example is *Untitled 5* by the American-based artist Camille Utterback (2009). She designed *Untitled 5* as an interactive system, which can be explored by the audience (figure 14).



Figure 14

What is interesting in Camilla Utterback's work is the dynamic, generative and interactive system, which responds fluidly and intriguingly to physical movement. Camille Utterback has, by her aesthetic system, created a framework for various possibilities to occur through the physical relationships between the audience and the projection. The idea of Camille Utterback's work is to be an eternal living system projected onto a 2D surface; it is not a design tool.

Another example is the Swedish based design group *Front* (2009) using Motion Capture (figure 15). *Front* tracks 3D motion by an infrared pen, whose movements are recorded by two cameras and thus generate 3D digital files. The idea is similar to the experiment by Tavs Jorgensen. *Front's* technique captures movements in 3 dimensions as a tool to define shape, but does not use a dynamic interactive system as in Camille Utterback's work.



Figure 15

I saw a combination of these two examples as a good basis for a 3D digital design approach, which led me to a cooperation with the programmer and designer *Marcin Ignac* (2009). Together we have developed what I have called an *Interactive Dynamic Design Tool*. We made use of Marcin Ignac's skills for programming in the programming language *Processing* and the use of a *wii* remote as a device to capture the 3D motions. By the *wii* remote the movement of the hand is tracked in a 3D virtual space (figure 16).

A dynamic and generative system is defined by emerging 3D geometries, which respond to speed. The size of geometry and the distance between the geometries reflects the speed of the movement of the hand with the *wii* remote (figure 17).



Figure 16

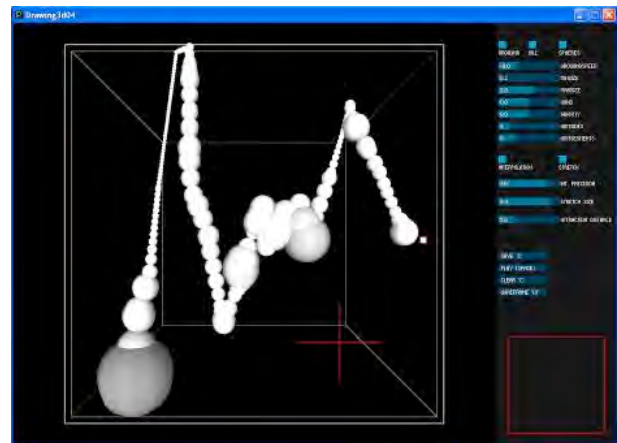


Figure 17

Furthermore the emerging geometries can either increase or decrease and be affected by the following movements of the hand by being repelled or attracted. The geometries provide a trace of the movement in the interactive dynamic system, which may be captured at any time. The captured movement forms the basis for a 3D physical model produced by the use of RP (figure 18), which express the captured movement in physical form.



Figure 18

The constellation of a programmer and designer has been constructive. The programmer is the specialist in the "material" of computer software, and I as the designer have had the notion of a digital design tool based on the idea of material-driven form-finding. It is obvious in this cooperation that creative thinking relies on the dynamic system, rather than the particular artefact.

The next step is to test the Interactive Dynamic Design Tool in cooperation with an artist from the field of ceramics and related fields for further development.

### 3.3.3. Capturing flowing form (E4)

Fourth question (Q4): Is it possible to capture transient phenomena and achieve similar effects as in reality by the use of e.g. plaster and what is gained by the use of digital media?

Plaster has the quality of a crystallizing process, which enables us to capture a movement of the material in a process from fluid to stable. This was explored in several ways; e.g. using gravity and blasts of compressed air, as shown in figures 19 and 20 respectively.



Figure 19



Figure 20



The transformation of a ceramic material, which can subsequently be fired, is of paramount importance to this research. Plaster is not such a material. But by accident I was introduced to Karen Harsbo, associate professor at the School of Architecture in Copenhagen, Fine Art department and head of the Ceramic Lab, and her collaboration with Neil Brownsword, PhD from United Kingdom. As it turned out, they experiment with a mixture of plaster and liquid porcelain. This particular mixture constitutes a material with the quality of plaster as well the quality of a textural ceramic material meant for firing. This mixture was utilized in the experiment.

The mixture of plaster and liquid porcelain showed great potentials for capturing form in motion, which could be further developed, but most importantly regarding this research, the experiment put the use of dynamics into perspective. On one hand dynamics showed a potential to capture transient phenomena in a way which could be exactly controlled and even beyond the laws of physics, and furthermore a potential in an interplay with traditional techniques and materials. On the other hand, the experiment drew my attention to the lack of playfulness caused by the lack of interactivity found in the use of dynamics.

Another important and unpredictable outcome from this experiment was the idea of this mixture of plaster and liquid porcelain used in relation to the second question (Q2) in section 3.3.1, which the following section is about.

### 3.3.4. Silicone moulds and clay plaster mixture (E3)

Second question (Q2): Is it possible to improve the degree of complexity in the RP-produced model, when used within traditional techniques?

The mixture based on plaster and liquid porcelain mentioned in the previous section has shown a potential for improving the degree of complexity when transforming the RP-produced model into the ceramic material. An imprint of the RP-produced model by silicone can make the basis for the transformation. The mould of silicone is much more flexible than the traditional mould made from plaster. The mixture can be poured into the mould of silicone and can be fired after being disengaged from the mould. Complex digitally produced forms carried out by the Interactive Dynamic Design Tool, are now being explored for the potential to be transformed into the ceramic material. The mixed material has potential as a material for solid models and strong textural qualities gained by firing. Figure 21 shows such a test piece (left) and its silicone mould (right).



Figure 21

This experiment (E3) was based on the findings in the experiment: “Capturing flowing form” (E4) and thus an unpredictable interdependent relationship (IR1). The outcome from this experiment (E3) will subsequently support the experiment: Interactive Dynamic Design Tool (E2) transforming the RP produced model into ceramics and thus a second unpredictable interdependent relationship

(IR2). These unpredictable relationships serve as examples for how interdependent parallel experiments are able to generate unpredictable and surprising results. Thus the *Method of Branching Experiments* is useful for the design researcher to generate new knowledge to support the designer in design practice.

#### 4. Concluding Remarks

In this paper I have introduced my method of research, which I have named the *Method of Branching Experiments*. The method has shown a potential to produce knowledge that supports design practice regarding the interplay between designer, techniques and material. The method is characterized by an explorative and experimental approach based on the researcher's own design practice in interplay with techniques and materials relevant for the research, and by parallel interdependent experiments. The experiments have shown how new questions derived from an introductory experiment influenced the process of exploration, by suggesting further experiments. The new questions did not change the direction of the original experiment, but rather clarified and specified it, allowing the process to branch off in a variety of directions, and to be fuelled by spontaneous curiosity. Furthermore I have shown how the parallel experiments have contributed unpredictable solutions to other experiments. Thus the notion of parallel interdependent experiments within a defined frame can be seen as a dynamic system in which a number of unpredictable and surprising relationships can emerge and be exemplary for what can be done and how, within the context of the original research question.

As we have seen, the method utilizes design practice and the artefact as a means especially for design research. This is in a way that differs from the usual obligation of design to fulfil a purpose of everyday use, solve problems or fulfil certain needs. The strength of the method was found to lie in its capacity for producing unpredictable and explorative situations that stimulate the researcher's search for new knowledge. The main weakness and danger of the method is that it may render the experiment, artefact and discussion too abstract and thus incomprehensible, inaccessible or irrelevant for the intended audience, thereby making the knowledge it generates useless.

As a measure against this potential problem this research included collaboration with other designers. Selected designers are introduced to the research and invited to explore the obtained results in collaboration. Thus the relevance and usefulness of the results are evaluated currently, through the interaction with designers, traditional design practice and production of artefacts such as jewellery and tableware. Yet the process of research itself is secluded from such collaboration, and remains a practice in its own right, subject to its own criteria of quality.

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# Disturbance, Dialogue and Metaphor: the Study of Practices and Perspectives through Design Enquiry

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## Abstract

Practice theory (Reckwitz, 2002) provides an alternative to three approaches that currently dominate the study of culture: culturalist mentalism, textualism, intersubjectivism. Practice theory looks to background practices as the basis of our shared understanding of the world. Practices are routine forms of behaviour consisting of interconnected forms of bodily activities, mental activities, 'things' in use, and background understanding in the form of know-how, moods, feelings and motivations.

There is significant potential within practice theory to account for phenomena that design practitioners and researchers have long recognised as being central to understanding of design activity. These phenomena include tacit knowledge, insight and the emergence of new artefacts and practices. Practice theory embraces diverse range of theorists including Heidegger (1962), Wittgenstein (1968) and Schatzki (1996). Much of the published work in this area is oriented toward the articulation of the ontological position of the researcher or the applied investigations of social phenomena. The research practices appropriate to modes of qualitative enquiry consistent with this ontology are yet to be adequately recognised and articulated.

The discussion in this paper is guided by the following questions: What are the research practices appropriate to praxeological enquiry? How do these apply to research by design?

I do not propose to offer a comprehensive response to these questions – practice theory is as yet an emerging paradigm. I will, however, discuss three constructs that I consider to be helpful in sensitising the researcher to the structure of practices and perspectives – disturbance, dialog and metaphor. I discuss the relevance of these constructs to design enquiry, with particular reference to issues confronted by the design practitioner-researcher.

## Keywords

Practice theory; phenomenology; practice led research; Heidegger, Gadamer

Reckwitz (2002) distinguishes between four approaches to the study of culture: culturalist mentalism, textualism, intersubjectivism, and practice theory. Culturalist mentalism locates the basis of our social and cultural life in mental representations. Textualism focuses on discourse, and intersubjectivism on interpersonal interactions. Practice theory offers an alternative to these three more established approaches. Practice theory looks to background practices as the basis of our shared understanding of the world.

Practices are routine forms of behaviour consisting of interconnected forms of bodily activities, mental activities, 'things' in use, and background understanding in the form of know-how, moods, feelings and motivations<sup>1</sup>. In practice theory, the principal focus of study is our embodied engaged dealings with the world. Practices are to a large extent performed, and are thus potentially open to observation.

Practices incorporate particular ways of understanding the world (Reckwitz, 2002, p.253). We are always already oriented in the world. The world shows up for us in the light of our concerns. The ontological position that most comfortably aligns with practice theory might be described as 'perspectival realism' (Wachterhauser, 1994).

In this paper I am guided by the following questions: What are the research practices appropriate to modes of inquiry that are consistent with practice theory? How do these apply in the context of design enquiry (research by design)? I will discuss three constructs that are helpful in sensitising the researcher to practices and perspectives.

The first construct is the phenomenon of 'disturbance' (Heidegger, 1962). It describes various ways in which our unobtrusive engagement with the world might be interrupted. While practices are potentially open to observation, a difficulty arises from the fact that we are always already thrown into the world. We are deeply embedded in shared cultural practices. These practices form the most basic understanding that we have of ourselves and of our world. They tend to recede into the background. One of the challenges for research is that practices are, for the most part, taken over unawares. Practices are rarely the focus of conscious thought. In order to study practices, and the perspectives that open up through our engagement with those practices, we must interrupt our ongoing dealings with the world. We must develop strategies for noticing the structure and style of our practices.

The second construct is 'dialogue'. Dialogue might be seen as a specific instance of the operation of 'disturbance.' When we genuinely engage in dialogue we are interested in understanding what the other has to say. We are attentive to the difference being expressed by a dialogical partner. Gadamer (1989) characterises the process of dialogue as a 'fusion of horizons' where each dialogical partner initially comes to a topic from different perspectives. If the dialogical partners are attentive to the differences in those perspectives, then the perspectives of each partner will undergo some change. In being attentive to difference we create an opportunity to shed light, not only on the perspective of the other, but also on our own perspective on the situation.

Gadamer's phenomenological description of dialogue can be used to draw attention to the fact that any act of interpretation involves orienting and reorienting oneself in the light

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<sup>1</sup> This description of practices is a development of the description given by Reckwitz (2002, p.249). Reckwitz describes practices as 'routinized behaviour consisting of interconnected forms of bodily activities, forms of mental activities, 'things' in their use, and background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.' I have shifted some of the terms of this description to draw out the Heideggerian insight that much of our background understanding is pre-conceptual, that is, prior to any mental representation. Terms such as 'states of emotion' and 'motivational knowledge' may suggest that emotion and motivations are mental representations. Heidegger provides a critique of this position in his discussion of 'attunement' in *Being and Time* (Heidegger, 1962, p.173) (King, 2001, p.56).

of the contingencies of the situation. Being attentive to these changes in orientation can provide a valuable pathway into conceptualising one's own background awareness. Holding onto these moments of 'insight' should allow the researcher to be able to draw on resources in their culture to articulate that background awareness in ways that are accessible (recognisable) to other participants in that culture.

The third construct is 'metaphor.' In practice theory all understanding is perspectival. This understanding resides primarily at the level of background awareness. Metaphor, provides a construct for drawing attention to the 'as' structure of our background understanding.

(Reckwitz, 2002, p.250) draws attention to work of Heidegger (1962) and Wittgenstein (1968) as the 'philosophical background of practice theory.' Reckwitz goes on to suggest that 'everything that is original in practice theory is already in the work of these authors.' The discussion in this paper is motivated in part by a belief that we should look to Heidegger, not just for the background philosophy of practice theory, but also for practical guidance as to how to engage in praxeological enquiry.

'Disturbance' is a concept explicitly thematised by Heidegger in *Being and Time*. It is a concept that is gaining recognition in design literature, however, the radical implications of this concept are not always recognised. I will discuss the notion of disturbance with particular reference to recent work by Klaus Krippendorff (2006) and the work of the IDEO (Kelley & Littman, 2001).

'Dialogue' is a concept explored by Gadamer (1989). Gadamer, a former student of Heidegger's, developed his phenomenological description of dialogue to elaborate a Heideggerian perspective on interpretation. I draw on this description to recover an over subjective dimension to the phenomenon of 'insight.'

In the section on 'metaphor' I take some liberties with the position of both Heidegger and Gadamer. For Heidegger, there is no need to maintain a distinction between the literal and the metaphoric, and therefore no need to maintain a category called 'metaphor.' All language is metaphor, in the sense that all language operates by drawing our attention to the similar in the distinct. In this paper I retain the use of the term 'metaphor' as it provides a useful point of reference when discussing the way in which language might be used to bring our background awareness into view.

## **Disturbance: the challenge of noticing the structure in our practices**

Central to Heidegger's *Being and Time* is the recovery of background understanding, the mode of understanding that makes it possible to make our way around in the world. At the heart of Heidegger's exploration of background understanding are careful descriptions of the way that objects normally show up for us. In *Basic Problems of Phenomenology* (1982, p.163) he discusses the experience of entering a lecture theatre. He points out that we don't first notice 'walls,' 'doors,' 'seats' and 'stairs' and their properties. We don't first perceive individual entities and then somehow establish coherent interconnections between them. We simply go about the business of attending the lecture. We are always already oriented towards the lecture theatre. Walls, doors, seats and stairs are always already integrated into a referential whole that relates to our concerns. Similarly in *Being and Time* Heidegger demonstrates that the most basic

understanding that we can have of a hammer is in its transparent use (Heidegger 1962, p.98).

It is only in situations of the disturbance of the transparent functioning of a piece of equipment that we start to notice it as 'a thing' – if it is unavailable, broken, not performing as we expect it to perform, if we wish to improve it (design), or if we wish to theorise about. Theoretical accounts of the world have traditionally overlooked the necessarily perspectival nature of our access to the world. While the world is as it is, there are many ways in which we can access (or fail to access) the world as it is. What shows up for us in the world necessarily depends on the orientations that we bring to our encounter with the world and those orientations are inherently linked to our engagement with the world – an engagement shaped by shared practices.

Understanding things 'as things' is a derivative mode of understanding. The more basic form of understanding is 'know how,' the transparent background awareness that we have of the world when things are in use. Tom Kelley, general manager of IDEO, provides a simple example of the way in which we tend to carry our understandings of the world primarily through deeply embedded actions rather than conscious thought. In the context of redesigning toothpaste packaging, in a project undertaken in the 1990's designers and researchers at IDEO found that people found it very hard to adapt to a toothpaste cap that departed from the traditional screw top. The problem with the screw top was that over time toothpaste caught in the grooves making it difficult to reapply the cap. In trials of an alternative pop-off cap Kelley (Kelley & Littman, 2001, p.45) reports:

People kept trying to screw off our pop-off cap, even after they realized it had no screws. Decades of screwing caps on and off—thousands of times for most people—had created an ingrained perception and habit. The cap on a toothpaste tube must screw on and off.

The habitual coupling of self and world was such that the toothpaste cap solicited ingrained responses from people even though they had a conceptual understanding that contradicted the likelihood that those responses would be successful. The response of the IDEO designers was to develop a cap that was a compromise between the screw top mechanism that accorded with habitual expectations and the new pop-off cap, no doubt smoothing the way for the pop-off toothpaste caps that are now quite common.

Practice theory repositions our tacit, background awareness in such a way that it becomes the condition of possibility of any other form of understanding. In order to draw out the radical implications of this move, I will compare Heidegger's position with the mentalist-textualist position articulated by Klaus Krippendorff in *The Semantic Turn*.

Krippendorff's stated aim is to shift design from a focus on functionalism (Krippendorff, 2006, p.5) towards a focus on sense, meaning and social significance (Krippendorff, 2006, p.xvii). Krippendorff explores the meaning of artefacts from four different perspectives: the meaning of artefacts in use, the meaning of artefacts in language, meaning in the lives of artefacts; and meaning in an ecology of artefacts.

It might be expected that an exploration of the 'meaning of artefacts in use' would have much in common with the way in which artefacts are conceptualised within practice theory. In practice theory artefacts are things to be handled, they are constitutive elements of the patterns of activity that are our practices (Reckwitz, 2002, p.253). Krippendorff does in fact draw on a number of Heidegger's ideas – these include the

phenomenon of 'disturbance'<sup>2</sup> and the distinction between the 'ready to hand' (the background awareness of equipment in use) and the 'present at hand' (the conceptual understanding of items of equipment as things). He also appeals to Gibson's affordances (Krippendorff, 2006, p.111) a phenomenon entirely compatible with a Heideggerian ontology.

While Krippendorff acknowledges that 'the understanding of artefacts...is *demonstrable* by interfacing with them' (Krippendorff, 2006, p.292) (my italics) he appears to hold that any understanding that we might have of artefacts is necessarily conceptual. Passing over practices, and the attendant focus on the interpretative structure of background awareness, amounts to a failure to recognise that these background interpretations are a potential opening onto new ideas and new ways of being in the world. This has significant implications for design practice and research. Almost all the strategies listed by Krippendorff in his account of 'methods for creating spaces of possible futures' (Krippendorff, 2006, pp.213-221) operate at the level of conceptual understanding. Similarly in the section on 'methods for inquiring into stakeholders' concepts and motivations' (Krippendorff, 2006, pp.221-230) the exploration of methods which focus on 'unconscious habits' and 'nonverbalizable routines' is mentioned but is of only marginal concern. Compare this to the priority that practitioners such as the IDEO group (Kelley & Littman, 2001) and David Sless (2002) give to user studies where anomalies and disruptions to the observed experience of others, or to the experience of the designer themselves, provide insight into the structure of the situation and open up avenues for design responses.

Kelley describes a number of strategies that have emerged from the experience of the IDEO group, specifically oriented towards the elicitation of anomalies. These include: learning to notice aspects of one's own experience where the organization of the experience is lacking in some respect, in the context of meetings, travelling or visiting another company for example (Kelley & Littman, 2001, pp. 42-43); learning to notice actions that seem clumsy or difficult (ibid, pp.44-49); observing users different to oneself, kids, for example (ibid, p.33); and observing users who break the rules, who improvise rather than using products and systems as they have been designed to be used (ibid, pp.39-40).

Practice theory anticipates the importance of 'disruption' as a way into noticing the taken for granted aspects of our background awareness. The priority given to 'disruption' within practice theory accords with the research approaches developed in practice by user centred design practitioners such as the IDEO group. It is important to note that Kelley is critical of focus groups and marketing research methods more generally. David Gilmore, also a member of the IDEO group argues that there is a significant difference between research undertaken to 'inspire design' and research conducted to 'validate' design – 'one is about idiosyncracies and little details and the other is about averages and generalities' (Gilmore, 2002, p.32). The richly textured qualitative investigations advocated by Kelley and Gilmore would seem to have much in common with the phenomenological approaches of practice theory, the aim of which is to bring into conscious awareness that which we already in a sense know, that which resides in our background understanding (Glendinning, 2007, p.16).

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<sup>2</sup> Following Dreyfus (1991) Krippendorff uses the term 'breakdown' to refer to Heidegger's concept of 'disturbance.'

The phenomenon of 'disruption' provides a powerful entry point into understanding the structure of our background awareness. It can be used to access a myriad of routinized interactions between agents, bodies, artefacts, environments, discourse, concepts and identities. Holding onto anomalies sensed, but deeply embedded, can be an important catalyst for cultural change (Spinoza, Flores, & Dreyfus, 1997). Practice theory suggests that there is considerable scope, in both design and in social research more generally, for developing research practices that are attentive to our pre-conceptual ways of understanding the world.

### **Dialogue: the interplay of emergent and preceding horizons**

In a review of the approaches used in his own auto-ethnographic study of cultural politics of the paralympic movement P. David Howe draws attention to an issue that lies at the heart of any research endeavour that draws on the researcher's own practices as a primary source of data (Howe, 2008, p.156):

The danger of this phenomenological position is that the truths discerned by self-examination may be too closely bound to the experience of the researcher and the categories of their culture.

This concern is just as pressing for the design practitioner-researcher engaged in projects that draw upon their own practice as a significant source of data as it is for any other form of auto-ethnography.

From a practice theory perspective, existing experience in the form of practices of perceiving, noticing, categorising, articulating, making and otherwise acting in the world are intrinsically linked to the way in which the world shows up for us. Our practices operate at basic levels of perception governing what we notice. Heidegger (1962), Merleau-Ponty (2002) and Wittgenstein (1968) have all developed phenomenological descriptions that draw our attention to the fact that there is no such thing as pure sense perception. Heidegger (1962, p.207):

What we 'first' hear is never noises or complexes of sounds, but the creaking of a wagon, the motor-cycle. We hear the column on the march, the north wind, the woodpecker tapping, the fire crackling...It requires a very artificial and complicated frame of mind to 'hear' a 'pure noise.'

Even at the level of perception we are interpreting the world. Gibson's affordances (Gibson, 1979) might be seen as an elaboration of this position. A surface, for example, will not be perceived as pure sense data but as 'climb-on-able, 'fall-off-able' or bump-into-able' relative to the perceiver's actions and concerns (Cazeaux, 2007, p.64). Our practices enable our encounters with the world by allowing us to project into a situation.

If we accept that we can only ever have an understanding of a situation by coming to that situation from a particular perspective, then this raises the issue of how it is possible to move beyond that perspective. Hans Georg Gadamer, a philosopher, phenomenologist, and former student of Heidegger's, has developed a rich body of work aimed at developing our understanding of the practice of interpretation.

Gadamer (1989, pp. 367-368) develops detailed descriptions of the way in which our understanding is transformed through engaging in open dialogue with an 'other.' When we enter into a conversation, each participant brings a particular perspective to the matter at hand. Through the course of the conversation similarities and differences

emerge. If we are attentive to the differences, if we genuinely try to project into the situation to see how the other's claims might make sense, then our own initial projection into the situation is inevitably changed. At the very least we have a broader perspective on the way in which the situation at hand might be interpreted. At a more fundamental level, key aspects of our initial projection may no longer seem tenable. Gadamer employs the term 'fusion of horizons' (Gadamer, 1989, p. 306) to describe the development of perspectives (horizons) that occurs through open dialog. Through dialog, the initial perspective may shift in ways that align more effectively with the perspective of the other, but this is always a development of that initial perspective. Our changed perspective will never be identical to the perspective of the other. The initial projection into the situation is always productive of any future understanding of the situation that we might attain.

It is possible to draw on Gadamer's concept of fusion of horizons to account for the development of new ideas – not just in the context of conversation – but in the context of design and research activity more generally. Coyne and Snodgrass suggest that Schon's protocol studies reveal that the process of designing is dialogical, the talk back of the situation in the architectural context consisting of reflection on 'the construction of the problem, the strategies of action, or the model of the phenomena' (Snodgrass & Coyne, 1997, p.22). Gadamer's account of dialogue allows us to see how practice theory might offer a viable account of the phenomenon of 'insight.' Insight might be characterised as the recognition or resonance that occurs when the orientation that a designer/researcher has been projecting into a situation shifts in such a way that they glimpse the situation from another perspective, and that perspective seems, at least for a time, to make sense.

Practice theory posits an account of understanding as an orientation. It also offers a distinctive and compelling account of how it is that we develop new ideas. As we work through the process of trying to establish an effective coupling between self and world we orient and reorient ourselves in relation to the world. Any particular orientation will bring forth the world in a particular way. As we orient and reorient ourselves towards the world, the world will show up in different ways. Contrast this with a cultural mentalist account of change where understanding is conceived entirely in terms of mental representations. Change is construed as a combinatorial process where new ideas (representations) are generated by combining existing representations. In design contexts such a process is implied by the term 'synthesis.' The design methods movement was notable for the difficulties encountered in trying to account for the generation of design ideas in this way.

In a discussion of the new thinking required to drive entrepreneurial activity, Spinosa, Flores and Dreyfus (1997, p.53) observe that it is important for the entrepreneur to maintain a sense of both the 'sensibleness' and the strangeness of their new way of thinking. Their rationale is as follows. First, it is typically difficult for people to recognise the potential of the new way of thinking. The danger here is that people tend to make sense of the world in terms of existing categories and perspectives. It is all too easy for people to respond to the new thinking by subsuming that which is strange or difficult under existing categories, casting it as a manifestation of existing ideas in an attempt to master or reject it. The entrepreneur must find a way of articulating the relevance, the 'sensibleness', of the new thinking, showing how it relates to our tacit understanding of the world, and building an understanding of how this new way of thinking addresses particular issues or needs in a new way. Second, if the entrepreneur is successful in articulating the soundness of the new thinking there is a risk that it will seem obvious.



The danger here is that people will assume that if something is self evidently true then it must already be known and that the implications of the ideas have already been explored. The entrepreneur must preserve a sense of the difference between the new way of thinking and existing norms.

What of the auto-ethnographic practitioner-researcher? What of the situation where the researcher is in dialogue with his or her own views, with his or her own perspectives?

My claim here is that there are significant parallels between Spinosa et al.'s entrepreneur and the practitioner and/or researcher working with ideas (anomalies, insights) that they consider to be potentially significant. The onus is on the auto-ethnographic researcher to be attentive to 'shifts' in their projections as they work through projects. Gadamer's description of dialogue suggests that interpretation is primarily a matter of allowing one's initial projection into a situation to be opened up and modified by the contingencies of that situation. As the practitioner researcher presses into the possibilities of the situation, they need to be attentive to both the limitations of conventional ways of thinking about a situation and to those moments when they develop a sense of possible alternatives.

Rissanen (2007, 2008) discusses a PhD project explicitly structured around the articulation of emerging and existing perspectives on designing and pattern making in the context of fashion design. The aim of the project was to develop approaches to design and pattern making that eliminate fabric waste. The project began by documenting existing approaches to designing fashion, approaches which encompass a range of relationships between pattern making and designing. The next stage of the project involved a series of design experiments organised in terms of distinct design approaches which seemed to have potential in terms of designing to eliminate fabric waste – including draping, interlocking pattern pieces, and backward engineering existing pattern pieces to eliminate gaps when laid out on a given fabric width. The design experiments evolved into the design of a zero waste menswear collection. The outcomes of the project will be reported in terms of the changes to existing industry practices that would be required to facilitate design for zero fabric waste.

Practice theory holds that practices and perspectives are inherently over subjective (Reckwitz, 2002). It is recognition of the solidarity that arises from our being inducted into shared practices that free us from the spectre of relativism (Bernstein, 1983). If the outcomes of auto-ethnographic research are to be recognised as being of value to others, then the practitioner-researcher must be able to contextualise those outcomes in the light of perspectives that are familiar to others working in similar areas. The practitioner-researcher should be able to contextualise new, speculative projections so that they shed light on our more familiar perspectives whilst in the process articulating the merits of the new alternative.

## **Metaphor and entailments**

Heidegger makes extensive use of the 'as' structure of our understanding in his phenomenology whilst, at the same time, making no explicit mention of metaphor. Apart from a reference to the fact that language is fundamentally metaphorical (Gadamer, 1989, p.429), Gadamer too is largely silent on the subject. It would seem that neither Heidegger nor Gadamer see the need to maintain a category called 'metaphor' as their ontological position is such that there is no distinction to be made between literal and metaphorical language. All language use involves 'seeing as.' All language is metaphorical. One simply needs to speak of 'language.' That it is the nature of language to allow us to perceive the similar in the distinct is implied (Vedder, 2002, p.197). Ricoeur

(2003), provides a compelling example of this position by drawing attention to the fact that to use a common category such as 'dog' or 'cat' to refer to any animal in particular is necessarily in itself an instance of 'seeing as.' We live within a culture that has lost sight of this fundamentally metaphoric character of language.

In this section I explore the value of the language construct "... as ..." in bringing to the fore aspects of our perspectives – perspectives that normally reside at the level of background awareness, a level that is necessarily prior to concepts. I retain use of the term 'metaphor' in the context of this discussion as it helps to illuminate the provocative nature of the praxeological account of language and its relationship to understanding.

Concepts of metaphor are tied to concepts of language. If we conceive of language as primarily a matter of 'naming' then metaphor is a decorative, ornament of language, a figure of speech that can always be replaced with literal language (Ricoeur, 2003, pp.51-52). If we conceive of language as isomorphic with mental representations that are constitutive of our understanding of the world, then metaphor shapes our understanding in the most fundamental of ways (consider here the culturalist mentalism of Lakoff and Johnson (1999)). If however we conceive of language as equipment for drawing attention to aspects of our understanding of the world (Heidegger, 1962, p. 108), then metaphor can be seen as equipment for drawing attention to aspects of the 'as' structure of our understanding,<sup>3</sup> understanding that typically resides at the level of background awareness. In practice theory metaphor does not capture our perspectives (as in culturalist mentalism), it is merely language that can be used to draw attention to aspects of those perspectives.

As we have already seen, any encounter that we can have with the world is always already an interpretation. A fundamental assumption of practice theory is that most of our understanding resides at the level of background awareness. Understanding is conceived primarily as a matter of 'orientation' rather than of conscious thought. In those situations where we do become conscious of our background awareness, moments of insight for example, the experience can be fleeting. New perspectives might be momentarily glimpsed, preceding perspectives discarded in an instant.

Once glimpsed the researcher informed by practice theory requires a construct that will allow him to background perspectives into view. While Heidegger and Gadamer would no doubt assign this function to our use of language as a whole, the construct "... as ..." provides a concise and explicit way of drawing attention to the perspectives that constitute our understanding. 'Metaphor' in the form of the construct "... as ..." allows us to draw attention to particular ways of seeing the world so that the entailments (implications) of those perspectives can be explored.

Much of the research on the metaphor and entailments explores entailments that are worked out in the context of language itself. George Lakoff's (1996) analysis of different conceptions of family – the 'strict father family' and the nurturant parent family' – is a case in point. Starting from an initial observation that much political rhetoric is based on metaphors of the family, Lakoff has analysed the way in which the two models of family have been used to frame the rhetoric of conservative and liberal politics in America. While Lakoff is clearly interested in the practical implications of the use of these metaphors his analysis is entirely at the level of discourse.

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<sup>3</sup> It should be noted that I am drawing here on Heidegger's characterisation of language when it is being used to make assertions about the world. Heidegger's concept of language is in fact broader than this but a focus on assertions is sufficient for my purpose here.

Practice theory would, of course, suggest a very different approach to the working out of entailments. It is interesting that Krippendorff (2006, pp.106-107) in his discussion of UCMs (User Conceptual Maps) comes to a position that closely approximates the practice theory approach. Krippendorff discusses an example of a study where users were found to be using two different models of home heat control: 'as a valve' and 'as a feedback system.' Krippendorff reports that these models were derived from extensive interviews where users explained how they handled thermostats and that this was correlated with recorded room temperature fluctuations. Krippendorff also comments on the fact that the engineer's design of the thermostat accommodated both models of use 'probably without intention or awareness of the difference.' Here we see the operations of two different models at play in both the design and the use of an artefact. The fact that the models were derived from extensive interviews suggests that the models weren't operating primarily at the level of conscious thought, but that they formed part of the background awareness of both user and designers. This movement from use and design, to discourse (the UCMs), and presumably back to use and design, is entirely consistent with a praxeological approach to design enquiry.

Given that the ontological assumptions behind the study were obviously in some ways at odds with practice theory – the terminology of 'User Conceptual Map' gives this much away – does it really matter whether or not the design researcher is aware of the possibility that much of our understanding could be embedded in the structure of our background understanding?

On one level design research is generally applied research. It is a practice and, as a practice coupled with the world in very real ways. It is thus likely to gravitate towards activities that work in spite of the epistemological and ontological assumptions of the researcher. On another level however I think it does matter. The background perspectives of researchers can have very real implications for the priorities that they give to particular research practices and the aspects of a situation that come to their attention.

## Conclusion

Practice theory is an emergent approach to the study of the social that offers many ideas that should be of value to design research: the repositioning of background awareness (know how) as the pre-condition of any other form of understanding; the recovery of artefacts as a central focus for investigating the social; the recognition that understanding can never be fully captured or formalised but that we may draw attention to aspects of the structure of that understanding. Furthermore practice theory has the potential to provide a compelling account of the phenomenon of 'insight' and the way in which new understandings emerge.

I have explored three constructs that I consider to be helpful in sensitising the design practitioner-researcher to the possibilities and implications of practice theory: disturbance, dialogue and metaphor.

'Disturbance' is a concept explicitly thematised by Heidegger. It is a concept that has already been taken up to some extent in the context of design research. Reckwitz (2002, p.250) has observed that there is a danger in trivializing practice theory. It is not a full blown grand theory, and there is every possibility that it might be reduced to concepts of agents and behaviours and become subsumed within existing approaches to the study of culture. The work of Klaus Krippendorff has been discussed in this paper to provide

an example of how this is happening in the design literature. Krippendorff draws on ideas from Heidegger, including his concept of disturbance and his distinction between the ready-to-hand and the present-at-hand. Krippendorff also draws on Gibson's concept of affordances. He subsumes these phenomena within an ontology that does not recognise practices as *the* site of the social. In the light of practice theory 'disturbance' can be seen as a starting point, a way into noticing the way in which specific practices are structured. This potential is passed over when practices are conceived of as mere patterns of behaviour, rather than being constitutive of our perception, our discourse, our understanding and use of artefacts, our identities, and our motivations as well as our actions.

'Dialogue' is a construct developed by Gadamer to elaborate a Heideggerian perspective on the dynamics of interpretation. Gadamer's phenomenological description of dialog draws our attention to both the possibility and the potential of allowing ourselves to be sufficiently open to the contingencies of a situation that we are able to adapt our initial projections, whilst at the same time recognising that those initial projections the condition of the possibility of our having any understanding of the situation. We can conceive of the shift in understanding that occurs as we orient and reorient ourselves towards a situation as a form of 'disturbance.' I have suggested that this form of disturbance accords with the phenomenon often referred to in design literature as 'insight.' As with other forms of disturbance – it should be regarded as a potential point to access into the structure of our background awareness.

A difficulty arises from that the fact that the bringing into conscious of an awareness of aspects of our background understanding can be fleeting. A third construct 'metaphor' has been discussed with a view to demonstrating the value of this language form, both in drawing attention to the 'as structure' of our background awareness, and in holding particular perspectives in view so that the implications of those perspectives can be explicitly interrogated.

I close with the observation that a focus on practices as the site of the social may result in collapsing or minimising some of the existing distinctions between modes of research. An ethnography consistent with practice theory would develop a clear focus on practices. Auto-ethnography would be undertaken by practitioner-researchers oriented towards bringing aspects of the background awareness that is cultivated by their own practices to the fore. Under these circumstances the auto-ethnographer would seem to have much in common with the design practitioner-researcher engaging in design projects with a view to drawing on aspects of their understanding of their own design practice.

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# The Conversational Self: An approach for using personal journals in design research

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## Abstract

As Goldschmidt's (1995) 'team of one', this research describes ways in which the designer, understood as agency, may conduct productive and creative internal conversations through a journal writing practice, as both participant, and as observer - as 'self', and 'self-as-other'. Conversation theory (Pask, 1975) is introduced as a theoretical frame for this approach to journal writing as a conversational practice, which works at multiple levels within the journal text. The designer (understood as self, actor, person, and 'other' agency) negotiates and describes the workings of a diversity of experiential details and social knowledge. As journal texts, these writings and sketches result in rich experiential knowledge narratives. In my application of this approach, shared agreements and new insights are documented as multiple inputs and insights about the particular design context.

This paper introduces two social science theories about conversational learning and experiential knowledge to inform this design practice research methodology. Firstly, Baker, Jensen and Kolb's (2002) five dialectic pairings for learning conversations, and secondly, Archer's (2003) agential self which engages in internal dialogues as both a participant, and an observer. The paper describes the application of this methodology for design development of a visual photo-journalism project. Selected journal entries are described and analysed to show the workings of experiential knowledge and knowing in the journal text as a series of conversations with self. The experiences of the *doing* of design is thus introduced as a process of story-telling about the everyday, using this particular journal writing format as a means of talkback as part of the design process.

In conclusion, this paper reflects on the value of this research methodology as a framework for exploring the workings of experiential knowledge in visual design contexts.

## Keywords

Design and conversational learning, self as agency, journal writing constructs, practice patterns, experiential knowledge, visual story-telling and design research



## Introduction

The journal-writing methodology described in this paper is based on an understanding about the relevance of conversation theory for design practice. Pask's (1975) conversation theory describes two or more participant voices exploring and negotiating topics and themes about a particular design context. As this occurs a wide range of experiential knowledge details are discussed, shared and result in the emergence of in-common understandings. Glanville (2007) describes the significance of conversation for the generating of new knowledge in design research. The methodology introduced in this paper involves a conversational space where, as a 'team of one' (Goldschmidt, 1995), the designer is understood working through several forms of agency in their own designing. That is, the designer-self is understood as being both objective, as well as subjectively engaged with the design process and their prior expertise. As these different forms of agency, the designer brings several potential voices of self, and 'self-as-other' into the conversational mix. Understood in this way, the journal writing described here involves several 'voices' of agency discussing all manner of everyday experiences and references to external influences (Archer, 2003). What results is an emphasis on the concurrent development of several perspectives which introduce a variety of experiential knowledge and knowing into the project 'text', as themes and threads of shared thinking are woven into the overall project narrative development.

The journal format described in this paper also involves application of Baker, Jensen and Kolb's (2002) five different dialectic learning conversations as possible framings for conducting a range of these internal conversations. Their five pairings can be used at any point in the journal writing to note down the real-time events and activities taking place in the design process. For example 'apprehension/comprehension' often provides a starting point for scoping out the particular context of a design project. Whereas 'ranking/ linking' is a dialectic frame for analyzing the project and the emerging narrative, in terms of the wider social context. The five dialectic pairings provide a useful means to access dynamic interactions between the designer, the project development, its objectives, and the external environment.

The methodology described in this paper shows how the journal is developed as a written document with richly detailed scenarios about designing, where a diversity of experiential knowledge, and forms of knowing, are able to be identified as active within the project. After establishing the theoretical framework for the methodology, this paper introduces a case study example from my design practice to show the value of this approach for my design research. These extracts show my application of this approach to a particular visual design project. It shows how as designer /researcher, I position my 'self' to both stand outside of the process, whilst at the same time, to be actively engaged in commentary about the writing. By adopting this stance, my research explores how the designer/researcher can be involved in a process of inquiry, which acts, observes and listens to the social, emotional and rational nuances of experiential knowledge. My understanding of the value of this methodology is based on evaluating my uses of it in various design projects. I suggest that it is a useful practice-based approach for capturing and managing details of experiential knowledge and knowing, which might be active in some way in the past, present or future of a design process.

## Theoretical framework for research methodology

The journal texts introduced below introduce extracts from a case study where I used this particular research methodology. As a result of working with this approach to

journal writing, project momentum gathers new insights through the journal narrative development, as shared and negotiated perspectives shaping the development of new knowledge through the designing. The journal extracts describe instances of experiential knowledge acting as both external influences, as well as being evident in the workings of my own 'craft' expertise for visual design practice. Random and often insignificant details are shown to often have wider social implications. As designer and author, I am able to introduce a range of narrative detail to frame my interpretations about the social and everyday particular contexts I am writing about. The methodology encourages a generative and shared conversational process for conducting a design inquiry. As Kenya Hara comments:

The essence of design lies in the process of discovering a problem shared by many people, and trying to solve it. Because the root of the problem is within the society, everyone can understand plans for solutions and processes for solving the problem, in addition to being able to see the problem from the designer's perspective. Design is appealing because the process creates inspiration that is engendered by this empathy among human beings in our common values and spirituality. (Hara, 2008, p. 24)

### ***Conversation theory***

Pask's (1975) conversation theory from cybernetics describes the ways in which conversations between two or more participants, lead to knowledge emergence. Conversations are a process of negotiating shared understandings, between two or more participants. Glanville (2007), after Pask, describes this ontology of conversation as one which leads to the formation of new, shared concepts. Agree, or agree to disagree, but acknowledge a new thought about what is being jointly considered. Pask's cybernetic theory describes an ontological world-view that human society has the means to continually renew and reproduce itself - to create the new, the unpredictable, the imagined, to engage with differences, through the having of learning conversations.

Goldschmidt (1995), and Glanville (2007) suggest that conversation can be conducted by the individual, in conversations with 'self', about the situation at hand. It can be done playfully, as a challenge, in a supporting way, but with the aim to introduce new thinking about diverse viewpoints and points of consent or disagreement. Through conversational exchanges in collaborative contexts, 'norms' emerge, which provide boundaries around the emerging 'topics'. As Goldschmidt's 'team of one', finding a way to engage meaningfully with conversation with oneself offers ways to explore design as a process of learning and understanding.

### ***Margaret Archer's self as agency and the internal conversation***

Margaret Archer's theory about social learning describes a dialogic interplay of 'object' and 'subject' self - as participants in the 'internal' conversation which the self can conduct. The dialogues between these two participant voices provide a framework for beginning to explore the different spaces and perspectives of self as 'agent', and self as 'person', as a relationship within and between, voices of the self, where all manner of reflective and reflexive concepts can be discussed. Archer's two 'voices' of the self - her 'subject' and 'object' self voices, are configured as the key real-time individual participants in the journal writing format discussed in this paper. These are the means by which the individual writer constructs the space of 'I' (subject) and 'You' (object), who are also in conversation with the 'Me', and 'We' of the 'team of one'. These voices of self are all involved in the journal writing process as identities of the designer/self as various forms of agency. Understandings of the productive and creative qualities of human endeavors are what Archer (2003, p. 115)

describes as the self-made qualities of human subjects, which she terms 'project-makers'.

Archer describes how an understanding about how the 'I' speaks 'to itself', is a pivotal guiding feature of the human subject. She describes the ways in which time is configured within this construct, as the future possible self (the 'You') is conditioned by the past self (the 'Me'), and shared with the 'We' of social public identifications. Archer describes these as 'morphogenetic processes', which take place over the life-span of an individual. Her theory describes the personal power which comes from understanding the self, as agency, as a recursive process of deliberation, reflection and finally action, for all manner of life projects. This is a distinguishing of 'agents', and 'persons', which Archer (2003) describes as an important and critical distinction:

What we make of ourselves, through the 'ultimate concerns' that we endorse and the projects we conceive of in order to realise them, represents the other part of our self-constitution. This process of becoming the Actor whose role is the social expression of our personal identities, though not accomplished under circumstances of our choosing, is voluntaristic; it is an expression of our activity rather than passivity. Personal identity also has causal efficacy, an important instance of which is the power to transform our initial agential placement and to modify subsequent placements, without however being able to nullify the fact that we always have an agential status. As persons we also have the causal power to personify our roles as Actors in a unique manner, to modify them incrementally, or to find a role personally wanting once we have come to occupy it.

The importance of distinguishing between agents and persons can now be made clear. In a nutshell, the person can deliberate upon her objective status as a social agent. In other words, when we talk to ourselves, one of the things that we talk about is our agential placement. (Archer, 2003, p. 112)

Archer's positioning of the past 'Me' collective 'We', and future 'You' around the present 'I', mean that the 'I' is constantly evaluating and monitoring actions with a view to actively shaping reflexive thinking around the things that are deemed of importance. Shared negotiations become the possibilities for 'We' through empathy and as agreed meanings and understandings from wider public contexts. The 'Me' is continually looking back, at the past narrative and qualitative frameworks which have been brought forward into the present, and which may resonate with the future as considered judgments by 'You', as the mature 'Actor' self.

Figure 1 illustrates this understanding about the self as a unity of various identities and agencies working together in design practice. These include her descriptions of the 'Self' ('I'), 'Primary agency' ('Me'), 'Corporate agency' ('We'), and 'Actor' ('You'). In this way, the self converses with 'itself', as both observer and participant, across past, present and future. Figure 1 shows how, as a result of my application of this journal methodology, I am able to cycle through and across these four domains of self, and 'self-as-other', as a design project narrative develops. In Figure 1, the designer as 'author' engages with the journal writing process through the uses of 'Subject' self and 'Object' self, abbreviated as 'ss /os'.

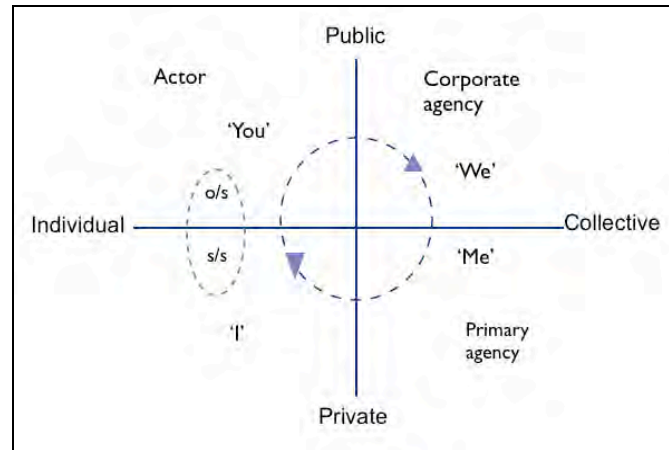


Figure 1: Adapted from Archer (2003: p 124): How the subject reviews itself as social object

Whilst these are analytical distinctions, they show a means to construct causal agency through the workings of self, as an abstract construct that can then be used in a practical way for researching the workings of experiential knowledge in design. The practical application of the methodology involves the adaptation of Baker, Jensen and Kolb's (2002) theory of learning conversations.

### ***Dialectic frames as conversational styles***

Baker, Jensen & Kolb describe five kinds of learning conversation that are specific dialectic pairings, for exploring different states of mind, action, being, and thought. Baker et al's five pairings are: 'Apprehension/Comprehension', 'Reflection/Action', 'Doing /Being', 'Inside Out/Outside In', and 'Ranking/Linking'. As a theory of experiential learning, this set of dialectic constructs encompasses a holistic approach to the ways experience and knowledge can be understood in learning. Their five processes are presented on the basis of extensive research in conversational learning situations and evaluations of relevant field data in cognitive thinking and processing. They describe their approach as a simulation of how humans learn, develop and interact:

..a holistic model of the learning process and a multilinear model of adult development, both of which are consistent with what we know about how people learn, grow, and develop. (2002, p. 8)

Baker et al's five dialectical pairings are based on extensive data analysis within teaching and learning contexts, and evaluating conversations and stages of development using experiential knowledge. The dialectical processes they describe are based on acceptance of differences, contradictions and tensions within a topic of discussion; acknowledging that there is a multiplicity of views about a topic of conversation. They describe each of the five pairings as a unique space for a dialectic exchange of position of self, in relation to the situational context:

the dialectic of the knowing dimensions of experiential learning theory; apprehension and comprehension. Next, the dialectic of praxis that incorporates the integration of intention- reflection and of extension- action." This is followed by "examination of the dialectical tension between the epistemological, discursive process and the ontological, recursive process. The fourth is the dialectic of individuality and relationality that contrasts conversation as inside-out and outside-in experiences. Finally, the dialectic of status and solidarity

describes the ranking and linking dynamics that shape the social realm of conversation. (2002, p. 52)

In my research, uses of these five dialectical processes provide practice-based opportunities for introducing a structured engagement with conversational learning. Through conversations that are loosely structured around these five dialectics, layers of meaning, perception, value and belief expose implicit and explicit perspectives about everyday experience and knowledge. Baker et al describe this learning process as one which can be directed by a 'teacher/leader', who encourages participation and acts as a facilitator rather than the authoritative source of knowledge. In my uses of this approach, as shown in Figure 1, the 'ss /os' dialogues are used to facilitate and guide participation and open-ended learning through processes of inquiry.

In their account of the actual implementation of this method of conversational learning, Baker et al (2002) note that there are a range of student responses and abilities to manage this learning method. These include negative responses of frustration, confusion with a perceived lack of authority; to positive responses, which validate the importance given to the life experience of the individuals involved. They also note the wide range of sources of input from the environmental context - these include cognitive, emotive and sensory insights. Baker (2004) comments on these five pairings from Baker, Jensen & Kolb's work, as a particular model for learning, through the interplay of different perspectives which emerge as a result of using the framework:

.. a theoretical framework that encompasses the measure of possibilities across five dialectical continua - emotional and cognitive knowing, reflection and action, epistemological discourse and ontological recourse, individuality and relationality, and expertise and linking. When the perspective at the extreme pole of any of the dialectics dominates the conversation to the exclusion of others, conversational learning is diminished. These five dialectics are not intended as a rigid model. Instead they are an attempt to describe these and similar dialectical contradictions that generate the content of conversations. Therefore, using a conversational learning approach implicitly means that participants in the conversation intentionally strive to draw on the widest range of differing perspectives as resources. Gaining new understanding and insights through the interplay of opposites and contradictions, although often not easy, enriches the mutuality of learning. (2004, p. 695)

## **Journal format for internal conversations**

In my uses of this methodology, adaptations of Archer and Baker et al's social science theories work together to provide a particular format for personal journal writing. Conversational 'subject' self and 'object' self are used to range across their uses of the five pairings, shifting around in any direction or order. This provides a stable organisational structure for locating, negotiating, and managing themes and perspectives around a particular context. Each pairing is a distinctive dialogic which enables the production of concepts relevant to that particular state. For example 'apprehension/comprehension' is a state of beginning to speak about personal misgivings, hopes and questions, alongside clarifications about what is known about that particular context. In contrast, 'inside out/outside in' generates discussions about the relationship with the external environment, which is context-specific, and relevant to shared stakeholder objectives, values and goals. Through applying these five dialectical pairings to conversations with self through journal writing, my research shows how this assists me to become more familiar with a range of patterns of

reflexive thinking through a written personal narrative. As a result of the journal writings, topics and themes describe action, thought, and language usage, which all engage with aspects of experiential knowledge and knowing.

What is of particular relevance is the ways that each of these five pairings offers a dialectic which generates knowledge and knowing - not an 'either/or', but rather, an ambience of conversational flow and exchange, for building topics and possibilities, as a basis for ongoing conversations in the journal. Figure 2 shows this journal-writing methodology as a construct system for self-generating, deliberative productive conversations.

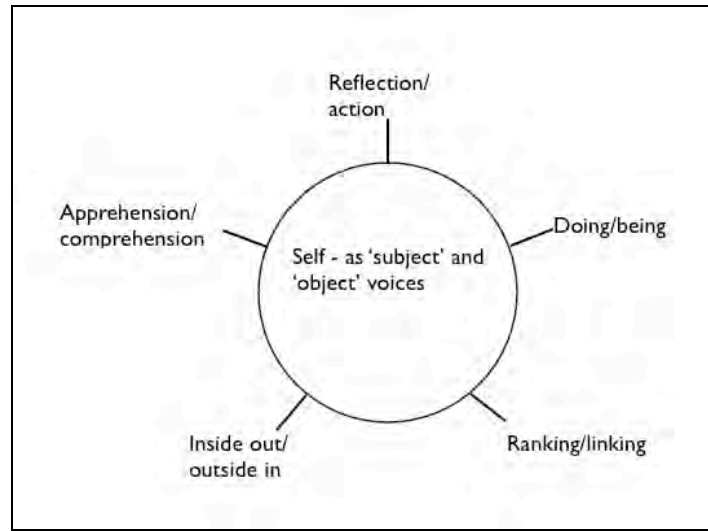


Fig 2: Conversational self as learning system: adapted from Archer (2003) and Baker, Jensen & Kolb (2002)

The five dialectic pairings in Figure 2 are similar to Kolb's (1984) definition of different 'learning styles', which describe four key patterns of thought in learning activity. These are his accommodator, converger, diverger, and assimilator styles. Reymen (2003) comments on Kolb's learning styles, and the need for designers to be aware of the value of maintaining a balanced, cohesive range of thinking possibilities for practice:

each learning style focuses more on certain and less on the other activities in the experiential learning cycle. This means that some people pay less attention to reflection than others do. When people are aware of their learning style, they can correct their behaviour to balance the activities of the experiential learning cycle (2003, p. 4)

As Reymen suggests, a self-aware learner (designer) is one who is able to balance out a range of perspectives that they apply to a particular project context. The journal format which I propose here offers such a set of possibilities - for the writer to explore a diversity of thinking approaches to a theme, which at the same time, are explicitly structured around an intention to write in a particular dialectic way - in using any of these five pairings. As a result, a diversity of detail and nuance emerges in the narration, which explores a wide range of experiential knowledge and knowing, through reflexive musings about one's and others, perspectives. These journal narrations are similar to what Krippendorff (1998) calls the 'ecological narrative':

Ecological narratives can continually expand their participants' understanding by bringing the narratives of each other into the context of all others. This expansion requires access to as many narratives a practical but, above all, a participant's openness to expand his or her horizon. Superior perspectives, completeness, accuracy, or finality are anathema in ecological narratives. (1998, p. 16)

As Krippendorff comments language through conversation is critical in this understanding of the workings of what he terms the 'ecological narrative':

"An ecological narrative is not social, political, or international because it *represents* social, political or international phenomena (as theorists must claim for their theories) but rather because its *distinctions are an acknowledged part of what is being narrated*, enacted, and hence experienced by its participants. Such a narrative cannot be modeled after or emulate a mechanistic, organismic, or mentalistic system. It may instead be understood in terms of a *dialogical concept of language* - namely, through *linguaging* or *conversation*." (1998, p. 9)

The journal writing methodology that I introduce in this paper seeks to provide a means for having what Krippendorff terms 'ecological narratives' which explore social contexts through 'dialogical concepts of language' for visual story-telling as design communication. The journal format I introduce provides a space for documenting internal conversations about the process of having the conversations, as wider self-reflexive interpretations. As a methodology, this approach to journal writing is similar to Schön's (1983) description of designing as an inquiry about, with and through the 'materials of the situation'. The case study I introduce explores social and cultural contexts using photography for story-telling through visual layout designs. The project is a form of photojournalism that explores processes of dialogic layout design. The journal narrative engages with both explicit knowledge, as concepts based on observation and reflection; as well as instances of tacit craft knowledge from practice and production. Further applications of the journal methodology have been carried out with design projects involving other team members and stakeholders. The journal material from these client based projects is however difficult to present as research case studies due to copyright and confidentiality issues.

### **Photo-essay project case study**

The case study described is a visual design project, where a series of photo-essays explore individual subjects, in relation to public signage in their external environments. My journal entries about the design process describe concept development, layout experiments and points of decision-making for the design production that emerges through my uses of written narratives, and diagrams and sketches. The uses of several voices of my-self, (and 'self-as-other'), provide a framework for introducing a variety of material from the everyday. In the journal, I introduce these through a range of writing styles and written formats, around the core structure of the two voices and five pairings.

Figure 4 shows how a set of 'themes' emerges about signage working within the social and cultural spaces of this photographic essay project. The conversation between 'ss/os' continues through question and answer, and through the framing of different dialectic pairings, to guide the different conversations. The result of my usage of this approach is that I am able to better manage the assemblage of multiple perspectives of from 'my-self' as designer, with those from 'self-as-other', through journal conversations. My uses of this approach shows how shared points of agreement which result from these internal conversations shape the visual text of the



essay, multiple perspectives within the visual essay as a designed artifact. What this offers my own research is a method for practice-based design research where I can continue to develop and produce dialogic narratives as visual design.

***Part 1: Jimmy's Garden***

The story context for this photo-essay is a seaside village where a local gardener offers home grown vegetables for several weeks during the tourist season. As 'subject' self ('I') begin with longer form narrative writing that describe details and observations in a descriptive writing style. This entry is made in the formulating stages at the start of this photo-essay project, using a 'reflection/action' pairing. 'Object' self then comments on this entry, as 'You' and also, as 'I', as the conversation develops around describing hand written signage objects, as a service system for information about produce, and as a means for transmitting local knowledge through anecdotes told at the sale point. Figure 4 is a long writing journal entry which establishes the situation for the story, to begin to understand the ways this particular experience of signage and the environment can be understood as a series of layers across material culture, the history of the village, and the service system of the local garden through the perspective of Jimmy, the local gardener. In Figure 4 'Object' self responds analytically and rationally to the social and cultural observations made by 'Subject' self.

	(10)
	#5 cont'd.
OS	<p>OK, good. You have some initial photos now of the scene and surrounds.</p> <p>What story angle is there?          What's the role of this signage?          What does it do to shift / regulate / influence local behaviours?          What kind of 'value' does it bring to the ambience of the village?          Can this be mapped as emotional / nostalgic charm,          Can a "value" be placed on that?          Signage → values → identity → emerging + changing demographic → co-existence of competing &amp; often conflicting lifestyles → contrast the 'old' beach fibres with 'new' eco-friendly &amp; designed by architecture          Consider the beach erosion → the wood piling up → forces of nature → coastal management plan: removal of asbestos tip → renewal beach patch → a scar on the landscape. The "underbelly" of the charming, picturesque beach is so dirty &amp; calm + forces of nature + dance</p>

	(11)
ES	<p>This was more a 'inside out' /          outside in conversation!!!          You are linking a lot of          things together in a chain          of related 'values' and          'contexts'. This is an evaluative          you have scanning process.          lifestyle → architecture / ethics          activities = burps / drama          natural forces - beach erosion /          human impact - asbestos tip          regeneration.</p>
OS	<p>Expressions of value</p> <ul style="list-style-type: none"> <li>- Veggie signage</li> <li>- hand written</li> <li>- suggest natural abundance</li> <li>- local labor + business</li> <li>- local 'gossip' and 'gossip'!</li> <li>- The story about the spicy              tomato sauce making night              (Jimmy + friend).</li> <li>- The use of tape to              block out what's not              available.</li> <li>- The list of herbs + veggies</li> <li>- Spelling - phonetic -</li> </ul>
OK	<p>This is like scanning. Now 'problem-          solving' → how would you          link these ideas together,          to structure an interesting +</p>

Figure 4: Jimmy's garden journal extract (reflection/action)



In Figure 4, 'Object' self asks questions about the theme, what is the role of signage in that context, how can this be mapped out as concepts, linking the 'old' with the 'new' etc. 'Subject' self replies by suggesting this is more of an 'inside out/outside in' conversation, which is trying to explore the relationship between the social changes taking place and the value shifts which may be taking place. 'Object' self then lists a series of 'expressions of value' as attributes and artifacts of the situation. These include signage as objects, as well as local anecdotes from the local community such as the story about the 'night of spicy tomato sauce making'. I note how 'Subject' self is able to generate emotional and descriptive thinking about the subject, whereas 'Object' self guides the conversation through analysis, questions, and the abstraction of narrative details into concepts and themes. The Figure 4 extract shows initial descriptive writing about 'Jimmy's Garden' leading to a series of key thoughts about the role of signage. These points are then further explored in the journal through the ongoing conversational structure.

Figure 5 is an 'inside out /outside in' pairing from the end part of the journal where I am working towards a solution or synthesis for the page layout designs. It shows how 'ss/os' continue to collaborate in exploring options for the page layout of the story. As designer, my intention is to introduce multiple possibilities for reading and interpretation as part of the overall project layout, so my voices of self focus on exploring how I can best develop a set of relationships for the image assemblages and text captions which communicate a richness of detail in the visual text. The journal provides a space for conversations about drafting layout options through image selection, editing and cropping. The dialogue introduces a range of ways of thinking about using various relationships between the narrative elements which have been discussed as key themes through the process of journal conversation. The process of sharing and negotiating that this entails between 'Subject' self and 'Object' self creates a dialogue where several options and possibilities are explored. As a design process, this methodology for journal writing offers ways to understand the development of the page layout design as playful semantic interpretations.

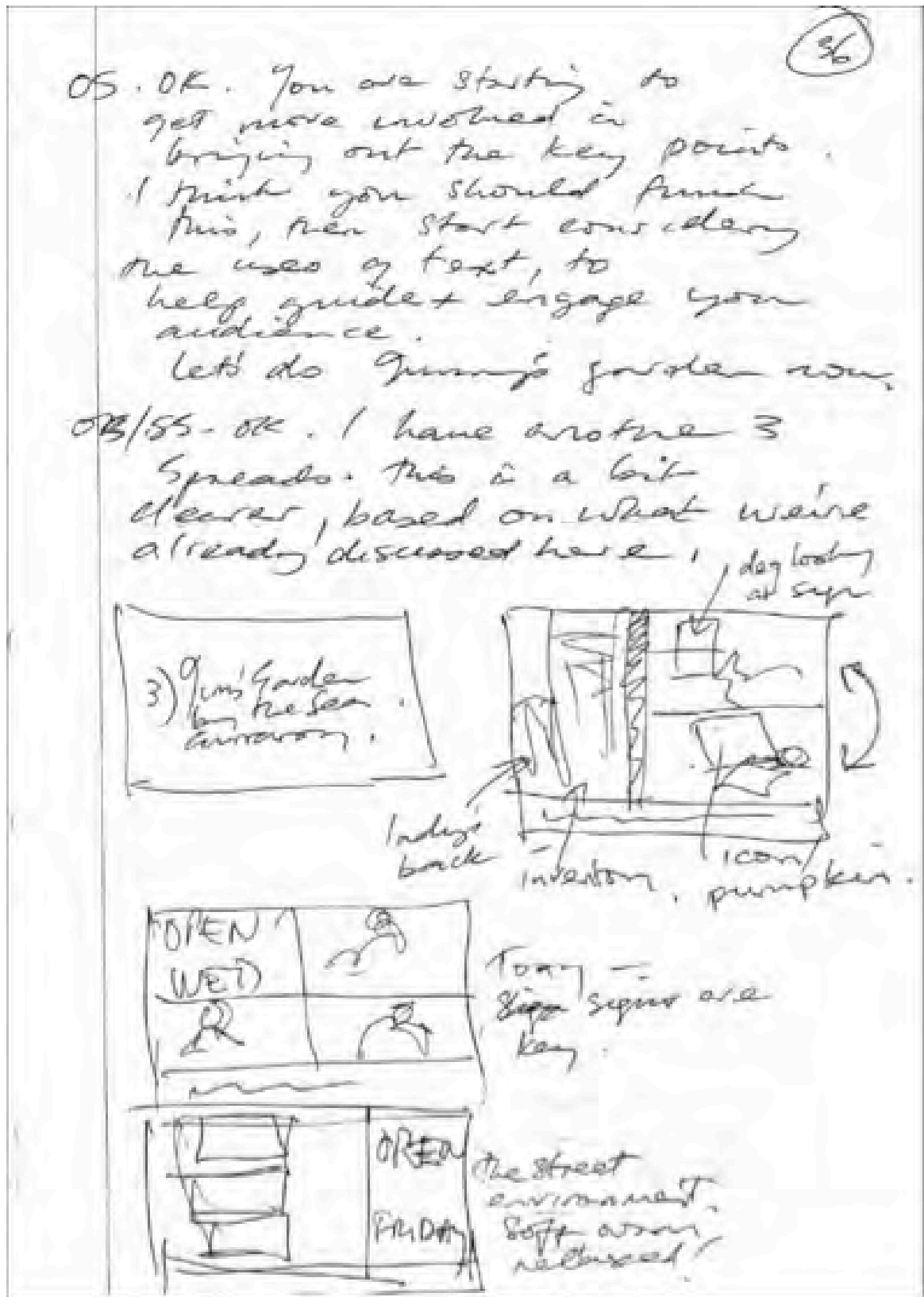


Figure 5: Jimmy's garden journal extract (inside out/outside in)

Figure 6 shows one of four final layouts for 'Jimmy's garden', as three assembled images and a text caption. Each of these four design elements offers an insight into the story - the village going through re-development, the service offered by the local produce stall, the artifact of the hand-drawn sign, and the quote from one of the workers at the stall. This layout design works as part of the overall series of spreads to present, and re-present the story of 'Jimmy's garden' around instances from everyday experience. The journal conversations provide the impetus for noting down and observing lived everyday activities, as well as a space for experimenting with the design construction of the final series of layouts.

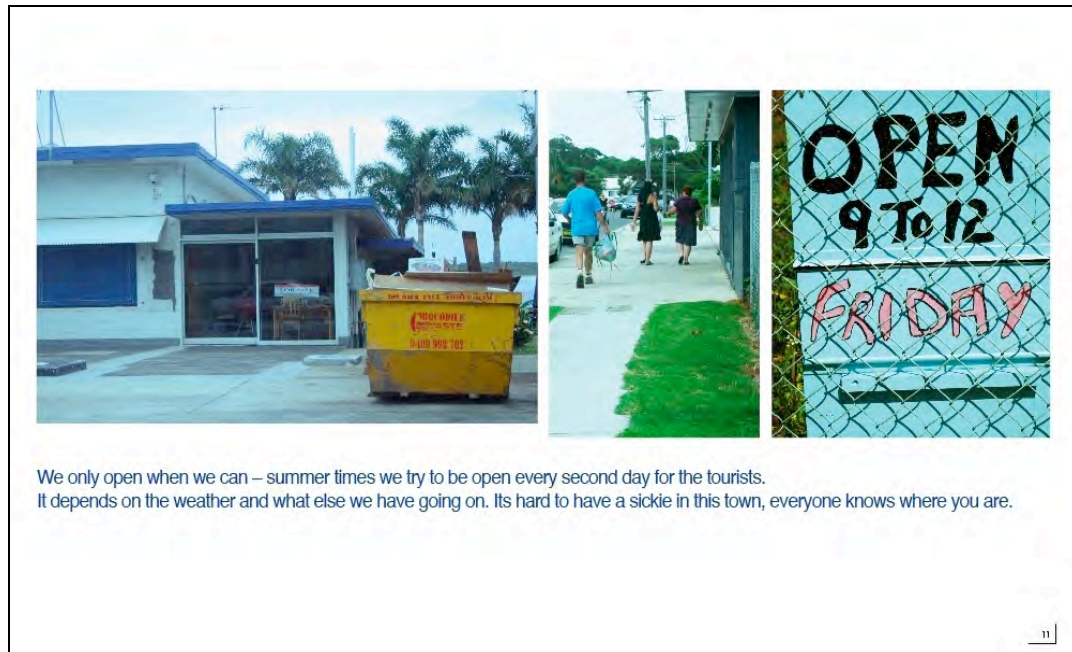


Figure 6: Jimmy's Garden layout spread (1)

### **Part 2: Laudy's One Stop Shop**

In the second photo-essay for this visual design project, I employ the same journal format using 'ss/os' voices to record the social and cultural attributes of this particular context, which is a heavily urbanized inner city street, where Laudy is the owner of the 'one stop shop' providing a wide range of groceries. Whilst her shop is the focal point of the story, it also includes an exploration of the immediate street as a social and cultural environment. Figure 7, as 'reflection/action' shows 'Subject' self continuing to write in a discursive descriptive style, about what is observed on that day whilst sitting in a café close to the grocery shop. The entry mentions the process of renovation and urban development, and refers to a street person who appears at the time. 'Object' self listens and suggests to 'keep shooting'. This entry provides an insight into the development of the initial themes and topics about the role of signage around Laudy's shop.

#10 JAN 14 . REFLECTION/ACTION .

95. Sitting at cafe in Newtown .  
 Have taken some more shots  
 here, wandering around  
 looking at things, thinking  
 about what's changed in the  
 most recent past . So much  
 building + changes going on .  
 Urban debris, junk in streets,  
 hand written sign on "Lake Town"  
 shop, they are closed .  
 One whole section of the block  
 is now a building site .  
 The man who used to sit on  
 the street isn't here today .  
 I wonder what's happening  
 to him . Oh + here he is -  
 he's in track pants + boots . He  
 looks OK .

05 . Keep shooting . There are  
 more 'layers' here . Take  
 as many shots as you  
 can, then print all + .  
 Start comparing . Think

Figure 7: Laudy's One Stop Shop journal extract (reflection/action)

The journal narrative continues to explore the social and cultural context of the street through daily site visits by my-self as researcher. What results is a large number of photographs about the street and surrounds. Through the journal writing, my 'ss/os' voices discuss ways of organizing and selecting these photographs for use in the photo-essays, around topics which are emerging as a result of journal entries. In Figure 8, an 'outside in/inside out' entry, 'Subject' self defines three specific themes - 'signs as welcome and presence for Laudy, the shop keeper, signs as movable and iconic street furniture, and signs as part of the landscape itself, as boundaries and markers'. 'Object' self responds by questioning the consistency of using 'three themes', and remarks on this as a possible consistent pattern of practice. "Subject' self replies that this is a deliberate strategy, by using two things and one thing in relation to each other to find a new insight or meaning. Further, that this is similar to the premise of 'personal constructs' from the work of Kelly (1991). In his theory, recognition of personal associative meanings provides a way to draw out personal experiential knowledge for generating new meanings and insights. The journal writing discusses this as a deliberate strategy for selecting and editing images, as a process of inquiry which introduces and links layers of visual information. The journal thus provides its own talkback about the production, questioning decisions made and suggesting other options and perspectives.



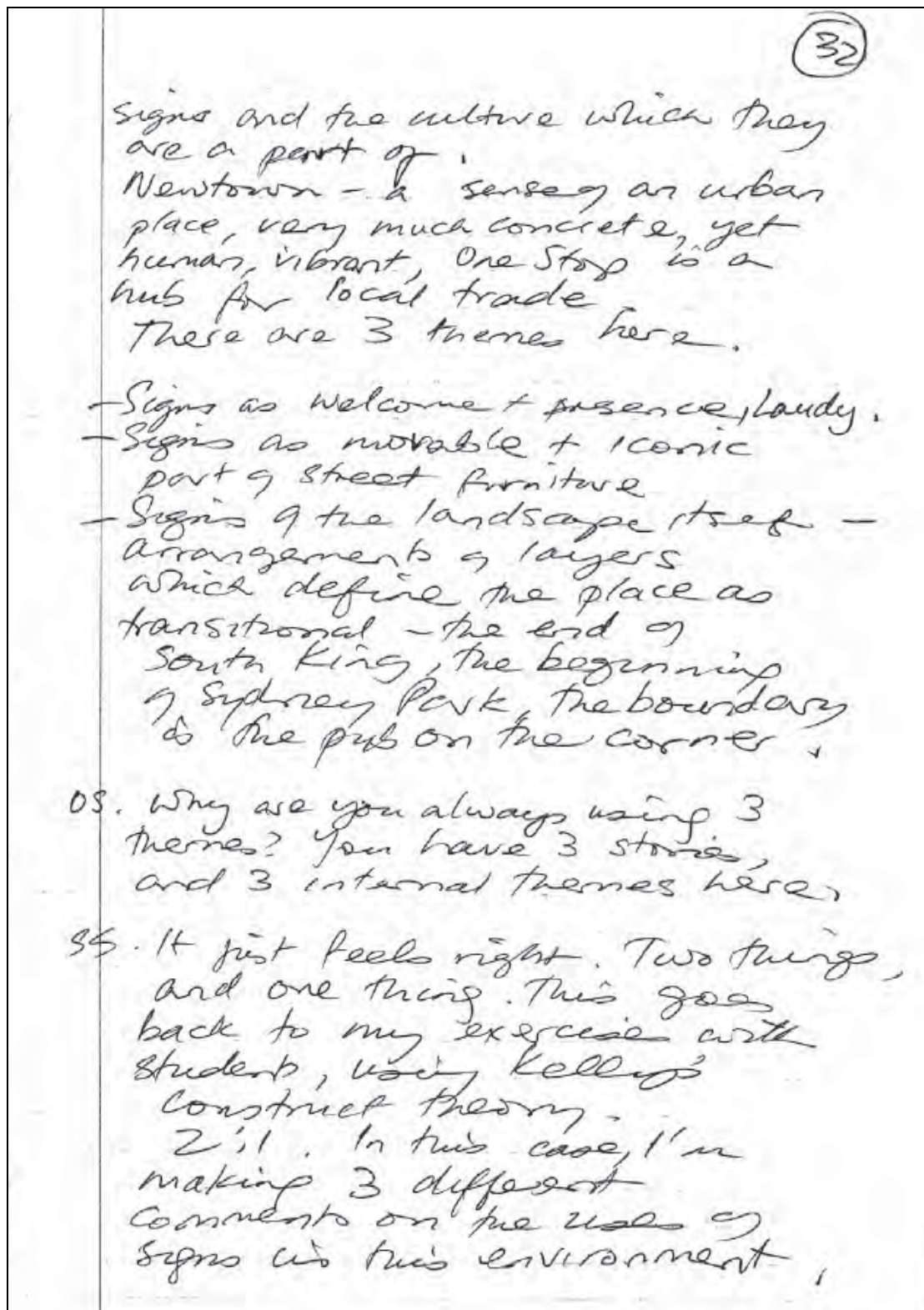


Figure 8: Laudy's One Stop Shop journal extract (inside out/outside in)

In this way, the journal space also invites commentary about the commentary, thus revealing patterns and styles of design practice activity. Figure 9 shows one of the layout spreads as three elements working together - two images, and a caption quote from Laudy about the 'NZ Fish and Chip' shop sign. The usage of these three linked elements as a linked grouping in the layout seeks to establish a relational construct, which is not fixed but dynamic. The layout came about as a result of working through

the selection of three related possibilities to work together as the two images and caption. The intention of this selection is to position the three elements as interplay of themes in the layout drawn from the journal conversation. The overall aim of the photo-essay is to design an open-ended narrative that flows from one layout spread to the next.

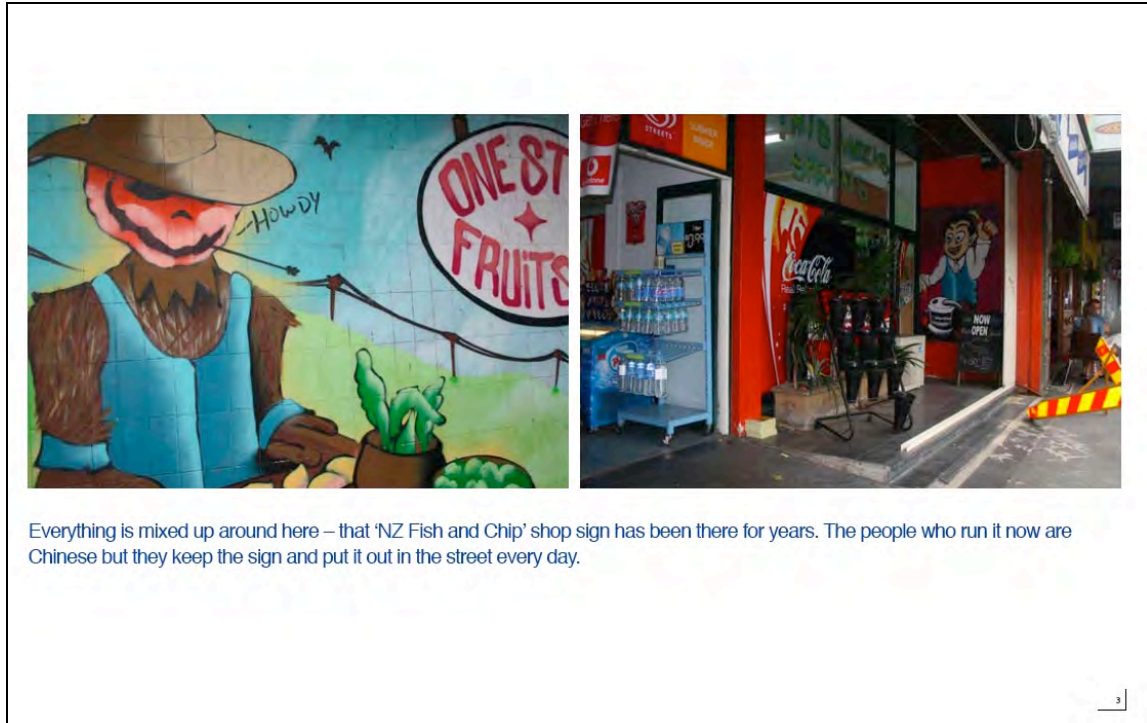


Figure 9: Laudy's One Stop Shop layout spread (1)

Figure 10 shows the next layout, as a continuation of Figure 9 that re-introduces the 'NZ Fish and Chip' image element. This sign element is shown as a photograph of street artifact, alongside other street objects, which are all re-presented as kinds of street furniture, as a new layer of possibilities for reading the photo-essay.

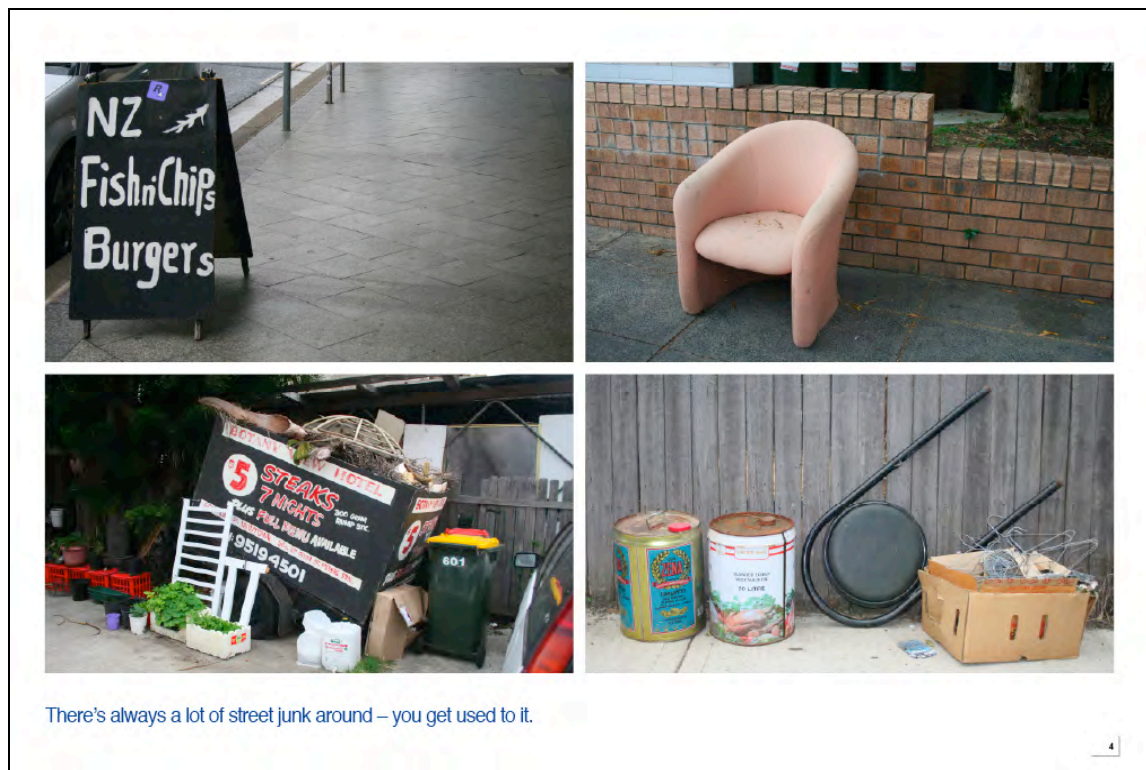


Figure 10: Laudy's One Stop Shop layout spread (2)

### Analysis of journal entries

In my evaluation of the uses of this particular methodology, I summarise the journal entries for the project. Figure 12 shows the way in which this is achieved by aligning the different 'voices' of self from several journal entries to show the flow of themes and conversational exchanges as commentary about the conversations. Figure 12 shows the initial four journal entries for this project, which were made as 'apprehension/comprehension' (A/C) and 'reflection/action' (R/A) pairings. In the Figure 12 journal summary, 'Object' self is shown commenting on the potential for uses of the five pairings across the project. The distinctive voices of 'Me' and 'We' are introduced as conversationalists within the journal text, reflecting on the 'shared' and 'agreed' approaches which are developing as a result of the ongoing entries by 'Subject' self and 'Object' self. The journal summary of these initial entries shows how the methodology provides a space for my deliberations whilst keeping a range of perspectives at the forefront, not to make decisions without a comprehensive and careful consideration of a range of views and expectations. What this offers is a space for insights about practice conventions and patterns. Overall, by using this methodology for the process of designing, I become a better and more informed listener working within my designing.



①

### SUMMARY OF ENTRIES

<u>No.</u>	<u>Subject</u>	<u>object</u>	<u>me/We</u>
1 A/C 28.12	background thoughts the process scanning Apprehensive	Supportive Explains context + challenges Mentoring	objective + long term goals - me 'problem' / Situation
2 R/A 29.12	Reasons to do this in intensive time frame  The focus on A/C R/A/D/B in project 2 - personal focus, not external  Questions layout + format for this journal	Comments on possible use of more I/O + R/L pairings. Clarifies reasons - these are just frames.  Reminds about process - Comments on use of more open spaces in format.	We - our shared exchanging using the pairings  we/us - our agreed approach
3 R/A 30.12	Comments on need to write in I/O in future.		Confirms joint approach.
4 R/A 6.1.08	Description of Jim's Garden at Curragh (one story) local knowledge	Questions What's of value here? Key features? Reminds about external context	

Figure 11: Journal summary of entries

## Conclusion

My research has endeavoured to show the underpinnings of a situated self for design practice research using this particular approach for journal writing. Through use this approach, my research engages with shared understandings to develop multiple perspectives for design practice contexts. For design research, the methodology that I describe seeks to provide a means for conducting explorative investigations of experiential knowledge and knowing through the uses of one's own self introduced as forms of agency working through design practice. The case study which I have described demonstrates my application of this approach as constructive means for starting design thinking at any point of the process, engaging with a range of thinking styles, through uses of the five dialectic learning conversations. These are reference points for the dialogic interplay between 'Subject' and 'Object' voices of self with which to begin to explore experiential forms of knowledge and interactions with design processes. What this achieves is a bringing together of rational, and intuitive modes of thought and action through internal dialogic conversational contexts.

As a methodological and abstract construct, this approach for capturing own design activities offers design research a structure for reflexive writing, which works through a series of levels within the conversational text. Nothing is fixed, except what emerges as agreed and shared understandings, which are constantly subject to review and change. As knowledge propositions and concepts are formed through initial formulations and observations, procedural and tacit patterns of practice also become topics for consideration, as journal writings about the strategies, craft and production. As a design research practice, this methodology offers a means to engage with experiential knowledge and knowing through multiple readings of situations - as personal, social and cultural understandings and observations of everyday experiences and events. As Enquist comments, design is a social practice which needs to engage with the integral relationships between human ecology, sociology and artefacts:

When distributed to different artefacts, the self appears in a multitude of shapes, characterized not only by its materiality but also by the necessity to preserve at least an illusion of a core self. The experience of a continuous evolution of these overlapping "selves", many of which are materialized together with others' overlapping selves, cannot be captured by traditional design approaches, not can ethical aspects and conflicts of the right to express yourself through artefacts... No meaningful separations are observed between the human ecology and sociology and the artefactual ones. Instead, it is the whole system of people, practices, values, and technologies in a particular situatedness that is meaningful to pinpoint and elaborate. (Enquist, 2008, p. 1)

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### **Author biography details**

Kaye Shumack is an Associate Professor at the University of Western Sydney, School of Communication Arts.

With a background in photography, visual design and media her research explores the strategic and critical role of visual media in communication design. This includes issues such as: collaborative processes of 'making' as forms of design practice for teaching and research; the role of the situated self; design, cultural identities and practices of citizenship.



# Experiential Knowledge, Knowing and Thinking

Peter Storkerson, University of Illinois, 2009

In short, natural language is open ended, multivocal and fuzzy (Lakoff, 1972). Natural semantic fields are open and potentially contradictory, i.e. what is oppositional on one axis is not on another.

## Abstract

This is a theoretical paper that briefly presents research to illustrate how proposed theories can be put into practice. Its purpose is to show a more systematic frame for studying and integrating experiential knowledge and knowing into design practice and research. Design begins and ends in the domain of experience, which design changes. Thus, experiential knowledge, thinking and knowing are at the heart of design, but they are not as systematically approached or understood as formal knowledge. Experiential knowledge and knowing are often deprecated as inferior to formal knowledge. Because they operate largely below consciousness, it is difficult to gain a clear view of them. Current psychology and cognitive science validate the power and primacy of experiential knowledge and knowing and point toward ways to operationally describe and predictively design for them. Egon Brunswik's lens model is offered as a way to operationalize a theoretical framework to study experiential knowledge and knowing systematically.





## Introduction

In this paper, the term “experience” refers not to sensations or qualia per se, but to the interactions that humans have with their environments as humans perceive or understand them, as they represent settings and events to themselves. Knowledge is the content of the human representation of experiences (whatever has been learned or reinforced), thinking is the process by which knowledge is constructed and knowing is the the act of achievement, which is phenomenologically marked by the sense of knowing. These three are inseparable. Knowledge is merely the current state of an ongoing knowing process, and while knowledge pretends to permanence, the experience of learning shows that knowledge is ephemeral, while the underlying processes endure.

The terms “experiential knowledge” “knowing” and “thinking” are used to refer to 1. things recalled from experiences, things tacitly or implicitly learned or acquired (e.g. how to ride a bicycle), 2. perceptual or “embodied cognition,” which is the basis for self evidence (e.g. that adding three sticks to two gives the same number as adding two sticks to three) and phenomenological aspects such as feeling through objects as blind persons have the sense of feeling through canes, and 3. the phenomenology of knowing: the sense of self evidence or obviousness, recall, or recognition, whether truthful or mistaken. The various kinds of experiential knowledge and knowing have in common the use of what is termed unconscious, non-conscious or *implicit* thinking, which does not involve explicit, expressible, analyzable theoretical systems of knowledge. Experiential knowledge and thinking focus on the contextualized or situated, ecological, level everyday existence as it unfolds to an actor, rather than on, structured argument that is schematized, enclosed and defined from outside.

The understanding and evaluation of unconscious thinking has shifted in recent decades, away from physiological, stimulus response models, toward the broader view of a level of implicit thinking, which is not accessible, but which underlies the thought that is explicitly, consciously available.

“There now exists substantial evidence that the unconscious is not identifiably less flexible, complex, controlling, deliberative, or action-oriented than is its [conscious] counterpart..... Research has demonstrated the existence of several independent unconscious behavioral guidance systems: perceptual, evaluative, and motivational. From this perspective, it is concluded that in both phylogeny and ontogeny, actions of an unconscious mind precede the arrival of a conscious mind—that action precedes reflection. (Bargh and Morsella, 2006)

The actions of unconscious mind both precede conscious reflection and give it its base. Polanyi describes the human in terms of multiple levels of operation, from physiology to abstract thought or decision making, each of which is steered by the one above, while the programming of each selects a determinate set of possibilities upon which the next higher level is dependent. (Polanyi, 1966, pp. 34-36) Each level represents a further elaboration of self-organization based on those coming before. The reflections of Schön’s practitioner represent a conscious steering of interactions between self and environment: thoughtful, but nevertheless embedded in experience and built on a previously structured system of experiential knowing.

## The nature of experiential knowing

A broad range of researchers have proposed various “dual process” models, which Evans (2008) has presented in the following tables which indicate the breadth of work in this area. Table 1 is a taxonomy of models or labels. Table 2 is a corresponding set of characteristics. His system 1 corresponds to implicit thought while system 2 corresponds to conscious, explicit thought. *“In other words, System 2 is a form of thinking under intentional level control, supported by unconscious processes in System 1 that deliver percepts, memories, and so on.”* (p. 258)

**Table 1: Dual-system models of mind: labels attached to dual-processes in the literature, aligned on the assumption of a generic dual-system theory**

<b>Author(s)</b>	<b>System 1</b>	<b>System 2</b>
Fodor (1983, 2001)	Input modules	Higher cognition
Schneider & Schiffrin (1977)	Automatic	Controlled
Epstein (1994), Epstein & Pacini (1999)	Experiential	Rational
Chaiken (1980), Chen & Chaiken (1999)	Heuristic	Systematic
Reber (1993), Evans & Over (1996)	Implicit/tacit	Explicit
Evans (1989, 2006)	Heuristic	Analytic
Sloman (1996), Smith & DeCoster (2000)	Associative	Rule based
Hammond (1996)	Intuitive	Analytic
Stanovich (1999, 2004)	System 1 (TASS)	System 2 (Analytic)
Nisbett et al. (2001)	Holistic	Analytic
Wilson (2002)	Adaptive unconscious	Conscious
Lieberman (2003)	Reflexive	Reflective
Toates (2006)	Stimulus bound	Higher order
Strack & Deustch (2004) I	Impulsive	Reflective

**Table 2 Clusters of attributes associated with dual-systems of thinking**

<b>Cluster</b>	<b>System 1</b>	<b>System 2</b>
<b>Cluster 1</b>	<b>Consciousness</b> Unconscious (preconscious) Implicit Automatic Low effort Rapid High capacity Default process Holistic, perceptual	Conscious Explicit Controlled High effort Slow Low capacity Inhibitory Analytic, reflective
<b>Cluster 2</b>	<b>Evolution</b> Evolutionarily old Evolutionary rationality Shared with animals Nonverbal Modular cognition	Evolutionarily recent Individual rationality Uniquely human Linked to language Fluid intelligence
<b>Cluster 3</b>	<b>Functional characteristics</b> Associative Domain specific Contextualized Pragmatic Parallel Stereotypical	Rule based Domain general Abstract Logical Sequential Egalitarian
<b>Cluster 4</b>	<b>Individual differences</b> Universal Independent of general intelligence Independent of working memory	Heritable Linked to general intelligence Limited by working memory capacity

Experiential knowing is intuitive, because we arrive at knowing in such a way that consciousness is informed of what is known without witnessing or knowing how it was arrived at. Experiential knowing is impulsive because it appears accompanied by the feeling of knowing, often with an evaluative affect or an impulse to some action. The communications between conscious and unconscious processes are strictly limited. Self reports can often effectively be conscious theories of what went on below consciousness. Such reports can often be confabulations, offering more-or-less plausible accounts.

It is proposed that when people attempt to report on their cognitive processes, that is, on the processes mediating the effects of a stimulus on a response, they do not do so on the basis of any true introspection. Instead, their reports are based on a priori, implicit causal theories, or judgments about the extent to which a particular stimulus is a plausible cause of a given response. (Nisbet and Wilson, 1977)

Experiential knowing is largely perceptual in its intuitive reasoning. Lakoff and Johnson and others demonstrate the importance of perceptual metaphors in language and that they determine how we think when we use them. Gärdenfors (2004) demonstrates the correspondence of intuitive logic to geometry. Experiential knowledge delivers what we take as real and objective, distinct from logical proof. Experiential knowledge is recalled or recognized, or it is obvious or self-evident, reflecting unconscious processes that give rise to it.

Experiential knowledge is often expressed in the experiential form of narratives.

Narrative construction may be the common and nearly universal form in which people interpret their experiences, whereas propositional knowledge may be a less common but still very important *derivative* of narratives. In other words, people will nearly always make sense of their experiences by constructing them in story form, and sometimes (but not always) they will proceed from these stories to infer or deduce generalizations. (Baumeister and Newman, 1995)

Experiential knowledge is highly dependent on memory and recognition, thus on semantic and sensory patterns and features (Rubin, 1995, 1995a). Experiential cognition is not able to perform complex calculations. It is able to compare large amounts of data rapidly, in parallel, without engaging conscious memory, to detect correspondences and discern coherence, or to play out possible scenarios. For instance, an experienced expert can bring a large repertory of experiences which can be used to play out scenarios. Because it is not theoretical or systematic, experiential knowledge can be domain specific, and holistic.

Experiential knowledge is heuristic—its reasoning methods are not complex, and they are probabilistic, relying on experiential likelihood, but not foolproof indicators. It reflects the natural world, with its mix of cause-effect and chance events. Through its ability to integrate large numbers of data experiential thinking can be robustly reliable. It is creative and works in open-ended situations to make sense of ill-defined situations. Formal knowledge reflects systems that are clearly defined in their ontologies and procedural rules. Finally, experiential knowledge and thinking provide judgments that are effective and actionable where situations, themselves, are ambiguous.

Experiential knowledge can be informed by theoretical knowledge but does not depend on it. Formal knowledge depends upon experiential knowing for both its application and its formation. Formal knowledge is applied in specific situations, requiring experiential level judgments as to what knowledge to apply and how.

Formal knowledge also codifies what has been conceived of experientially. For example, elementary school students are often taught probability theory graphically, using tree diagrams which yield solutions and enable students understand how probabilities actually work and why. Figure 1 shows that even though heads and tails are equally likely outcomes of a coin toss, after three coin tosses, only one combination will give all heads or all tails, while there are three that will give two heads and a tail and three that will give one head and two tails. The formula expresses and summarizes the physical model, from which it was derived.

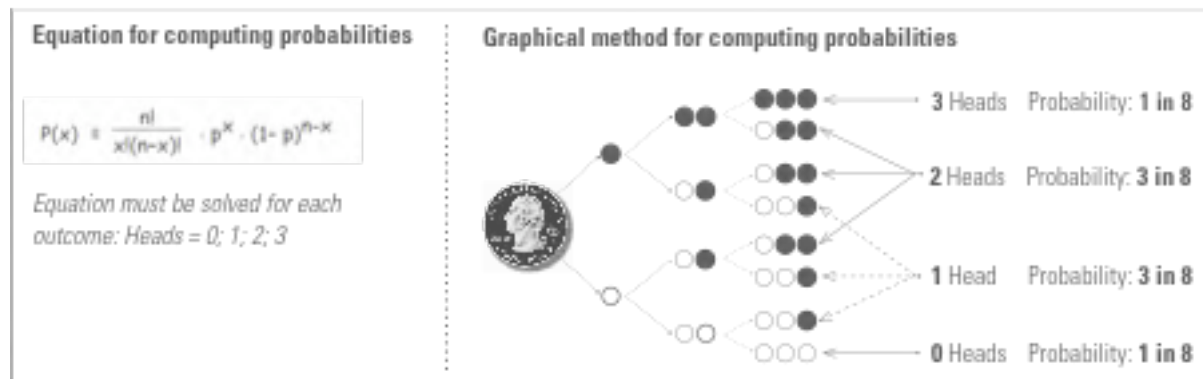


Figure 1: Tree diagram of binomial distribution

Experiential knowledge is required for making the models that become formalized. It is also used in the computation of formal knowledge.

When Charles Weiner remarked to physicist Richard Feynman that his scientific notes “presented ‘a record of the day to-day work,’ ... Feynman reacted sharply.”...

Feynman’s reaction to Wiener describing his notes as “a record” was to say: “I actually did the work on the paper.” (Gleick, 1992, p. 409)... To which an apparently uncomprehending Wiener responded, “Well, the work was done in your head, but the record of it is still here” (p. 409). One cannot fail to sense frustration in Feynman’s retort: “No, it’s not a *record*, not really. It’s *working*. You have to work on paper, and this is the paper. Okay?” (p. 409, italics in the original). (Kirlik, 2005)

Like the chess master who makes rule guided spatial moves of pieces on a board, the theoretical physicist manipulates the symbols in a formula based on spatial rules. He or she uses a repertory of moves and strategies acquired by experience, to achieve a spatial configuration that reveals the answer. This process is largely implicit: “*long-term practice prompts the acquisition of visual memories of chess configurations with integrated form-location conjunctions. These perceptual chunks enable complex visual processing outside of conscious awareness.*” (Kiezel et al, 2009) These interrelations between experiential and formal thinking and the limited human ability to do formal computation without external aids brings the notion of formal “thinking” as mental process distinct from experiential thinking into question. It seems strange to call diagrams, formulae or texts “cognitive objects” because they cannot think, but they are designed to leverage experiential thinking into formal thought.

Experiential knowing is a continuous process of judgment and decision making: interpreting or judging what is going on, and acting to adapt to it or affect it. Judgment and decision making are a good place to examine experiential knowledge and thinking. In Dreyfus’s five stage model of expertise (Table 3), formal knowledge—consciously applied non-contextual rules and procedures—are the bottom rung. Competence proficiency and expertise result from acquiring experiential knowledge, recognizing situations, being able to strategically focus attention on what is important.

**Table 3. Dreyfus's five levels of expertise**

<b>Level of Expertise</b>	<b>Characteristics</b>
<b>1. Novice</b>	<ul style="list-style-type: none"> <li>• Task decomposed by instructor into abstract context-free features (procedures for operating a car).</li> <li>• Attention to "rules" relating action to features (how to implement the procedures).</li> </ul>
<b>1. Advanced Beginner</b>	<ul style="list-style-type: none"> <li>• Introduction and instruction regarding situational aspects (engine sound).</li> <li>• Introduction of non-situational aspects (indicated speed for shifting).</li> </ul>
<b>1. Competence</b>	<ul style="list-style-type: none"> <li>• Increased situational awareness.</li> <li>• Need to develop a strategy to allocate attention to what is important <i>in the given situation</i>.</li> <li>• Assimilation of experience and ability to function when multiple decisions are required in real time (how much to slow down for curve ahead given road conditions, etc.) and when results are unexpected (a skid).</li> </ul>
<b>1. Proficiency</b>	<ul style="list-style-type: none"> <li>• Intuitive behavior (assimilation of prior levels into unconscious functioning).</li> <li>• Intuitive discrimination of situations and responses to them.</li> <li>• Sense of "obviousness."</li> </ul>
<b>1. Expertise</b>	<ul style="list-style-type: none"> <li>• "Sees what needs to be done, but <i>decides</i> how to do it".</li> <li>• Subtlety in discrimination of situations.</li> <li>• "Intuitive, immediate response to each situation."</li> </ul>

Each of these stages involves assimilating the previous stage into intuitive, experiential level knowing and behavior, and concentrating on the stage above it. Expertise is the unconscious, intuitive and spontaneous functioning of all but the highest level judgment and decision making on goals and strategies.

"With enough experience with a variety of situations, all seen from the same perspective but requiring different actual decisions, the proficient performer gradually decomposes this class of situations into subclasses, each of which share the same decision, single action or tactic. This enables the immediate intuitive response to each situation which is characteristic of expertise (Dreyfus, p. 22).

Living is often uncertain and unpredictable. Uncertainties can be described in different ways depending upon situations. Lipschitz and Strauss (1985), for example, distinguish three basic types of uncertainty and five strategies for dealing with them: 1. uncertainty about the understanding of the situation, 2. inadequate or equivocal information, and 3. diverging or conflicting alternative actions. The five strategies are, 1. seeking more information, 2. making reasonable assumptions, 3. weighing alternatives, 4. forestalling consequences by anticipating them and 5. suppressing or disregarding uncertainty. Daily judgments involve uncertainties ("Is that car going to stop for the light? Should I?"). Decision making in the natural world often requires that uncertainties be resolved into a "best guess"

judgment, requiring experiential knowledge and thinking. The solutions may not be the “correct” ones, but they attempt to be the best available, actionable choices available under the circumstances to achieve goals, avoid disaster or, at least, stay in the game. Experts provide concrete, experience-based information to assess the situation, play out strategies, and structure the decision space. Experiential knowledge often carries with it experiential metaknowledge, such as the experience from which a lesson was learned, or from whom something was learned, the reliability and biases of the source and the situational context. This contextualization, which is uncharacteristic of formal knowledge, is often encapsulated in narratives. (Schank, 1990) In cognitive engineering, one approach to problems of the reliability of information is the incorporation of metadata. For example, the metadata around a thermometer reading could include its accuracy, its reading speed and overshoot, its condition, its location. All of these can be used to re-calibrate the reading or determine its reliability under the specific conditions.

## **Egon Brunswik’s ecological approach to human function in natural settings**

Egon Brunswik (1903-1955) developed a theoretical and methodological approach to behavior that includes experiential knowledge and cognitive processes, as well as formal knowledge and supports quantitative research into the variables underlying human judgment and decision making. Brunswik saw his work as an evolution away from introspection and behaviorism and toward a functional perspective that combines the richness of introspective accounts with the rigor of behaviorist measurements. (Goldstein, p. 66)

Brunswik’s approach has six fundamental characteristics:

1. It is centered not on sensations or drives, but on the ecological level of interaction between organism and environment as the appropriate, objective level of human function.
2. The organism is purposive, pragmatic and cognitive (Tolman, 1951 p. 13). It seeks to act appropriately with the environment and for the furtherance of its goals.
3. The organism is separate from the environment. It builds a model of the environment on the ecological level as cause and effect, but with high variability. This corresponds to the natural environment which is “quasi-chaotic.”
4. The relationship between organism and environment is semiotic. Brunswik’s position rejects behaviorist notions of perception as arising out of sense impressions. Rather, a purposeful cognitive function utilizes and organizes the “proximal” sensory inputs as its methods for acquiring informational *cues* to form an intensional, coherent perception of the “distal” environment.
5. The organism is able to use cues “vicariously” using alternate cues when individual cues are unavailable, impaired or otherwise unreliable. Brunswik defines vicarious functioning as a mark of purposive behavior.
6. The organism does not perceive sensory inputs directly, but as they have been made into perceptions.



Psychological behaviorism, as developed in the nineteenth and twentieth centuries and continued through Thorndike, Watson and Skinner, intended to remove the notion of consciousness (Watson, 1913, p. 177) and to describe the human as a behavioral system of causal relationships between stimuli and physiological responses (Pavlov, 1933), in which habitual behaviors are induced by repetition and reinforcements. Gestaltists argued the reverse, that is that wholes are not simply built up from parts, but that the parts are used in the active, *intentional* perceptual processes.

“There are wholes, the behaviour of which is not determined by that of their individual elements, but where the part-processes are themselves determined by the intrinsic nature of the whole. It is the hope of Gestalt theory to determine the nature of such wholes.” (Wertheimer, 1924)

Brunswik extended Gestalt theory beyond perception to his functional model of interaction between organism and environment, including the organism’s representation of the environment as it can impinge upon the organism and as the organism can affect it. (Brunswik uses the term “organism” because his model is applicable to living creatures in general.) This model centers on the relationship between proximal sensory information available to the organism and the distal features of the environment. Proximal stimuli are signs indicating what is in the environment.

Brunswik (1957, p. 5) considered the organism and environment to be distinct systems, each with its own "surface and depth, or overt and covert regions," and he argued that the "coming to terms" of these "equal partners" most crucially involved the development of "*rapport between the central, covert layers of the two systems.*"...Adequate adjustment to the world requires accurate perception and effective actions, and these are matters of central distal correspondence: 0) bringing one's (central) perceptions into line with (distal) objects and (2) bringing about (distal) states of affairs that coincide with one's (central) desires. (Goldstein P. 12) (italics added)

Developing a stable perception that corresponds to the environment is an achievement. Natural environments operate by cause and effect but have limited predictability. Because, in natural environments, causes have multiple effects and effects have multiple causes, natural environment, unlike formal systems, are inherently quasi-chaotic. Furthermore, there is no one-to-one mapping between proximal effects or cues and distal objects or events they represent. Thus, achieving a stable reliable perception is a matter of balancing various equivocal information.

Causal connections are probably always to some degree *equivocal (mehrdeutig)*. Types of local representatives are, that is, not connected in a simple one-one *univocal (eindeutung)* fashion, with the types of entities represented. Any type of local representative is found to be causally connected with different frequencies with more than one kind of entity represented and vice versa. And it is indeed, we would assert, this very equivocality (*Mehrdeutigkeit*) in the causal “representation”–strands in the environment which lend to the psychological activities of organisms many of their most outstanding characteristics. (Tolman and Brunswik 1935, p. 43) (italics in the original)

Brunswik's answer to this problem of multivocality is "vicarious function." (Hunter, 1932) A spleen cannot do what a heart does, but while one speaks with one's mouth, one can use one's hands instead if needed. The organism applies this principle to perception, choosing how it assigns and uses proximal cues according to circumstances.

"Hunter, concentrates on the implications of...[vicarious functioning] upon the flexibility and exchangeability of pathways relative to an end when he elevates "vicarious functioning" to the role of the defining criterion of the subject matter of psychology. (Brunswik, 1952, p. 17)

Vicarious function underlies Brunswik's notion of cognitive function and his notion of "representative design" in experiments. Objective research can be carried on at the ecological level of perception as the correspondence between the internal representation of the environment, (whatever that may be) and the environment as the organism can interact with it.

Experiments that are representative of human function should enable persons to operate as they do in the natural world. Such experiments need to recognize that people function on an ecological level and enable them to use multiple cues vicariously. Dreyfus made a similar point concerning studies of expertise.

As you all know, everyday, skilled decision making has been systematically overlooked in laboratory studies that study decision making outside natural context in which the decision maker has experience..based expertise. Such studies force the subject to behave in nonskillful ways and so enforce the traditional account of deliberation as applying rules to situations defined in terms of context-free features. (Dreyfus, 1993, p. 23)

Brunswik shows this approach in his work on perceptual size and shape constancy. Perceptual constancy refers to the fact that in perception, the sizes, shapes and other aspects of physical objects remain constant even as they are moved or placed at different angles. This demonstrates that the proximal sense impressions on the retina, which may change radically, do not determine the object perceived. Instead, the organism uses multiple cues vicariously to deliver the perception of a constant object in different locations or at different angles. This function is subject to variations that can be measured, and the effects of variables can be studied. Brunswik and his students conducted experiments in which persons were asked to determine the relative size of objects at different distances, demonstrating the tendency to maintain size, and its dependence on the absence or presence of other cues. For example, "*when geometric objects ... are shown in an indoor setting that furnishes a normal array of distance cues*" (Brunswik, 1947, p. 18). This illustrates vicarious functioning in the use of other objects and the environment as cues to determine the scale of the object. Optical illusions also demonstrate the function of cues and the probabilistic variability of the process where cues are withheld or systematically manipulated. Gestalt experiments, such as the effects of arrows on the perceived center points of associated or attached lines indicated that *instructions on what to concentrate on* when looking can also reduce perceptual errors. (Brunswik 1947, p. 16)

## The Lens Model:

Brunswik's crystalized this approach in his "lens model" of perception, below. It centers on the functional rapport between organism and environment. The initial focal variable, which is the distal object, is available to the organism through a series of mediating sensory cues along with spurious or stray inputs from the environment and stray effects of the cues. The organism's achievement of a stable relationship (in this case perception) is effected through purposive vicarious processing assigning significance to cues. The organism's purpose is to accurately represent the environment in order to interact with it.

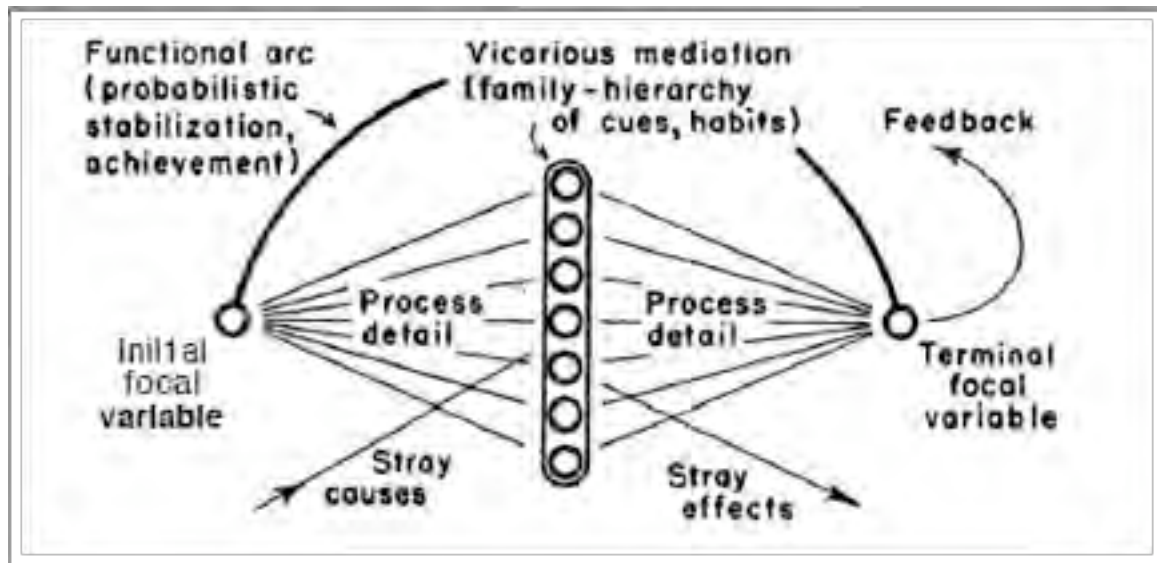


Figure 2. Brunswik's lens model: "composite picture of the functional unit of behavior" (Brunswik, 1952, p. 20)

This lens model is a template which can be scaled, elaborated and extended in various ways for situations of varying complexity. Cues can be evaluated across dimensions of evaluation including whether they are misleading, non-significant, ambiguous, reliable, or where the model is scaled up to goal seeking behavior, whether means are good, bad indifferent or ambivalent. (Tolman and Brunswik, 1932 cited in Hammond. p. 17). One important aspect of this model is that vicarious functioning implicitly incorporates metaknowledge, not as external qualifiers to information but integral to the information, recognizing the particularity of the situation so that accurate perceptual constancy can be achieved under varied circumstances.

The lens model addresses experiential thinking and offers ways to systematically analyze how it functions in practice. The model provides analytical tools for more systematically integrating experiential knowledge and formal thought into design. It can also be used in situations that have both experiential and formal aspects.

## Application of the Lens Model:

Stewart and Lusk (Stewart, E., Lusk, C. 1990) adapted and applied the lens model to judgment formation in meteorology as it is practiced, using forecasters from the National Center for Atmospheric Research (NCAR) in Boulder, Colorado. They studied the problem of forecasting microbursts, which are rapidly occurring and moving events comprised of strong wet or dry downdrafts associated with turbulent weather that pose a serious threat to aviation.

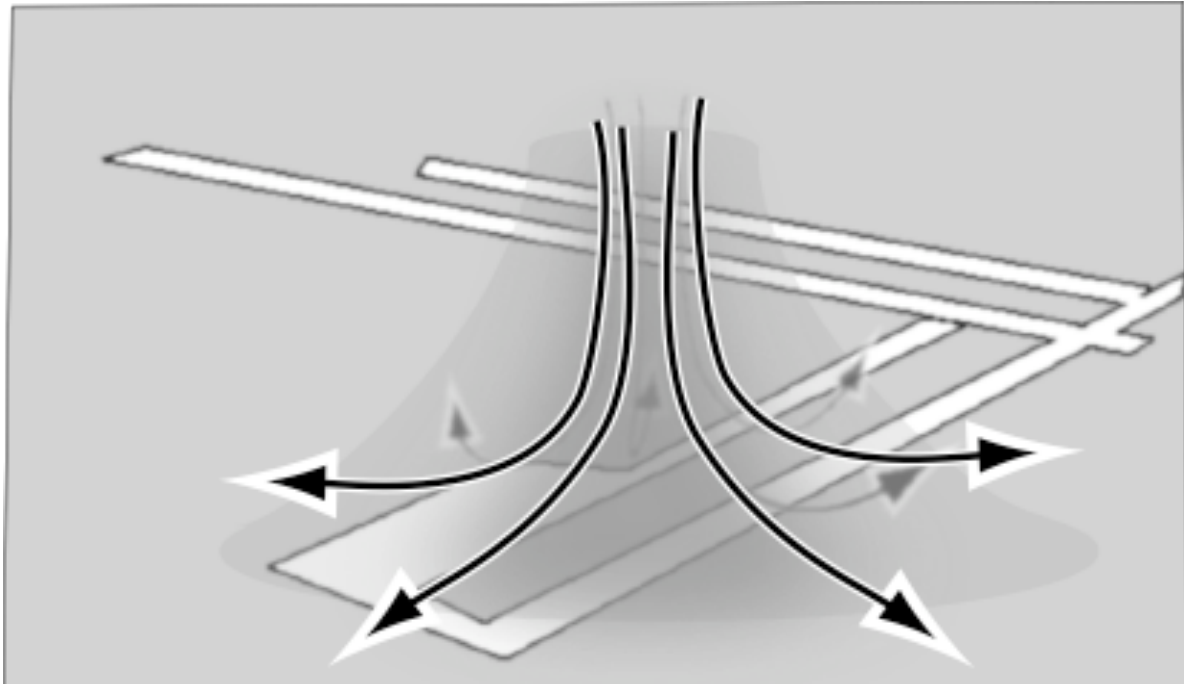


Figure 3. Microburst

The lens model (Figure 4) diagrams five phases of forecasting: A. the theoretical model of physical mechanisms that generate microbursts, B. the weather itself, C. the Doppler radar data which provides objective measures of the current situation according to the model and displays them to forecasters on computer screens, D. the forecaster's perceptions of that data, how the displays are interpreted, E. the extraction of cues indicating the current weather situation and its likely progress, and finally F. the forecaster's prediction. Forecasters interpret information based on theoretical models, training and experience. The goal of forecasting is a correct judgment of the "*probability that a microburst will be produced by the storm under observation within 5–10 minutes.*" (1990 p. 629) The ultimate goal is a decision whether airplanes should be allowed to fly in the area or not. Prediction is intended to provide judgments of the situation that will support decision making.

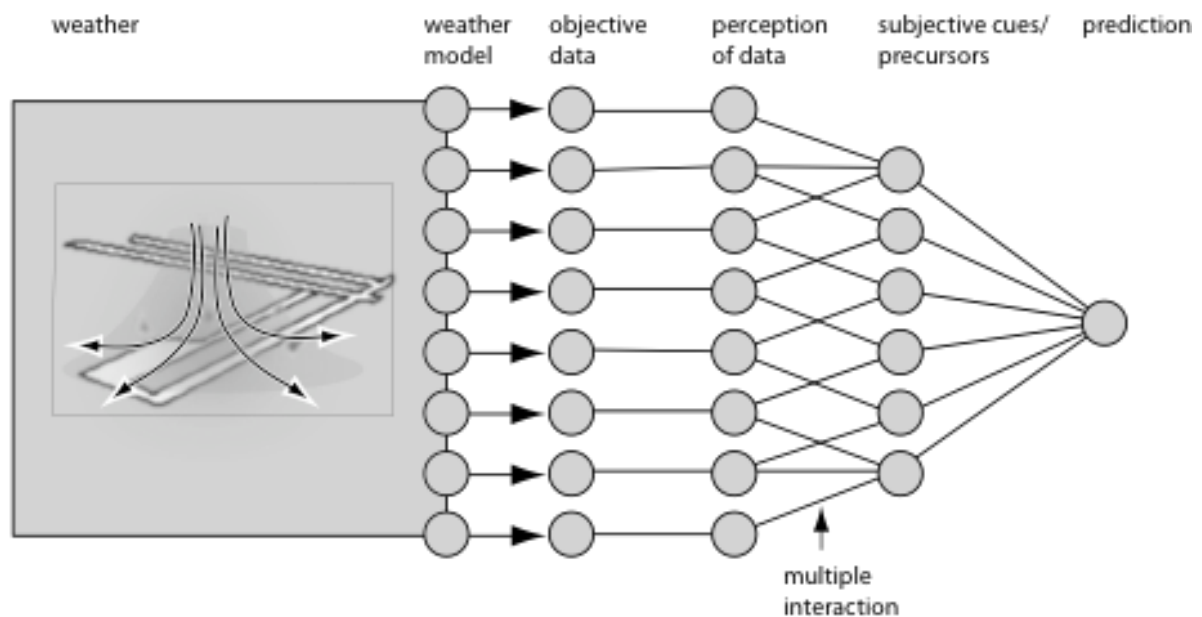


Figure 4. Six phases of microburst forecasting

Within NCAR methodology, the mechanisms that generate microburst (A) provide a formal model of judgment by which doppler radar data should be analyzed. The input data are quantitative while the judgments are connotatively qualitative: there will or will not be a microburst (figure 5). Thus, the quantitative output of the formal model does not translate unequivocally into the decision making that will be required. Other indicators are used including favorability of conditions in general, whether other microbursts have been sited, the current temperature, all influencing the forecast. There are six formally defined “precursor cues” “1) descending reflectivity core, 2) collapsing storm top, 3) organized convergence above cloud base, 4) organized convergence/divergence near cloud base, 5) reflectivity notch, and 6) rotation” (p. 63), which were also expressed quantitatively but perceived qualitatively, as metadata or qualifications such as “questionable”, “ambiguous”, “weak”, and “strong”. (see 1990 p. 629) These data are explicitly displayed on computer screens, as shown in Figure 5.

Forecasters’ access to the weather is mediated by the model of storm/microburst generation, which is presented as objective radar data displayed on computer screens. forecasters view the information and from it they derive “subjective” cues, that is explicit probabilistic indicators of the storm which they will process to form predictions. As the Figure 4 shows, there are multiple paths between perceptions and cues such that cues can be derived from more than one display and each display may relate to more than one cue. Forecasters are trained in the interpretation of data used to derive the judgments, which can make use of all cues separately and in relation to each other. A great deal goes on in the far right node. Judgments will support subsequent decision making which will translate forecasts into recommendations for human adaptations. The model of microburst generation, accuracy of doppler radar and decision making subsequent to forecasts were outside of the scope of this study, which focused on forecaster performance.

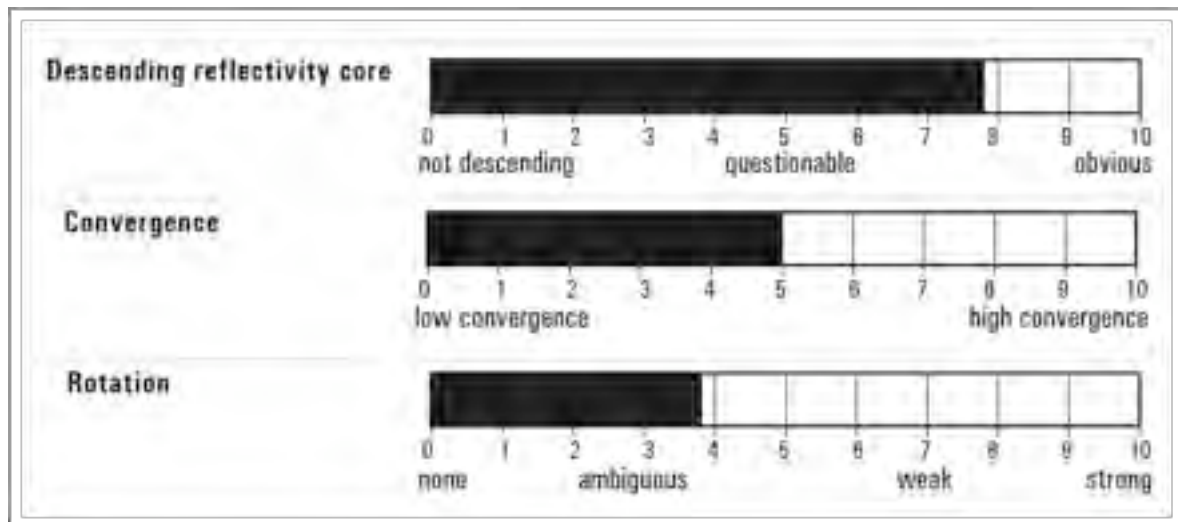


Figure 5. Schematic of analog display of quantitative measures used in forecasting.

The goal of the study was to decompose this system at each point represented by a set of cues and corresponding judgments, measure the accuracy of its throughput from radar displays to forecast, and examine the contribution of the various cues to forecasts, as well as forecaster differences:

- Reading of cues from screens;
- Use and weighting of cues under different conditions;
- Combining of cues (cognitive processing);
- Forecaster bias toward or against predicting microbursts;
- Regression bias: the tendency to alter their predictions based on recent experience;
- Consistency within and between forecasters: did similar data produce similar forecasts and were the same cues treated in the same way.

These could then be related to presentational variables such as displays and forecaster variables such as training (how much and by whom), and experience.

This research conformed to Brunswik's notion of representative experimental design, in which subjects are able to use multiple cues vicariously to make judgments about the environmental state of affairs. It provides insights into how those cues are actually processed in ways that can be helpful to forecasters and to those responsible for designing the presentation of cues, that is, those who determine the information to be presented and how it is to be displayed. The methodology supported a mathematical expression of the decision making process, from which substantial results and findings were obtained. A further study could be constructed to examine throughput including advisories and pilot decisions. Using historical data, it would be possible to complete the loop from the event to the actions taken, so that the throughput from initial conditions to final judgment could be directly compared to actual weather outcomes.

## Summary

This review has offered a theoretical and methodological approach to integrate experiential human function into design in the way that ethics are currently integrated. Just as human centered design is a method for operationally determining and fulfilling human needs, this functional semiotic approach to perception, judgment and decision making can be used to operationally determine and support individual thinking, judgment and decision making. This approach is deeply design oriented:

1. It views people as independent actors with intentions, its notion of man and environment as separate and equal partners corresponds to design's notions of human construction and the artificial.
2. It gives primacy the ecological level of the natural world in which people operate, which is where design is located.
3. Its notion of "representative design" in research describes and defines user testing according to criteria based on performance outcome and human function. It vindicates user testing's potential as core, knowledge producing research.
4. In a human oriented, non-reductive way, it supports the decomposition of design problems into measurable and computable elements for design manipulation.

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## Diversity in the design processes of studio jewellers

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### Abstract

Because of the availability of new materials and innovative techniques, the design process of studio jewellers is becoming more and more complex. Moreover, on top of this increasing complexity, there is a lot of variation in design strategies used by studio jewellers. The complexity and diversity within the design strategies and the tacit nature of this kind of knowledge seems to suggest that these strategies cannot be easily communicated in an explicit way. Based on the existing literature and a series of group conversations with studio jewellers and designers of objects, this paper tries to define a conceptual framework in which the diversity in design strategies used by studio jewellers is described. It can also be used to communicate about the design processes despite the implicit nature of this knowledge and despite the uniqueness of each design process.

Within the conceptual framework the design processes are described as a series of reflective moments where design parameters (potentialities) are turned into constraints (actualities) imposed on a design space. By means of a possibility to reconsider previously imposed constraints (backtracking), the design process of studio jewellers can be described as a continuous reflective search through design space. Moreover, because constraints can be imposed both by thinking and by doing, the conceptual framework can be used to describe this particular property of the design process of studio jewellers (both design by thinking and by doing).

### Keywords

Studio jewellers, diversity, design process, reflection, conceptual framework

### Introduction

Because of the availability of new materials and processing techniques, the design process of studio jewellers<sup>1</sup> is becoming more and more complex (Foqué, 1975; Schwartz; 2006). However, whereas detailed descriptions of this process are available within the other design disciplines (e.g., product design, architecture, interior design, ...) these descriptions are not always suited for the practice of studio jewellers. Since 1960's design processes in general have been described in many ways but two global paradigms can be distinguished (Dorst, 1997). The first one is *the approach of rational problem solving* (e.g., Simon, 1967). This approach describes the design process using

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<sup>1</sup> A studio jeweller is a designer of jewellery that is responsible for the whole design process, starting from the creation of an idea to the actual shaping of the object.

very explicit and clearly defined concepts. It can also be called normative because it describes the design process as a method, prescribing how to design in order to find a solution to a given problem and this in the most efficient way (Roozenburg & Eekels, 2003). Following this approach, it is the task of the designer to analyse the problem at hand, to split up the problem in different subproblems, to find solutions for each subproblem and to bring all solutions together. Moreover, it was thought that there was an optimal order in which these different subproblems had to be considered in order to result in the most efficient process of solving the problem.

The second approach can be called *the approach of reflective practice* (e.g., Schön, 1991) and these methods were formulated as a reaction to the first approach of rational problem solving. According to reflective practice, the design processes are described as a constant interplay between problem setting and problem solving (which was not the case within the rational problem solving paradigm). The designer is actively involved in setting the problem (redefining, reinterpreting and reformulating the problem at hand) and the resulting design was therefore considered both a solution and a test for the problem "constructed" by the designer (Gedenryd, 1998). This approach can be called descriptive because these models are more in correspondence with the actual design practice. Moreover, within this approach it is stressed that each design task is unique and therefore it is not always possible to be prescriptive.

A problem with the rational problem solving approach is that the actual materialisation of the solution is typically left out of the descriptions of the design processes. This was of course because most of the time the design processes were studied with the design practices of architects and product designers in mind (for these designers are not expected to materialise their designs). However, even if the materialisation of the design was actually considered, this phase was usually not described as being a part of the design process. It was typically viewed as consisting of actions that could happen after the design was finished and, as such, could even be left to other people (i.e., not familiar with the art of designing). In contrast, in the practice of studio jewellers the materialisation of the design -described as actively manipulating the material and processing it in order to shape it is usually considered as an integral part of the design process. The division between problem solution and materialisation of this solution is as artificial as the above described division between problem setting and problem solution.

In this paper we describe a conceptual framework that integrates several of the advantages of preceding approaches. It concerns a description of the reflective practice of studio jewellers that uses explicit and clearly defined concepts and that includes the actual materialisation of objects as part of the design process. Describing the design process in explicit terms can be very useful because of several reasons (Roozenburg & Eekels, 2003). In the first place, it provides a common language to enable different designers to communicate about their own design processes despite the implicit nature of this type of practical knowledge (*education*). Second, such a conceptual framework has the potential for increasing the systematic exploration of other possibilities and for stimulating creativity (*innovation*). Finally, it provides a language for describing and interpreting the diversity that is apparent in different designers (*design strategies*).

## A conceptual framework for describing the design process

This section defines a conceptual framework for describing the reflective practice of studio jewellers and designers of objects. The design process is described as a series of reflective moments, actions that are imposing constraints on an individual design space. These actions are taken while reflecting and this reflection in action is both based on preceding constraints imposed on the design space (looking backward) and on the estimated results of these actions (looking forward). The concepts defined explicitly within this framework are based on the existing literature about this subject. Moreover, the framework is based on several group conversations with studio jewellers and designers of objects. When appropriate, real life citations of these group discussions are used as illustration for the concepts used (citations presented in italics).

Each designed object can be described using a finite set of properties (e.g., properties of shape, material, function, ...). The creation of a designed object consists of giving values to these properties (e.g., the shape is a sphere with a width of 20 mm, the material is steel, the colour is grey RAL 7021, functioning as a brooch). These properties are called design parameters and they can be defined as follows:

**Design Parameters:** the complete set of factors a particular designer is implicitly or explicitly reflecting upon and that is determining his/her design.

When the parameter is given a certain value, this is called a constraint. These constraints can be defined as follows:

**Constraint:** a parameter that has been given a certain value.

The density of a material is an example parameter that can have different values. For example, the scale of Mohs can have a value ranging from 1 to 10. When the studio jeweller has chosen a certain density, that is, has given the parameter "density" a specific value (e.g., on the scale of Mohs), a constraint is imposed on the possible materials he/she can choose.

By describing design objects using this finite set of design parameters, these objects can be represented by means of points in a design space (sometimes called solutions space; e.g., Lawson, 1979; Cross, 2006). Because the design parameters are by definition contingent upon an individual designer (yielding a different set of design parameters for each designer), design spaces are also individual. The design space of a certain designer encompasses all the designs he/she is in principle able to design. The design space and the design objects that are contained within this space can then be defined as follows:

**Design Space:** the space spanned by the design parameters.

**Design Object:** a single point in design space.

Most of the design spaces of studio jewellers are huge multi-dimensional spaces with hundreds of design parameters to be considered. Exactly how these assignments of values are made (and why a particular value is chosen) will be described later. Also concepts related to the reflective nature of the design process will be introduced later.

The huge set of design parameters can be ordered and categorised in meaningful groups. These groups of design parameters can be called design clusters and they can be defined as follows:

**Design Cluster:** a cluster of design parameters that are related to each other. This cluster spans a subspace of design space. The order of the different design parameters within this subspace is not specified.

Relevant examples for studio jewellers are the clusters concerning the material used for the design object (e.g., density, colour, transparency, melting point) or the shape of the design object (e.g., assembled or not, height, organically shaped or geometrically shaped). Note that this clustering is individual: each designer can have his/her own system for clustering design parameters and even for a single designer different design problems might require a different categorisation of design parameters in clusters and subclusters. The particular manner in which these design parameters are clustered is one of the sources of diversity in between studio jewellers and designers of objects.

Each design object can be considered in a certain context. Because not all of the design objects will be adapted equally to this context, one can attach a certain quality measure to these design objects. This design quality with respect to a certain design context can be defined as follows:

**Design Quality:** a measure, attached to each point in design space to indicate the goodness of fit of a particular design object to the design context.

**Design Context:** the designer with his/her knowledge structures (vision, general knowledge, experience, skills, style, ...). These knowledge structures can be shaped by the knowledge structures of externals (e.g., a client, users,...).

With these concepts in line, it should be stressed that the process of designing does not consist of a simple and sequential search through this design space (constraining each design parameter one by one and in a fixed order) but is rather considered to be a reflective process (e.g., Schön, 1991).

*Reflection is very important in the design process. For me, the reflection is the most important, especially in the creative part of the process. This reflection can also happen meanwhile, while questioning everything again and again. The reflection is very important to me in the whole process. It is a constant thinking forwards and backwards. (reflection in action)*

Each consideration of a design parameter can be described as a reflective moment taking into account the preceding design parameters (looking back at the constraints already imposed) and the possible outcomes for each design parameter value (looking forward) (Lawson & Dorst, 2009). For example in the case of studio jewellers, when considering the design parameters contained within the material cluster, the possible values for these design parameters are dependent on preceding constraints (for example the constraints contained within the cluster "shape" determine which materials are possible at that particular moment). At the same time, the choice for a specific material will be determined by its potential of generating design objects with a high enough design quality. Moreover, each consideration of a design parameter can be viewed both as a search for a solution (imposing a new constraint) but also as a test for preceding solutions (preceding constraints). If this test is successful, a new constraint is imposed and the preceding constraints are considered valuable. If this test is unsuccessful, no new constraint is imposed and preceding constraints have to be reconsidered. In order to implement this "use/test duality" (Gedenryd, 1998; p. 85) in the conceptual framework, design parameter reflections can be described as follows:



**Design Parameter Reflection:** choosing implicitly or explicitly a value for a particular design parameter. This is done by following three steps:

1. Generating the possible values for this particular design parameter based on constraints already imposed on other parameters.
2. Choosing the value for this design parameter resulting in the highest estimated design qualities (based on individual rules of thumb, called heuristics).
3. If the estimated design quality of this choice is high enough: continue to the next design parameter (if not finished yet). If not: reconsider a previously imposed constraint by means of a design parameter reflection (i.e., backtracking).

While designing, the designer constantly has to decide to continue or to reconsider previously imposed constraints (backtracking). This implies that the designer has to estimate the design qualities of the design objects that are still attainable when choosing a particular value for a design parameter. This is done by using heuristics (Lawson & Dorst, 2009). These Heuristics can be defined as follows:

**Heuristics:** individual rules of thumb that allow a designer to estimate the design quality of the design objects that can be reached when choosing a particular value for a design parameter.

The informativeness and the efficiency of the use of these heuristics towards estimating the outcomes of particular design parameter reflections can be considered another source of diversity. This kind of diversity is most prominent when comparing the novice designers and expert designers. For novices these heuristics might not be very informative but with increased experience of the designer, including the availability of an increasing number of preceding design solutions, these heuristics become more and more informative. Because of this improved workings of heuristics, these expert designers are good backtrackers. By constantly reconsidering previously imposed constraints they can work out "parallel lines of thought" (Lawson & Dorst, 2008, p. 60) they search design space in a "depth first"-modus (Cross, 2006, p. 26) and they are more eager in reframing the problem turning them into "pragmatist designers" (Gedenryd, 1998, p.90).

Using heuristics increases the probability of finding design objects with a high design quality but is not a guarantee for that (De Groot & Medendorp, 1986; Cross, 2006). The more experience (novices versus experts), the better these heuristics in predicting possible end results, the higher the probability of success. Based on the improved heuristics, expert designers can see possibilities in design solutions that are considered as "more risky" by others (Lawson & Dorst, 2009, p. 208).

The chain of reflective considerations and the working of heuristics can be represented using the concept of a decision tree<sup>2</sup> (Winston, 1992). Backtracking, based on the predictive skills supported by these heuristics, is then represented by moving upward and downward this decision tree (reframing abilities of expert designers). Figure 1 presents a highly simplified design process (only three design parameters are shown) in which the difference in informativeness of heuristics for novices and experts and a possible mechanism of how this difference is shaped can be explained.

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<sup>2</sup> The concept of a decision tree does not automatically imply conscious, self-reflective decisions of the designers, although this could very well be possible.

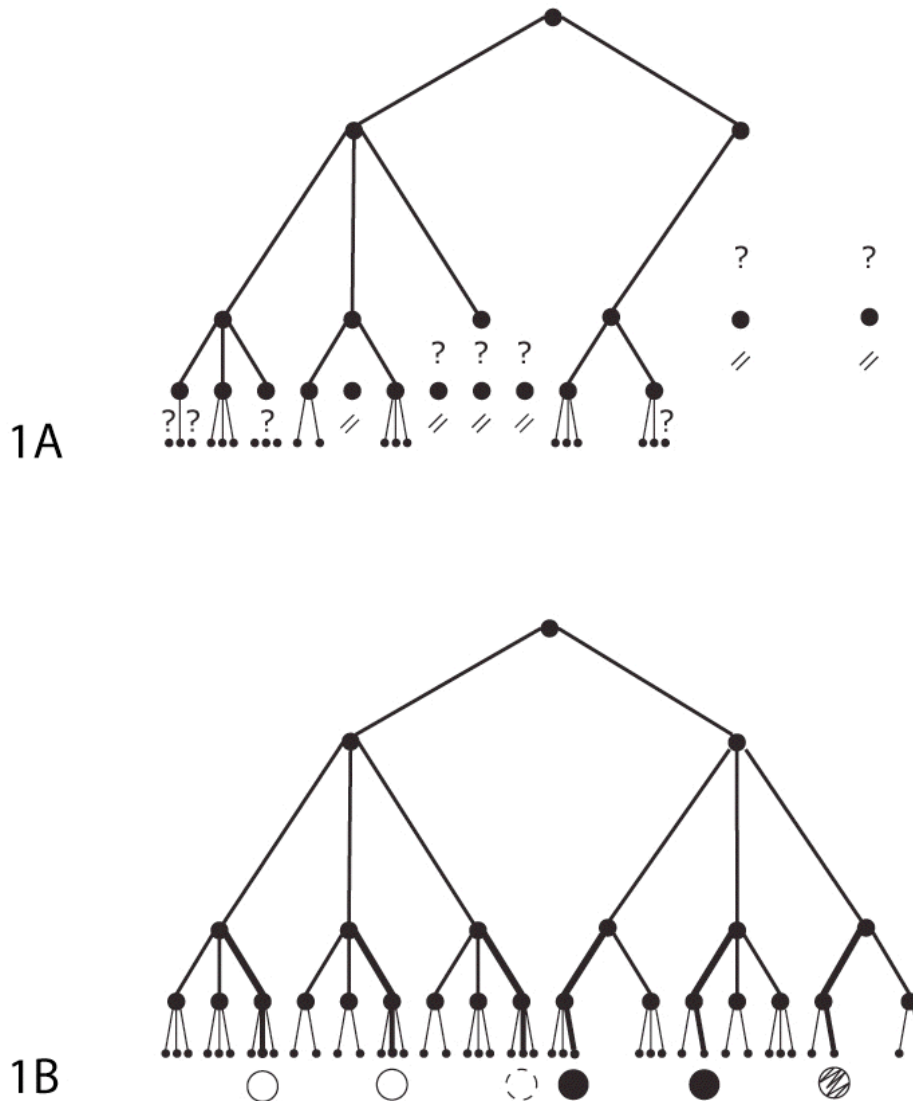


Figure 1. The working of heuristics for novice (1A) and expert designers (1B)

Figure 1A represents a possible design space of a novice designer. Here, some of the branches are not shown because novice designers do not always see all of the alternative moves available to an expert designer at that point in the design process. And even for the alternatives that are available at that point, the heuristics are not informative with regard to the design qualities of the possible design objects. The novice designer really has to actively explore this subspace in order to obtain information about the design quality of the design objects contained within. Once a certain path has been followed, a line appears, hereby indicating that the designer "has been there before". When the bottom of the decision tree is reached and a design object is found, the

designer knows the design quality of that design object. When a combination of constraints has frequently resulted in design objects with a high design quality, this series of constraints is reinforced (figure 1B) and an experienced designer can transfer this practical knowledge to other parts of the design space (taking the same decisions in another context will probably result in design objects with a high design quality) (Lawson & Dorst, 2009; Ahmed, Wallace & Blessing, 2003; Kolb & Fry, 1975). The opposite can happen when a combination of constraints frequently resulted in design objects with low design qualities using these heuristics. Information about other parts of the design space becomes available without "having been there before". Diving into and back out of subspaces becomes easier and faster (looking forward using heuristics becomes better; Christiaans & Venselaar, 2005). On top of this, alternative values for this design parameter that were available based on previous experience and previous design projects become available at this particular point (e.g., a certain processing technique that was up till now only available in the context of metal is now seen by the designer as an alternative value in the context of a composite). Because each design project is in the same time a learning process, this means that an individual design space is constantly growing, even while designing.

The design process is described as a chain of reflective moments where constraints are imposed on the design space. Moreover, backtracking is viewed as an integral and important part of this reflective moment and not as an inefficient way of designing ("the designer had to go back because of an erroneous decision"). It is precisely the ability of the designer to flexibly reconsider previously imposed constraints on the design space that makes him/her a good designer (moving up and down the decision tree).

*If I don't see a solution, it is because I got lost in places while forgetting the essence of the story. So I always reflect. I always return to what I wanted to make, to where I started. And does my design fit with the original story? And so maybe I have to take a different decision. The decision can for example have to do with choosing another material or another processing technique. (backtracking)*

Moreover, this backtracking allows a kind of search through design space that is more efficient than a linear approach given the ill-posedness of the design tasks (Neuckermans, 1980; Rittel & Webber, 1973). Where novice designers have to dive into their decision tree in order to have an idea about the design quality of the underlying design objects, expert designers can, based on their heuristics, reach the same result more efficiently without having to concretise each decision (Lawson & Dorst, 2009).

*So these are the things that appear by doing it, unless you have a lot of experience. But I'm not that old and the experience is missing, my oeuvre is not that large. I have not always the technical skills needed. So I can't predict how the parts can move, how they react, so this appears while making it. (novice studio jeweller)*

In this perspective each reflective moment can be seen both as a step towards a solution and as a test for preceding constraints ("use/test duality" as described in Gedenryd, 1998, p.85). If the test fails, preceding constraints (imposed by the designer or even those imposed by a client) have to be reconsidered.

In order to illustrate this process of reconsidering previously imposed constraints on a design space. Figure 2 presents again part of a design process (only three design parameters) using again the concept of a decision tree.

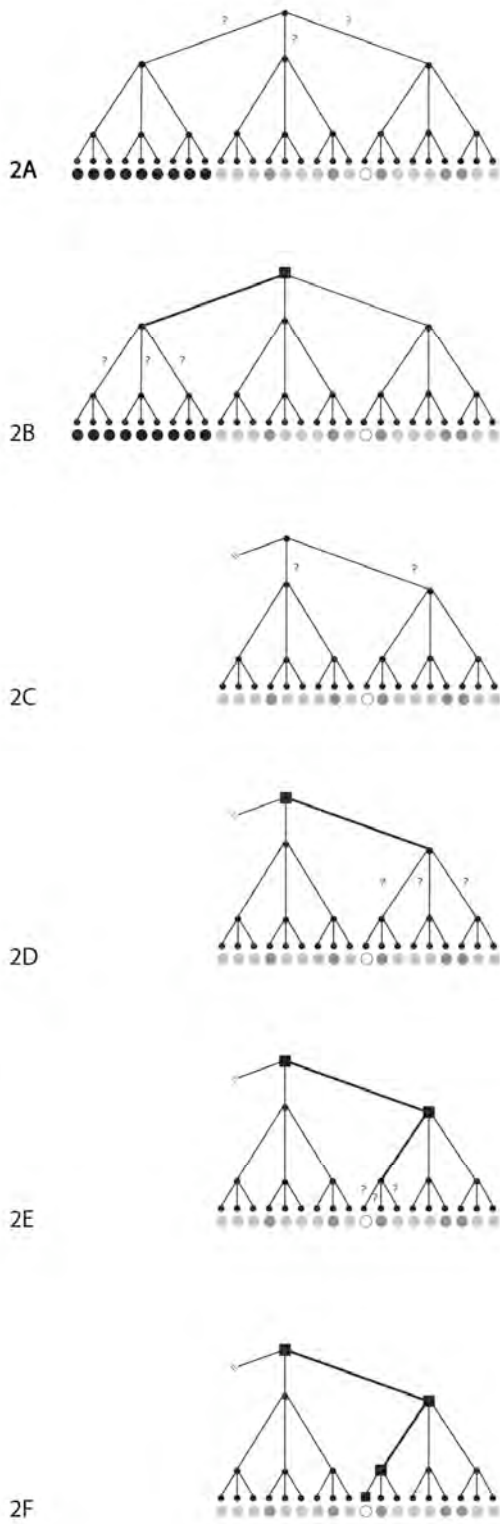


Figure 2. Part of a design process

Figure 2A presents the starting point, that is, when all three design parameters still have to be constrained. Figure 2B shows the situation after the first design parameter is constrained. This choice was rather arbitrary because at the present stage of the design process (i.e., rather early) the heuristics of the designer were uninformative. Now, the second design parameter has to be considered. However, this designer cannot fix the value of this design parameter because at this stage his heuristics become relevant and inform him not to continue (all choices lead to design objects with a low design quality). In figure 2C, the designer is reconsidering or backtracking to the first design parameter (turning this constraint back into a design parameter) with the dead end pruned away. In figure 2D the designer has imposed a new first design parameter constraint and is now once again considering the second design parameter. Because his heuristics tell him that now there is indeed a branch leading to design objects with a high enough design quality he chooses this branch by imposing a further constraint on the design space (figure 2E). The same holds for the last design parameter (figure 2F), but because at this stage actual design objects are reached, the choice is made based on the design quality itself and not on an estimated version based on heuristics. The designer created a design object he/she likes.

In this example it still looks as if the order in which the design parameters are considered is fixed. Because choosing an order in which to consider these design parameters is part of the design process this will be explained later (design cluster reflection).

In existing models, the design process is sometimes described as both problem setting (analysis) and problem solving (synthesis) (Roozenburg & Eekels, 2003; Hamel, 1990). However, even if the designer is described as taking part in the problem setting and even if there is a constant interplay between these two components (Gedenryd, 1998), the authors of this current paper prefer to describe the design process as imposing constraints on design space rather than in terms of problem setting and problem solving. By formulating the design process using one single concept (design parameter reflection) it is stressed that in the case of wicked problems "the process of formulating the problem and of conceiving a solution ... are identical, since every specification of the problem is a specification of the direction in which a treatment is considered" (Rittel & Webber, 1973, p. 161). The designer adding constraints, then, is both setting the problem and solving the problem (designer imposed constraints). Because both problem setting and problem solving can be seen as imposing constraints on the design space, and similarly, because backtracking is both reframing the problem and reconsidering previously found solutions, a concept that captures this in a single design process (design parameter reflections as defined above) is much more appropriate.

In the case of real studio jewellers, client imposed constraints (design parameter reflections where the client or the user is actively involved) and designer imposed constraints are two important groups of constraints. Within the designer imposed constraints another important distinction has to be made: the group of constraints imposed by thinking and the group of constraints imposed by doing (e.g., Sennett, 2008). The proportion of design parameters constrained by thinking and by doing is considered to be another source of diversity within the design practice of studio jewellers and designers of objects.

*The design and the realisation of it are two separate things, but at a certain moment there is a zone where they are mixed together. You still tighten the concept while realising your concept. (designing by thinking and doing)*

*I think you can't disassemble those two. While you are designing, for example, you always think of material and the making process. It often runs through each other. If you materialising the design, you have to make choices again. (designing by thinking and doing)*

*Actually everything is contained within the concept. Some designers just make some simple sketches and the producer has to solve all the rest, but I cannot work like that. That is an advantage for the producers, because they can immediately start the production. I'm always trying different solutions in my head, even before I even put a line on paper or before doing something, to finish the design. Generally, I have an image of the design in my head and I want to make it like that, without changing a thing. (design by thinking)*

*I have to touch the material. I really need to saw and file it. I have to work with silver and gold. I really have to feel it, and let it slip through my hands. By doing it, I discover what I want with the material. (design by doing)*

*My objects are shaped while working on it. In the past I always designed all aspects of my objects before materialising them. Nowadays planning and making comes together. (design by doing)*

Grouping the design parameters according to the person imposing the constraints (the client or the designer) and the manner in which this was done (by thinking or by doing), a prototypical design<sup>3</sup> process of a studio jeweller can be described by means of the design clusters presented in figure 3.

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<sup>3</sup> The concept of a decision tree does not automatically imply conscious, self-reflective decisions of the designers, although this could very well be possible.

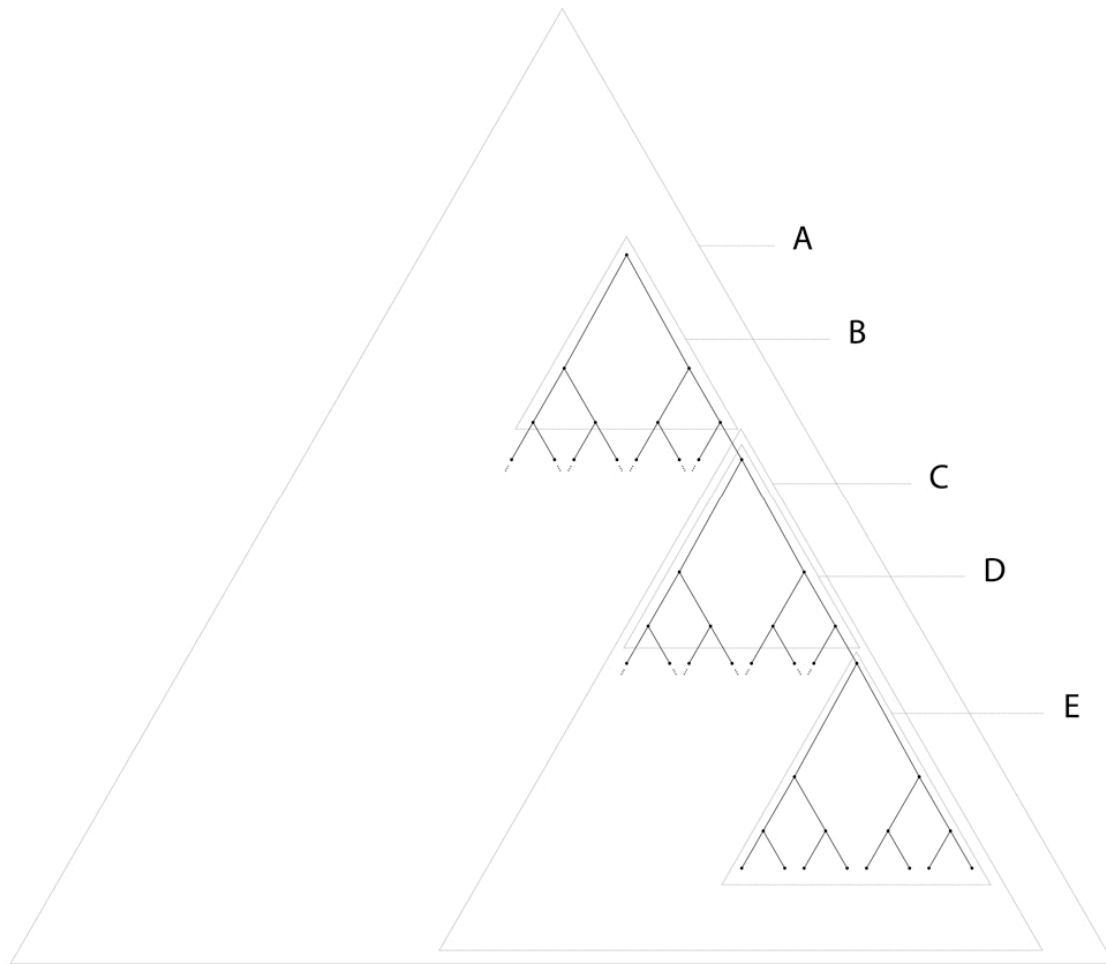


Figure 3. Prototypical clusters and subclusters of the design process of studio jewellers

In this figure, the first cluster A is the whole design space, with a number of subclusters. Cluster B are the design parameters that are under the control of the client.

*We determine first and foremost the price set by the customer. The client shows us a sketch, thereby form and function are settled. Usually he applies also the desired material. It's up to us to design his wishes. (client imposed constraints)*

*I get very few restrictions. They simply ask: design a cutlery and that's it, it is up to you. It is always like this, I get no restrictions, even not in price. I have never had to take something in account. So that gives a huge freedom. (almost no client imposed constraints)*

Cluster C, then, are the design parameters controlled by the designer (imposing constraints using his heuristics while reflecting). Within cluster C there are two subclusters, one for design parameters controlled by a mental act of thinking (design by thinking; cluster D) and one for design parameters controlled by a physical act of doing (design by doing, cluster E).

In a real design practice (and especially in the case of jewellery design) the client



imposed constraints are not always the design parameters considered first and a constant interplay between design by thinking and by doing (thinking by doing) is possible (Lauer, 1990). The order in which the different design clusters are considered (shape parameters, material parameters, functional parameters, ...) could also be different for each designer and even within a single designer, different strategies are possible depending on the situation.

*My inspiration is always nature and the human being. That is my starting point for searching the right shapes. I try to make these shapes always monumental, timeless and aesthetic. (shape-parameters as start cluster)*

*I'm more concerned with starting from the material itself: clay. With clay you can make all possible forms. (material-parameters as start cluster)*

*I'm a practical guy, I try to design things that can be used, which are solid when they are being used. That is the first condition. (function-parameters as start cluster)*

*If you design a jewel in a normal way, you use traditional techniques. I wanted to achieve a new kind of design without using the classical techniques. This ring is made from one wire. I wanted to make the processing-technique, in this case the technique of forcing, very visible. The process, the technique defines the design. (processing-technique-parameters as start cluster)*

*I never start from a material or shape, but from an idea, based on any situation around me. Then I search for a material that can translate the idea. It's very important to me to make the material alive. I would like to give the material a second skin. I try to transform the material. (concept-parameters as start cluster)*

Apart from the ordering of clusters of design parameters, the design process is sometimes described as starting with abstract considerations going to the more detailed considerations (Roozenburg & Eekels, 2003). Finally, in the case of studio jewellers this ordering of design parameter reflections is considered as a part of the design process. Because generating possible values for a design parameter in the context of a design parameter reflection is dependent on preceding constraints, choosing the right order is important. A design cluster consideration can be defined as follows:

**Design Cluster Reflection:** parsing<sup>4</sup> a cluster of design parameters into subclusters and/or individual design parameters and putting them in a certain order<sup>5</sup>.

Because the order of design parameters within a cluster is not specified, the first thing to do, when entering a design cluster, is to parse it. This parsing determines in what order the clusters and subclusters and individual design parameters will be considered. From such a perspective, the designer starts by considering a big design cluster (design space) and ends with a string of individual design constraints (a design object).

If, at a certain stage of the design process, the designer does not want to impose an ordering on a group of design parameters, these design parameters will remain clustered. For example a designer can "decide" first to select a material and leave the other design decisions (with no order specified) for a later moment. In this case the

<sup>4</sup> This parsing of design space can be compared with the hierarchical parsing algorithms used in natural language processing as for example in Gazdar & Mellisch, 1989.

<sup>5</sup> The choice of a certain hierarchically structured order could be based on heuristics as well and a certain choice can be reconsidered again by a comparable backtracking mechanism as above.

whole cluster (design space) is parsed into design parameters regarding the material used (in a certain order) and a subcluster of all the remaining design parameters (without a certain order). Another example is a designer who decides first to select a function, then to choose a material and then to shape it. In this case the big cluster is parsed into those three subclusters (in a certain order) but the order of the individual design parameters within these clusters is still not specified (so this is only decided upon the moment the designer enters each cluster at a later moment in the design process). Even within single designers, this order is not always the same.

*It could be a material that I find so interesting that I think, "what can I do with it". Then the design process starts from the material. But I do not always start working with a material. Unless someone asks me to work with porcelain. Then I explore the possibilities of porcelain, taking into account my personal vision. (considering the start cluster as part of the design process)*

## Conclusion

This paper defines a conceptual framework for describing the design processes of studio jewellers and designers of objects. This conceptual framework describes the design process using three basic design processes: 1. design parameter reflections (imposing constraints on design space by looking backward to the set of constraints already imposed, and by looking forward to estimate the design qualities, based on heuristics), 2. design cluster reflections (imposing a hierarchically structured order onto the design space) and 3. backtracking (reframing the problem by reconsidering previously imposed constraints or previously imposed hierarchically structured orderings of design space). The conceptual framework can be considered both holistic, in that the overall design process can be described as an interaction of these three basic processes, and reductionistic, in that only three basic processes are needed.

It is stated that such a framework is helpful because of three reasons: education, innovation, design strategies. The conceptual framework presented in this paper, based on the design processes of studio jewellers and designers of objects uses clearly defined and explicit concepts. Moreover, by describing the design task (both problem setting as problem solving) as imposing constraints by means of design parameter reflections (with the constant possibility of backtracking, based on the information provided by heuristics) the reflective nature of the design process can be expressed using this set of concepts. Both imposing constraints by thinking and by doing are described in terms of these same design parameter reflections. Finally, by the concept of design cluster reflections, the flexibility of studio jewellers in choosing the order in which to consider the different design parameters (or design clusters) can be described. The advantages of this description of the design process are threefold. First, several sources of diversity can be distinguished based on this model. A first source is the order in which the studio jewellers consider the different clusters of design parameters. This diversity can exist both between designers (different studio jewellers use different orderings of design clusters) as within designers (a single studio jeweller uses different orderings according to the task and the situation). Another source of diversity is the way studio jewellers are considering their design parameters. The proportion of design parameters constrained by thinking and by doing can be different for different designers (and again within designers). Diversity is also apparent when considering the experience of the studio jewellers. Again, this diversity can exist both between designers (experts studio jewellers are backtracking constantly while novices are not) as within designers (a studio

designer can be an expert within a certain part of his design space while being a novice for other parts of this same design space). When pinpointing different designers on these different diversity dimensions, different design strategies can be distinguished and interpreted.

A second advantage of using this framework, is the explicit use of concepts like design clusters, backtracking, design parameter reflections, ... . This can be very useful for educational purposes (Cross, 2006). Using an explicit language of the design process, a black box approach to education (only an evaluation of the end result without explicitly stating what went wrong) can be turned into a glass box approach (an evaluation of the process, explicitly stating what went wrong). Moreover, a modular approach to education becomes possible (exercises within clearly defined design clusters). A last advantage is the innovative value of working with explicit frameworks such as this one. After all, Christiaans and Venselaar (2005) showed that there is a positive correlation between the creativity of a product and the ability of the designer to explicitly think about his/her own design process.

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# **Capturing tacit knowledge: documenting and understanding recent methodological innovation used in Design Doctorates in order to inform Postgraduate training provision**

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## **Abstract**

This paper presents a preliminary review of recent Design PhDs that identify and analyse the methodological innovation that is occurring in the field, in order to inform future provision of research training for Design PhDs. Six recently completed Design PhDs are used to highlight possible philosophical and practical models that can be adopted by future PhD design students. Four characteristics were found in Design PhD methodology; thesis-structural innovation, a 'pick and mix' research design approach, situating practice in the enquiry and the validation of visual analysis. The paper concludes by offering suggestions on how research training can be improved for Design PhD candidates. By being aware of recent methodological innovations in the field, design educators will be better informed when developing resources for future design doctoral candidates, and assisting supervision teams in developing a more informed and flexible approach to practice-led research.

## **Keywords**

Methodological innovation, Design research methods, PhD research training, Approaches to design research

## Introduction

Over the last ten years, the United Kingdom has seen an increased interest in Design PhDs. For example, over the past two decades the number of Design PhDs awarded in the UK has more than doubled<sup>1</sup> (Christer, 2006, p. 36). In addition, the emergence of a number of major international conferences such as Doctoral Education in Design (Buchanan, Doorden, Justice, & Margolin, 1998), Doctoral Education in Design: Foundations for the Future (Durling & Friedman, 2000) and Doctoral Education in Design: Practice of Research (Durling & Sugiyama, 2003) reflects the growing interest in the nature of research and practice of the field (Durling, 2000). These seminal conferences provided a platform for educators to share their diverse experiences and insights on challenges arising from the development of Design doctoral programmes. Most of the early discussions at these events centred on the purpose of Design PhDs and how doctoral education will benefit the discipline, which then naturally progressed to discussions that focused on exploring the methodologies, structures and processes particular to Design PhDs.

In recent years, it has been observed that a more established typology of design methodologies has been developed, employed and validated as acceptable forms of research methodology for doctoral level programs. These methodologies have ranged from hybrid methodology, which employs a mixture of qualitative and quantitative methods; to more practice-based methodology, achieved through critical design projects such as examples shown by Seago and Dunne (1999) and Maze & Redström (2007). Saikaly (2005) describes this practice-based type of inquiry as a 'designerly mode of inquiry', distinct from the well-established science and humanities research approach.

Training provision for PhD design students is generally based on a generic university-wide programme, where science and humanities methodologies are dominant. The issue of discipline-specific training for design has improved slightly over the years, as a recent report has shown. According to the Arts and Humanities Research Council<sup>2</sup> (AHRC) review on Practice-led Research in Art, Design and Architecture (Rust, Mottram, & Till, 2007, p. 54), 16 out of the 19 surveyed universities' Art, Design and Architecture departments do provide formal research training designed specifically for their subject (compared to 9 in 2001). Out of these 16 universities, 15 of them now include training in methods for practice-led research (compared to only 2 in 2001). However, the AHRC report does not go into detail on the types of practice-led methods that are being taught, the breakdown between Art, Design and Architecture and whether the students were satisfied with the training provided. In addition to a lack of discipline specific training, research and knowledge around supervision in art and design remains rare, particularly in the case of practice-based research (Frayling, 1993), while existing literature on practice-based research degrees is aimed at helping supervisors manage their students (Newbury, 1996) rather than informing supervisors of the range of research methods available to their students.

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<sup>1</sup> According to the Art and Design Index to Thesis, 180 Design PhDs were awarded during 1996 – 2005, compared to 82 PhDs awarded during 1986 – 1995. The HEFCE report also reported a 232% rise in PhDs completed in the Creative Arts and Design subjects from 1995 to 2005.

<sup>2</sup> AHRC is a UK government funding body that funds research on a very wide range of subjects, from traditional humanities such as history, English, linguistics, French and other modern languages, philosophy and classics, area and interdisciplinary studies to creative and performing arts such as drama, dance, music, art and design.

## Design Research Frameworks

If we are to look closely at the range of subject and purpose covered in Design PhDs, it might be useful to review them in the context of different research design frameworks discussed over the years. One of the more widely-used frameworks is Frayling's classification (1993) of art and design research, which identifies three main types of research projects:

1. Research INTO practice
2. Research THROUGH practice
3. Research FOR THE PURPOSE of practice

Research into practice refers to research where art or design practice is the object of the study. Research through practice refers to research where art or design practice is the vehicle of the research, and a means to communicate the result. And finally, research for the purpose of practice aims to communicate the research embodied in a piece of design. I would argue that each method of research is not mutually exclusive. For example, Pedley's (1999) PhD was to study designers' attention to materials and manufacturing processes (a study 'Into' the design processes) by designing and prototyping of an innovative polymer acoustic guitar ('through' the practice). While Hillier's (2006) PhD uses practice as part of a quantitative and qualitative research methodology to identify and test readability and legibility issues. The conclusion of the results is embodied in a piece of design, which is a new typeface called Sylexiad.

Frayling's analysis of art and design research activity seems to cover all design research possibilities. In comparison, Cross (1999, p. 6) offers a design research taxonomy that is based on the *focus* of the investigation rather than in the method of research. He focuses on knowledge that resides in people, process or product:

1. Design epistemology – study of designerly ways of knowing (people)
2. Design praxiology – study of the practices and processes of design (process)
3. Design phenomenology – study of the form and configuration of artifacts (product)

Cross believes that designing is a natural human ability that is inherent in everyone, and not just professionals. Hence the immediate subject of design research is the investigation of how people design. Design knowledge also resides in the processes of the activity, tactics, strategies and tools used for the purpose of designing. Finally, the designed artifact embodies knowledge in its form, material, technology and context of use.

Fallman (2008) offers a more holistic framework in the field of interaction design research that not only refers to academic research, but includes knowledge gained through practice-based and explorative avenues. The model plots the position of design research activity in between three extremes:

1. Design practice
2. Design exploration
3. Design studies

The differences are primarily in *tradition* and *perspective*, rather than the methods and tools being used (see Figure 1). *Design practice* denotes activities that are similar to commercial design work, carried out in commercial consultancy but with a difference in that the researcher becomes engaged in a particular design practice with an appropriate research question in mind. The research question is developed and explored through either a reflective (first hand experience of the tools or



processes) or proactive manner (through an already established research agenda that seeks to change how a specific technique is used). *Design exploration* is similar to design practice but differs in one key point, in that it aims to explore 'what if' questions through the process of designing rather than by answering a particular research problem. Design exploration is a way to comment on a phenomenon by developing an artifact that embodies the statement or question that the researcher is attempting to critique. *Design studies* most closely resemble traditional academic, research whose goal is to contribute to the intellectual tradition and body of knowledge.

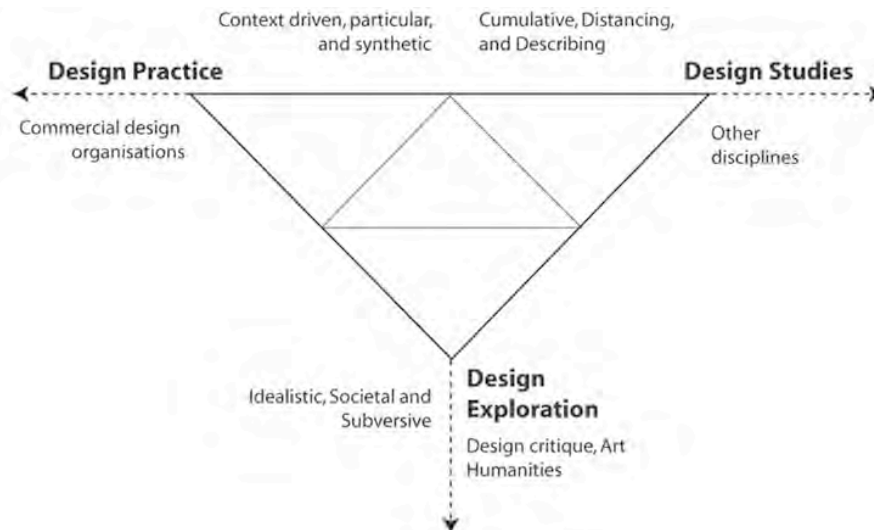


Fig 1. Fallman's (2008, p. 5) Interaction Design Research Model

Each framework presented here has its own function and value as one does not supercede another but instead provides different facets to the understanding of design PhDs. For the purpose of clarity, this review will frame the chosen examples using Fallman's (2008) framework, but uses Frayling's (1993) and Cross's (1999, p. 6) frameworks to analyse the purpose and methods of research employed in the selected PhD studies.

## Characteristics of Design PhDs

Langrish (2000, p. 302) describes three areas in which a Design PhD is distinct from other academic areas: (i) the questions asked, (ii) the methods used to answer them and (iii) the type of evidence that is acceptable to a design peer group of academics. Firstly, the questions that Design PhDs ask are concerned with things visual. Secondly, a review of Design PhDs seem to suggest a mix of methods used, ranging from quantitative, empirical methods to more qualitative, social science methods. Thirdly, the evidence produced in response to the research questions can vary from a traditional big-book thesis to a portfolio containing design pieces that are accompanied by a shorter thesis.

Chris Jones (1997, p. 5) differentiates between a PhD in Design and in Art by declaring that a Design PhD has to show exceptional ability to integrate imagination-and-reason, technology-and-art, and to make noticeable improvements to the quality of industrial life and its products, whereas an Art PhD should show exceptional perceptiveness and originality in art-making.

In recent years, a growing number of PhDs are described as ‘practice-based’ or ‘practice-led’. I would argue that Design PhDs are inherently practice-based (i.e. deriving from design practice, either through studying the people, process or products (Cross, 1999) and the approach has become more widely accepted within the academic community. Durling et al (2002, p. 82) describes practice-led research as ‘a study where practice is used as an interrogative process’ while Rust et al (2007, p. 11) emphasize that design practice has to play an instrumental part in an inquiry.

### Design PhD Case Studies

Six examples were chosen to highlight the spread of research that resides within the three areas of design practice, design exploration and design studies (Fallman, 2008). These examples were also chosen on the basis of their methodological innovation, either in the way the research design has been constructed or the use of a particularly innovative method. The PhDs were sourced from a combination of literature review surrounding design research methodology, and searches through thesis databases. The databases referred to were the Art and Design Index to Thesis (Christer, 2006) and the Index to Theses website (Expert Information, 2009). ADIT claims to be the first comprehensive index of postgraduate research theses in art and design in the UK, while the Index to Thesis database is a comprehensive listing of theses with abstracts accepted for higher degrees by universities in Great Britain and Ireland since 1716. An initial list of design PhDs were drafted and their abstracts reviewed in order to identify suitability and a final shortlist of six were selected. It has to be stressed that the case studies were not only selected on the basis of their innovative approaches, but by their impact on the research methodology applied in subsequent PhDs. At the same time, the review has considered other more ‘traditional’ quantitative and qualitative methods that have been employed with success in Design PhDs. Figure 2 illustrates where these projects are placed within Fallman’s (2008) description of design research activities. These placements are indicated to provide context to the different studies’ perspectives, rather than an empirically accurate categorisation.

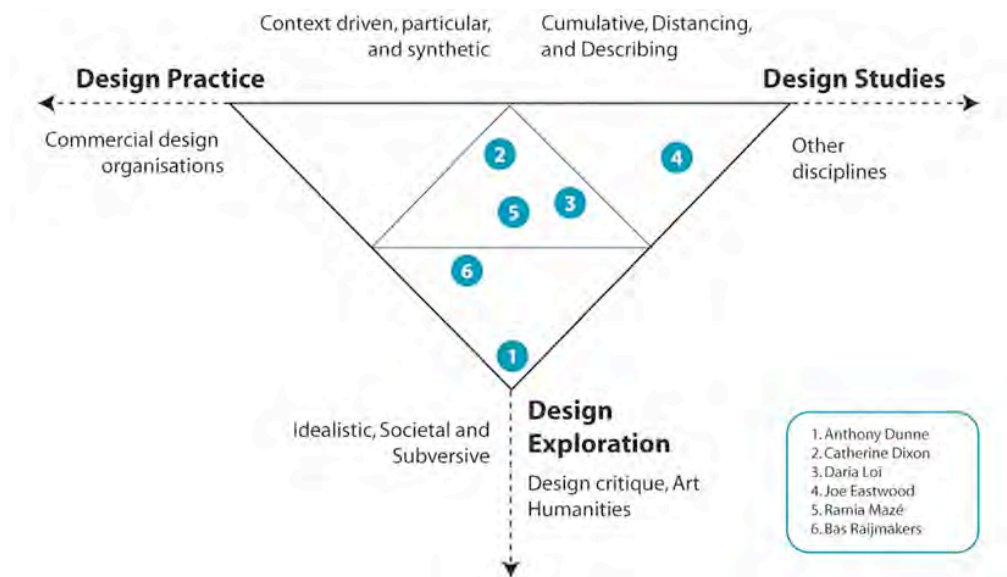


Fig 2. PhD examples placed in Fallman’ (2008, p. 5) Interaction Design Research Model

### ***Analysis Method***

A descriptive case study approach (Yin, 2003) was used as a general research strategy for this study. The six PhD theses was considered to be 'a set of individual case studies' (Robson, 2002, p. 181), where common features will be studied and compared. In general, case studies are the preferred strategy when 'how' and 'why' questions are being posed and the focus is on a contemporary phenomenon within some real-life context (Yin, 2003, p.1). This preliminary study aims to find out what types of research methods were used in each PhD thesis and understand how they were used.

The selection and justification of the data for this study was influenced by the method of documentary analysis. This method has generally been used to analyse governmental policy documents or curriculum documents to gain insight into an instructional activity or approach. As the main purpose of this study is to examine the methods employed in practice-based Design PhDs, the theses documents and secondary text written about these studies can provide a wealth of easily accessible, relatively unobtrusive and readily available research data (Forster, 1994 and Hakim, 1983). Additionally, it is a non-reactive process of collecting information and enables the application of a different perspective to a topic (ibid). The main disadvantages to this method as cited by Appleton and Cowley (1997) is the limitation of the data, potential bias in description of an activity or situation leading to 'hearing only one side of the story', missing or incomplete data required for the study, inaccuracies in original material and data studied out of context (Bailey 1982, Treece and Treece 1982, Stewart 1984, Webb et al., While 1987, Hakim 1993). As a method for a preliminary review in preparation for a larger more in-depth study, it is ideal due to its accessibility and readily available data.

Two sources of data were used in the analysis. The primary source of information came from the actual theses. The theses were a source of text that documented the actual methods employed and the justification as argued by the researchers themselves. Specific information was extracted from the theses in order to identify their purpose of enquiry and the methods employed in the studies. All but one thesis was reviewed in order to identify research methods employed and the reasoning for them. Due to the particular nature of Loi's thesis (which comes in a non-standard format of a suitcase containing artefacts and notes), the study used supporting text by Loi and other authors examining her research methods (see Loi (2004a), Rust, Mottram, & Till (2007) and Somerset (2008)).

The secondary data referred to by this study is based on additional academic text written in relation to the PhD studies. Examples of these articles include Mazé and Redström's paper (2007) discussing the operational and intellectual basis for critical practice in design and Seago and Dunne's (1999) paper discussing new methods in art and design. These articles provided additional insight into the purpose and reasoning behind the methods used.

In order to help the study identify the methodological approach taken, the text were coded in the following areas:

- Philosophical approach – What are its ontological and epistemological influences?
- Methodology – How did the researcher describe the general methodology applied in their research?
- Methods used – What were the research methods employed in the data collection and analysis?
- Thesis structure – Does the thesis structure provide clues to the way the study was conducted?

- Research purpose – How was the research conducted using Frayling's (1993) framework?
- Enquiry domain – Which knowledge area did the enquiry focused on? This was analysed using Cross's (1999) framework (see previous section)

Within each analysis category, phrases or sentences were coded when deemed to inform the enquiry of each category. The coded text was then displayed in a conceptually clustered matrix (Robson, 2002) as a method of data display (Miles and Huberman, 1994). A conceptually clustered matrix is a series of columns arranged to bring together items 'belonging together' in order to enable the discovery of patterns, themes and trends as well as enabling comparisons to be made.

### **Case Studies**

A short description of each study is presented, where their purpose of enquiry, methodology and research methods are discussed. The case studies are presented chronologically.

#### **Example 1**

##### **Anthony Dunne**

Hertzian tales: an investigation into the critical and aesthetic potential of the electronic product as a post-optimal object

*Year completed & awarding body*

1997, Royal College of Art, UK

This PhD explores how critical responses to the ideological nature of design can inform the development of aesthetic possibilities for electronic products. The outcome of the project is a 'design approach for producing conceptual electronic products that encourage complex and meaningful reflection on the inhabitation of a ubiquitous, dematerialising and intelligent artificial environment' (Dunne, 2005, p.147). Dunne's PhD is considered a methodological pioneer in the development of what would later come to be called a 'critical design' approach (Blauvelt, 2003; Mazé & Redström, 2007). Critical design has since been adopted as an umbrella term for any type of design practice which suggests that design offers possibilities beyond the solving of design problems. (Blauvelt, 2003). This thesis can be considered the 'blueprint' of what a critical design approach might look like, and is described by Seago and Dunne (1999) as using investigative design as a 'mode of discourse' in order to challenge preconceived ideas surrounding the object. The structure of the thesis consists of six essays that discuss existing theoretical perspectives and design approaches for developing the aesthetic possibilities of electronic objects. Five conceptual design proposals were developed as part of the research. Dunne (1997) stresses that these exploratory projects should not be considered as necessarily illustrations of the ideas discussed in the essays, nor are the essays an explanation of these proposals. Instead, they evolved simultaneously and are part of the same design process.

## Example 2

### Catherine Dixon

A descriptive framework for typeforms: An applied study

*Year completed & awarding body*

2001, Open University, UK

This PhD is described by Dixon (2001) as 'an applied research study within the field of typeface description. It focuses upon i) the pragmatic investigation of a problematic situation identified within the field and ii) exploration of an appropriate methodology located within the studio-practice of the researcher'. The research uses 'design as research' process, influenced by Schon's (1992) 'designing as reflective conversation with the materials of a design situation'. Dixon also describes the process as research initiated for the purposes of enriching or modifying aspects of a particular profession. The research method employed was reflective practice within a studio environment. The research outcome was a CD-ROM, which contained an alternative typeform description framework that has been tested and applied. The research outcome of this study was explicitly two-part, one part relating to the content of the study, and the other to the methodological approach of a practice-based enquiry. This is often the case with Design PhDs, where methodological innovation is often a required process due to the individuality of each enquiry.

## Example 3

### Daria Loi

Playful Triggers as keys to foster collaborative practices and workspaces where people learn, wonder and play

*Year completed & awarding body*

2004, RMIT, Australia

This thesis explored ways to foster organizational spaces where collaborative activities can be undertaken using design tools and methods. Loi (2004b) argued that in order for co-design activities to emerge, participants and designers have to be linked by meaningful relationships. As a result, she developed a series of tools called *Playful Triggers* and proposed them as effective tools to elicit relationships among users who can learn how to work together before undertaking co-design activities. The way the thesis was constructed and presented has been termed *multisensorial writing* (Loi, 2004a), an approach that 'mirrors how people experience and filter the world.' The thesis was presented as a suitcase containing participatory devices to enable readers to have a discourse with the thesis, while at the same time actively demonstrating some of the concepts that the thesis discusses (see Figures 3 & 4). The thesis/suitcase consisted of found and custom-made objects, CD, images and instructional notes. The tools created are based on Cultural Probes (Gaver, Dunne, & Pacenti, 1999) and offer a 'collection of tasks designed to elicit inspirational information from people about their individual lives' (Gaver, Walker, Boucher, & Pennington, 2002).



Figs 3 & 4. Loi's thesis-in-a-suitcase taken from Loi (2004) paper

#### **Example 4**

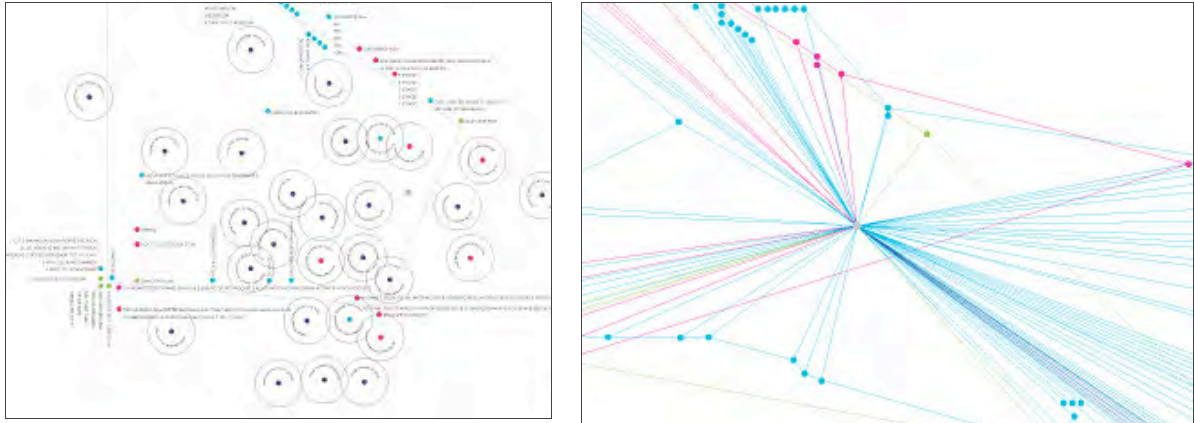
##### **Joe Eastwood**

An investigation of the relationship between typography and audio-based communication in the urban environment, with particular regard to pedestrian wayfinding.

*Year completed & awarding body*

2006, University of the Arts, UK

This PhD explores the relationship between text-based messages and audio-based communication within the contemporary urban environment. Issues relating to signage overload and urban movement were identified at an early stage in this study and pedestrian wayfinding was then selected as a form of communication that allowed for exploration of all the key issues. Eastwood uses a phenomenological perspective to reflect the researcher's own perception and understanding of each environment studied. The study was divided into two stages: a contextual review through a series of interviews with designers to identify key questions and two practice-based approaches that utilised analysis and experimentation – using visual analysis methods. The first approach was fieldwork observation of six public sites where a combination of notes, sketches, photographs and audio recordings were made of typographic and audio-based communication. These observations were visually analysed and a series of charts and macroscopic drawings were produced to facilitate data collection and analysis (see Figures 5 and 6).



Figs 5 & 6. Examples of visual documentation of Dam Square in Amsterdam extracted from Eastwood's project website (2009) and thesis (2007)

### Example 5

#### Ramia Mazé

Occupying time: Design, technology, and the form of interaction

*Year completed & awarding body*

2007, Malmö University, Sweden

This PhD is an inquiry into issues of time in interaction design, and argues that a central concern of interaction design must be the 'temporal form' of interactive objects and their 'form of interaction' as they are used over time. Philosophically, the study draws heavily on critical and 'post-critical' architecture theory. Mazé (2007, pg 20) also refers to Binder & Redström's (2006) 'Provisional Knowledge Regime' approach, a set of theoretical and experimental strategies and relations is presented as 'only one of many approaches, while a common ground is set for constructive and collaborative work' (Mazé, 2007, p. 20). This study's methodology can be described as a 3 x 3 matrix – exploring the themes within historical, practical and critical viewpoints – all underpinned by practice-based projects. Figure 7 is my interpretation of Mazé's research design, which she described verbally but not diagrammatically. I have also incorporated my observation of the discussion of themes progressing from theory to practice through the chapters, and how they relate to Frayling's (1993) framework.



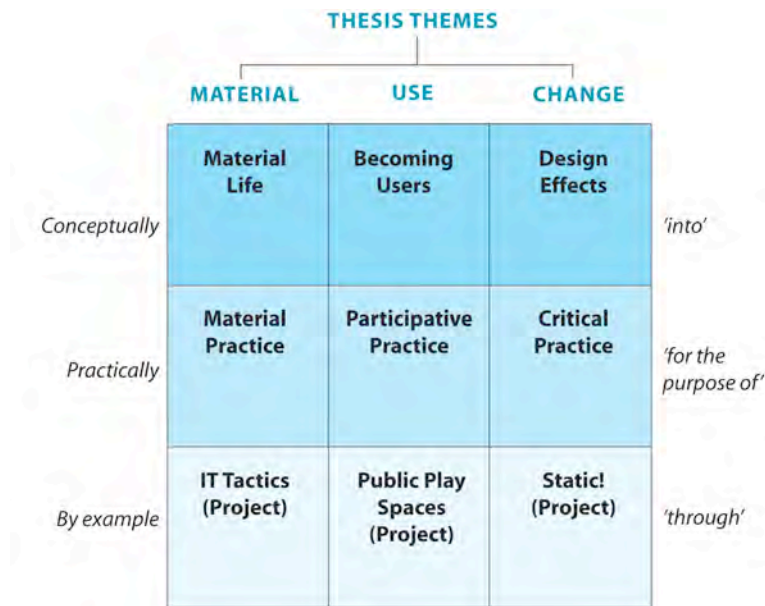


Fig 7. Maze's research design represented by a 3x3 matrix showing the relationship between chapters.

Design projects (which have been commissioned separately from the research enquiry) are presented as self-contained portfolio or documentary pieces. They are 'anchored' to the argument through open questions posed as speculations. Mazé uses design projects to initiate an internal dialogue 'criticality from within', with reference to Frayling's (1993) model of 'into', 'through' and 'for' design research. The study's outcomes are summarised as a series of questions within the three areas of Materials, Use and Change. These questions are meant to highlight issues that relate to temporal form, which needs to be considered during the design of interactive objects.

## Example 6

### Bas Raijmakers

Design Documentaries: Using documentary film to inspire design

*Year completed & awarding body*

2007, Royal College of Art, UK

This is an enquiry into how documentary film can be used in discovery research, which is a form of research that inspires and informs design practice through the use of video. The methodology is based on an interpretive viewpoint, derived philosophically from hermeneutics & phenomenology. The films ('artefacts') were created in order for the researcher to explore how design documentaries can be used in discovery research and to offer a critique on the existing practices of using video in discovery research. The process of making inspired Raijmakers' thinking in an iterative process, which was repeated several time in each case studies. At the same time, the films were considered to be 'data', case studies materials to be used in the inquiry. Raijmakers (2007) clarifies the research methods used under three areas:

1. Literature studies: Using hermeneutics and critical reflection to interpret text about films and the films themselves.

2. Film studies: The researcher conducted interviews with film directors and participated in documentary filmmaking master-classes. These were reviewed through content analysis, semiotics and mise-en-scene analysis.
3. Case studies of documentary films made by researcher: phenomenology and thinking-through-making (Seago & Dunne, 1999).

## **Analysis**

The case studies were compiled and analysed based on how each research was conducted using Frayling's (1993) 'Into', 'Through' and 'For the Purpose' framework. In addition, I have also used Cross's (1999) framework of 'people', 'process' and 'product' in order to reveal the focus of the investigations. The philosophical underpinnings of each study are also documented in order to reveal how and where the research methods may have evolved. A summary of these points is listed in Table 1 and key characteristics of the methods used will be discussed in this section.

### ***How was the research conducted?***

Almost all the case studies demonstrated multiple methods of enquiry into their respective subject, supporting a viewpoint that these types of enquiry ('into', 'through' and 'for') are not mutually exclusive. It seems that while Frayling's framework is a practical way to describe different types of design research, supervisors will have to be careful not to present the framework as individual routes of design research. The examples have shown that enquiries into design-related matters are much more complex and requires non-conventional research methods to address them. Examples like Raijmakers and Mazé have shown that it is possible to use all three types of enquiry as an appropriate approach to design research. The ability to analyse and articulate the type of research undertaken in a study will enable a new doctoral candidate to quickly grasp certain models of design research and begin constructing their own research model. However, students should not rely on the model to help them determine research methods, as the case studies have shown a range of methods and design research employed.

### ***What was the focus of the investigation?***

Three case studies were specifically interested in the study of practices and processes of design (process) while the other three case studies looked at studying both the design process and the configuration of artifacts. None of the studies were focused on investigating the manner in which people design. It is not possible to draw any conclusion as to why there is a lack of focus in this last category due to the small sample size. However, it is possible to infer from the analysis that the focus of investigation seemed to be consistent with the method of enquiry used (see the comparisons between the fourth and fifth column of Table 1). Except for Eastwood's study, Dunne, Dixon and Loi studies ('for' and 'through') are focused on processes and products. Mazé and Raijmakers ('into', 'for' and 'through') use all three types of enquiry to investigate process related issues.

PhD Examples	What are its ontological and epistemological influences?	Description of general methodology applied	Methods used	How was the research conducted? (Frayling, 1993)			What was the focus of the investigation? (Cross, 1999)		
				Into	For	Through	People	Process	Product
Anthony Dunne	Material critical theory	Critical design	- Exploratory projects - Reflective practice <sup>3</sup>		X	X		X	X
Catherine Dixon	Pragmatic and applied	Design as research	- Visual survey - Reflective practice - Peer reviews		X	X		X	X
Daria Loi	Participatory	Multi-sensorial writing	- Cultural probes		X	X		X	X
Joe Eastwood	Phenomenological	Design as research	- Interviews - Fieldwork documentation using photograph, notes and audio recording - Visual analysis - Exploratory projects			X		X	
Ramia Mazé	Critical and post-critical architecture	Criticality from within	- Exploratory projects - Reflective practice	X	X	X		X	
Bas Raijmakers	Hermeneutics and phenomenology	Design as research	- Literature studies - Film studies - Exploratory projects as case studies	X	X	X		X	

Table 1. PhD Examples Summary

<sup>3</sup> Dunne does not explicitly state the research methods that were used in the review of the projects. However, judging from Seago's description of 'highly considered artefacts' (in Seago and Dunne 1999 paper), it would seem to suggest that some form of reflective practice process took place.

### ***Philosophical and Methodological models***

It is perhaps not surprising to see that an enquiry using the practice of designing, as the main source of data generation should gravitate to research models that position the researcher at the centre of the enquiry. The reflective practice method, which involves the researcher thoughtfully considering one's own experiences in applying knowledge to practice, is evident in almost all of the case studies. Additionally, the use of the phenomenological approach was explicitly evident in two of the case studies. Phenomenological research focuses on the subjective experience of the individuals studied, enquiring into their experiences and understanding of a particular phenomenon (Robson, 2002). This approach enables the objective study of topics usually regarded as subjective by a researcher through the process of reflexivity. Crotty (1998) stresses the importance of reflexivity in order to be aware of the ways in which the researcher as an individual with a particular social identity and background has an impact on the research. The use of critical theory in Dunne's and Mazé's works illustrates the focus of their respective studies in using design as a method to critique, to ask questions rather than provide answers. Their approach differs from the other case studies in terms of their intent for their final designed outcome. Dixon, Eastwood and Raijmakers employed the design project as a vehicle to explore the research question rather than as a means to reflect upon and question the social, cultural and ethical implications of design objects and practice.

### ***Characteristics of the Methods Applied***

#### **Thesis-structural Innovation**

The creation of an innovative methodology seems to go hand in hand with thesis-structural innovation. This is especially evident in the way Mazé and Loi have translated their research methods into a thesis structure. Mazé's 3x3 matrix (see Figure 7) succinctly illustrates how she explored her themes through a theory to practice model (and vice-versa), as well as using Frayling's research framework to frame her chapters and research design. Mazé took Dunne's model of interlinking essays and projects and provided an additional layer of complexity by linking theoretical concepts with projects through discussions of practice, using existing design case studies. Loi has taken the thesis-structural innovation to a logical end by changing the actual thesis structure itself. Although it is fairly common for an artefact to accompany a written thesis in Design PhDs, it was unprecedented that an artefact alone should act as the thesis. Indeed, questions surrounding production, accessibility, control, disciplinary, supervision, institutional and examination issues have to be addressed (see Loi (2004) paper on this) in order to determine the viability of such alternative thesis format.

#### **'Pick and Mix'**

Research designs employed in all the selected examples can be described as 'pick and mix', a form of bricolage (Galloway, 2008) or assemblage which often combines methods from the social sciences, humanities and hard sciences to derive a suitable model of inquiry. The necessity of this approach is not surprising considering the lack of an established research framework for design. However, perhaps this 'pick and mix' has become the established paradigm for design, and methodological innovation emerges from the way a researcher combines established research methods with practice-based methods. Kincheloe (2001, p. 683) describes this process well through his description of bricolage as a method that 'does not simply tolerate difference but cultivates it as a spark to researcher creativity ... Sensitive to

complexity, bricoleurs use multiple methods to uncover new insights, expand and modify old principles, and reexamine accepted interpretations in unanticipated contexts'.

### **Linking Practice with Theory**

Reflective practice (Schön, 1983) seems to be the most popular choice for research that involves a practice-based element, where the process of designing is an integral part of the research. This method is a common model, even where reflective practice was not the main methodological framework for example in Dunne, Mazé and Rajjmaker's works. Dixon's work can probably be considered the most 'pure' in terms of its use of reflective practice as the main methodological framework, and all the other methods (peer review and visual analysis) are employed to support this. In contrast, in Mazé's and Dunne's studies reflective practice was used to critically review design projects in order to understand its relationship to the development of theory, which also has been supported by other non practice-based means. In Loi's case, she explicitly links practice with theory through the actual thesis construction, presenting (and defending) the research outcome through the reader's interaction with the piece.

### **Visual Analysis**

In Eastwood and Dixon's studies, the role of visual analysis was an important part of the data collection and analysis. In Eastwood's study, the fieldwork data was translated into a range of visual representations, which enabled him to analyse and derive conclusions from the data collected. These data charts and macroscopic drawings also serve to act as data presentation visuals, and have enabled him to communicate his research to his audiences. Dixon's work investigates the actual form of typeface constructions, and part of her research involves a visual survey of recent typeforms. This type of analysis is similar to the comparative research that is often conducted by designers during the early part of a design process.

## **Some considerations on training provision**

### ***Offering an alternate research model***

Students should be made aware at the beginning of their doctoral design research programme that while there are established research models in different disciplines, the 'pick and mix' design-specific model is more pertinent to their discipline. Design research frameworks such as these of Frayling (1993) and Cross (1999) are useful to establish the purpose and focus of enquiry undertaken by the student in order to help them select the most appropriate methods. Supervisors could encourage students to evaluate existing practice-based processes and consider how to make them more 'systematic, rigorous, critical and reflexive and communicable' (Newbury, 1996). The models reviewed should also consider the form and format of the final thesis, as innovative methodological innovation is often congruent with the way the thesis is structured.

### ***Reframing Methods***

Instead of discussing research methods by way of their associated discipline (arts, science, humanities), or through the type of analysis employed (quantitative, qualitative) the methods can be discussed in terms of how they might link practice with research and vice-versa. Similarities drawn from practice-based methods and

processes are a useful way to aid the novice design researcher link their existing design activity with research activity and emphasize the relationship between these two. Shared processes such as investigative, iterative and creative processes are evident in both practice and research (Yee, 2007). As such, we should be moving towards a holistic model as expressed by Fallman (2008) in how we discuss and explore knowledge within the design discipline.

### ***A Designerly Way of Researching***

The various research methods highlighted from the examples, within this paper have drawn from a mixture of established and new ways of collecting and analysing data. I would posit that this process of creatively combining processes is not dissimilar to how innovative processes are developed in practice (Yee, 2007), and that this should also be encouraged in the research enquiry. Hart (1998) emphasizes how important it is to develop an imaginative approach to research. For him, a research imagination is about:

‘having a broad view of a topic; being open to ideas regardless of how or where they originated; questioning and scrutinizing ideas, methods and arguments regardless of who proposes them; playing with different ideas in order to see if links can be made; following ideas to see where they might lead...’ (1998, p. 30).

Supervisors are encouraged to be open to methodological innovation, and to ensure that the development of these methods is rooted within a research tradition. As long as the student is able to demonstrate that the research conducted is ‘academic’ as in thoroughly argued and referenced (Glanville, 1998) then methodological innovation will often be part of their eventual contribution to knowledge in the field.

### **Reflections**

This study is designed to be a preliminary review of current Design PhDs. The selected case studies are chosen on the basis of their innovative use of methods and to illustrate a variety of different research design approaches to Design PhDs. Readers should note that the analysis and conclusions drawn are from a limited range of case studies and only provide a glimpse into possible research models. In order to fully inform the design research community, doctoral candidates and supervisors, a more in-depth study enabling deeper critical engagement with a larger sample of case studies has to be conducted.

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